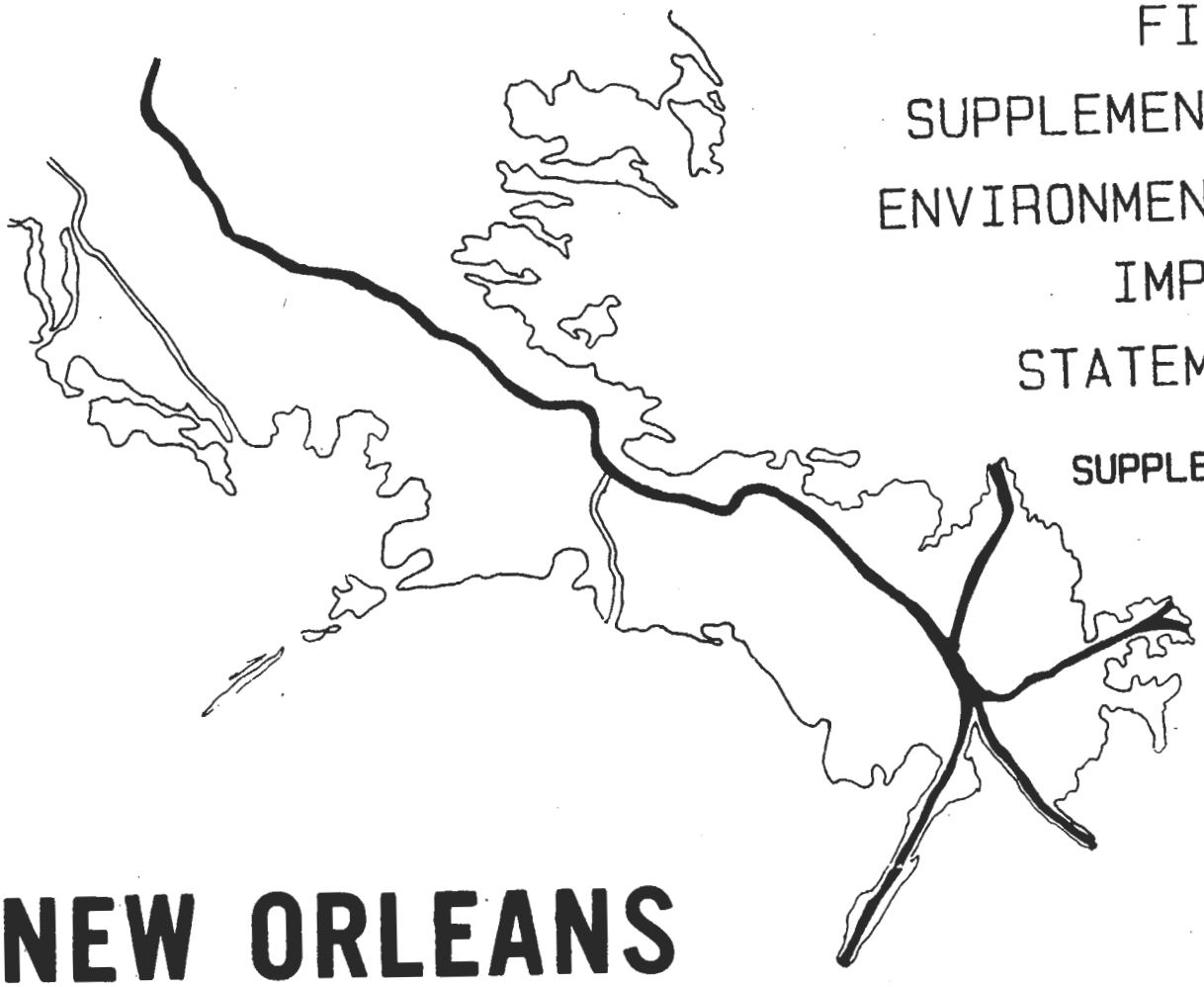
Vol 2

US Army Corps
of Engineers
New Orleans District

NOVEMBER 1987

FINAL
SUPPLEMENTAL
ENVIRONMENTAL
IMPACT
STATEMENT

SUPPLEMENT
II



NEW ORLEANS TO VENICE

UISIANA

APPENDIXES

BARRIER FEATURES

HURRICANE PROTECTION PROJECT

APPENDIX A

U.S. FISH and WILDLIFE SERVICE'S

COORDINATION ACT REPORT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
75 SPRING STREET, S.W.
ATLANTA, GEORGIA 30303

Colonel Lloyd K. Brown
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160

Dear Colonel Brown:

The enclosed Fish and Wildlife Coordination Act Report on the New Orleans to Venice, Louisiana, Hurricane Protection Project (Reach C and Barrier Feature) was prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The report has been coordinated with the Louisiana Department of Wildlife and Fisheries and the National Marine Fisheries Service.

Your cooperation in this matter is appreciated.

Sincerely yours,

Assistant Regional Director
Fish and Wildlife Enhancement

Enclosures

NEW ORLEANS TO VENICE, LOUISIANA,
HURRICANE PROTECTION PROJECT:
FISH AND WILDLIFE COORDINATION ACT REPORT
ON REACH C AND BARRIER FEATURES

SUBMITTED TO

NEW ORLEANS DISTRICT

U.S. ARMY CORPS OF ENGINEERS

NEW ORLEANS, LOUISIANA

PREPARED BY

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FISH AND WILDLIFE ENHANCEMENT

LAFAYETTE, LOUISIANA

U.S. FISH AND WILDLIFE SERVICE

SOUTHEAST REGION

ATLANTA, GEORGIA

NOVEMBER 1987

EXECUTIVE SUMMARY

The attached document presents the findings and recommendations of the Fish and Wildlife Service (Service) relative to the New Orleans to Venice, Louisiana, Hurricane Protection Project (Reach C and the Barrier Feature). This report is presented in accordance with the Fish and Wildlife Coordination Act; its contents have been developed on the basis of surveys and analyses of the study area, the recommended plan, and other structural alternatives studied.

The project was authorized by the Flood Control Act of October 23, 1962, for the purpose of providing hurricane protection to the developed areas of Plaquemines Parish along the Mississippi River below New Orleans. This is to be accomplished via upgrading an existing back levee system and a segment of the Mississippi River levee. This report addresses the potential impacts associated with two of the five project features, i.e., Reach C and the Barrier Feature.

The Reach C Feature and the Barrier Feature (West Bank River Levee alternative) would negatively impact, on an average annual basis, 750 acres of forested lands and 17 acres of estuarine marsh and scrub-shrub habitats. Those losses would have significant adverse impacts on fish and wildlife. Destruction of wooded batture (i.e., riverfront) lands would eliminate the primary spawning, nursery, and feeding habitat available to riverine fishes. The loss of estuarine marsh and scrub-shrub habitats would reduce the amount of organic detritus exported to adjacent estuarine waters; such detritus forms the base of the food chain for many species of commercially and recreationally important fish and shellfish. The value of the affected marsh as nursery habitat would also be lost. Project implementation would result in the annual loss of 1,584 pounds of commercial fisheries harvest, valued at $950, and 142 man-days of sport fishing potential, valued at $632.

The forested, marsh, and scrub-shrub habitats to be impacted by the project features serve as valuable nesting, feeding, and cover habitat to numerous wildlife species. Their destruction will result in a loss of 907 Average Annual Habitat Units to the evaluation species used in the Habitat Evaluation Procedures analysis (i.e., gray squirrel, downy woodpecker, swamp rabbit, North American mink, common yellowthroat, mottled duck, and great egret). The project will also result in the net loss of 222 man-days of sport hunting valued at $1,809, and 297 man-days of wildlife-oriented recreation valued at $1,323.

Most adverse habitat impacts could be avoided if borrow material for the proposed levee work were taken from non-wetland sites. Impacts could be minimized by backfilling all borrow pits with material dredged from the Mississippi River and planting the sites with bottomland hardwood tree species where appropriate. The configuration of borrow pits proposed for the batture area could be modified to maximize sedimentation rates and thus speed up revegetation and succession.

Unavoidable impacts to bottomland hardwood habitat associated with the project can be compensated by preservation of existing forested lands threatened by development or by creation of new bottomland hardwoods via selective planting on existing open lands. Impacts to marsh can be compensated by marsh creation or marsh management. The marsh creation can be accomplished by excavation of artificial crevasses or construction of sediment fencing in the active delta of the Mississippi River. Losses of riverfront hardwoods and scrub-shrub habitats can be mitigated via either of the above plans.

The Fish and Wildlife Service recommends that the following mitigative measures be implemented:

1. The least environmentally damaging reasonable alternative, i.e., the use of open, non-wetland sites for borrow materials, should be implemented. This action would eliminate the need for additional mitigation and is the only alternative that would fulfill all of the planning objectives.

2. Impacts on fish and wildlife resources should be minimized by leaving strips of batture woodlands intact along the length of the Barrier Feature borrow area. These wooded strips should be 500-feet-wide and spaced at intervals of 1.5 to 2 miles.

3. All borrow pits should be backfilled with material dredged from the Mississippi River channel (possibly in conjunction with ongoing construction of the other project reaches) to facilitate revegetation. Backfilled pits should be planted with bottomland hardwood species where conditions would be conducive to their growth.

4. Unavoidable impacts to bottomland hardwoods should be compensated in-kind via planting of existing open lands and preservation of those newly forested areas for the life of the project, or by preservation of an existing tract of bottomland hardwoods threatened by future development.

5. Unavoidable losses of marsh should be compensated in-kind via excavation of crevasses, installation of sediment fences, or implementation of marsh management features to create and/or preserve marsh.

6. Unavoidable losses to riverfront hardwoods and scrub-shrub habitats should be compensated through creation of additional forested and/or marsh habitat via the above-cited methods or by preservation of existing marsh or forested lands.

7. Mitigation features should be implemented simultaneously with other project features.

8. The initial development, replacement, and annual operation and maintenance costs for the mitigation features shall be borne as an integral project expense.

9. Detailed design of the hurricane protection and mitigation features shall be coordinated with the Fish and Wildlife Service and other interested natural resource agencies.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

The New Orleans to Venice, Louisiana, Hurricane Protection Project is located along the Mississippi River in Plaquemines Parish, Louisiana. The project was authorized by the Flood Control Act of October 23, 1962, in accordance with the recommendations of the Chief of Engineers and House Document No. 550, 87th Congress. The project is intended to provide hurricane protection to the developed areas of Plaquemines Parish along the Mississippi River below New Orleans. This is to be accomplished via upgrading an existing back levee system and a segment of the Mississippi River levee. The project includes five features: Reach A, Reach B-1, Reach B-2, Reach C, and the Barrier Feature (Figure 1). A Fish and Wildlife Coordination Act Report was transmitted to the District Engineer, New Orleans District Corps of Engineers (Corps) for Reaches A, B-1, and B-2, in March of 1982. The Corps is currently planning to upgrade the existing Reach C levee and has also been evaluating alternatives for the Barrier Feature. Accordingly, this report will address the potential impacts associated with those latter two features of the project.

This document constitutes the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et. seq.). In keeping with the requirements of that Act, this document should be attached to and made part of any report released for public review or forwarded for administrative approval.

PROJECT DESCRIPTION

The planning objectives of the study are as follows: to provide hurricane protection to residents of the area and to prevent losses due to flooding; to preserve the area's cultural heritage; to prevent the loss of recreational potential; to preserve, enhance and create as much marsh as practical; and to protect the flora and fauna of the study area. The project plan originally involved the enlargement of the locally constructed back levee from City Price to Venice on the west bank (Reaches A, B-1, and B-2), bringing the existing levee from Phoenix to Bohemia up to grade on the east bank (Reach C), and construction of a barrier levee on the east bank between Bohemia and Baptiste Collette Bayou to protect developed areas on the west bank, between City Price and Venice, from storm surges from the east (Barrier Feature). Impacts associated with the project were addressed in the final Environmental Impact Statement filed with the Council on Environmental Quality on January 16, 1975, and a Supplemental Environmental Impact Statement (covering Reaches A, B-1, and B-2) filed with the Environmental Protection Agency on April 12, 1985. Work on Reaches B-1 and B-2 is currently in progress; work on Reach A

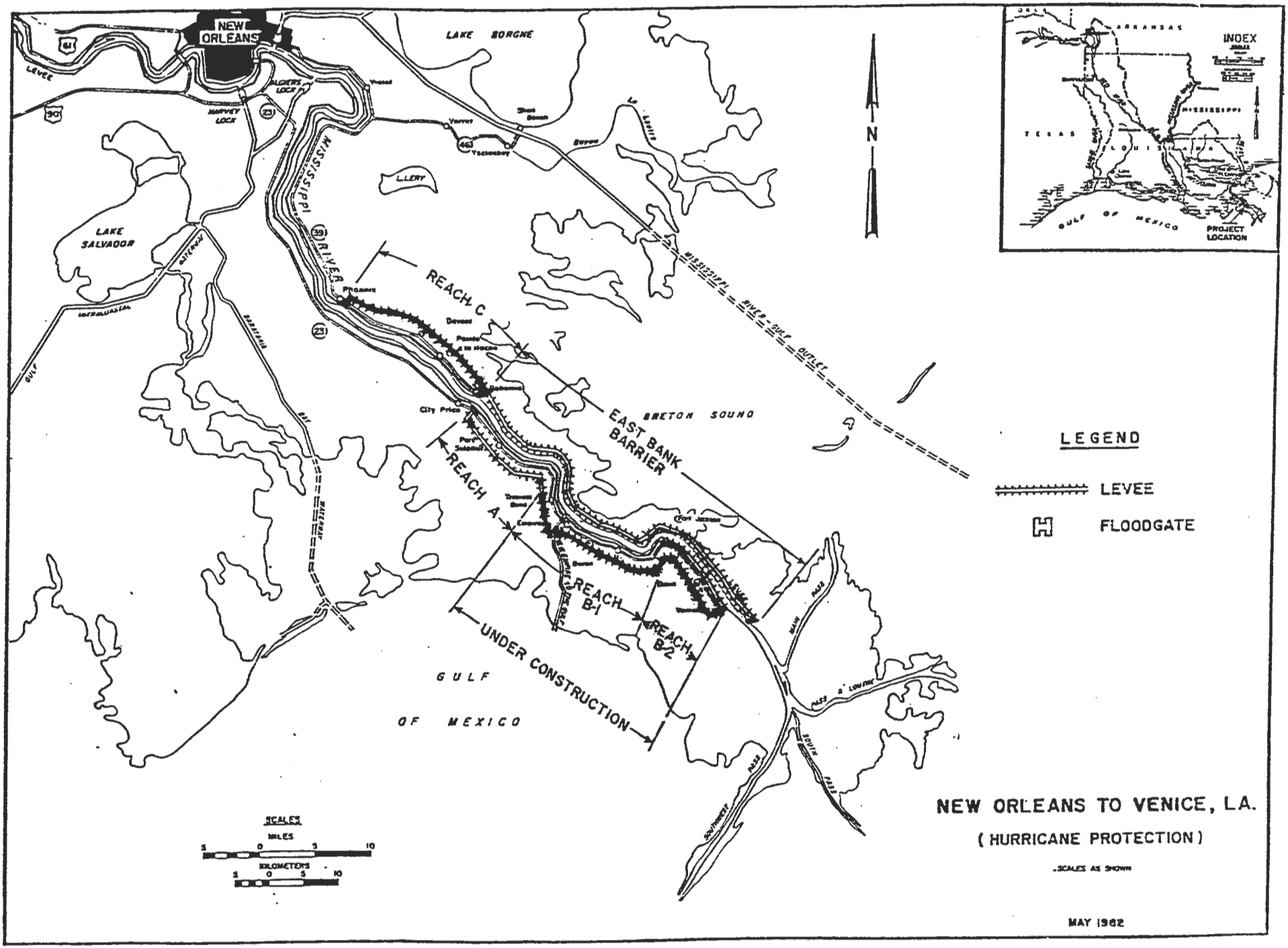

Figure 1. Vicinity map of the New Orleans to Venice, Louisiana, Hurricane Protection Project.

has not yet begun. Reach C and the Barrier Feature have been the subject of additional engineering and design and are discussed below.

Reach C

The 16-mile-long levee from Phoenix to Bohemia (Reach C) was considered complete in 1978. Recent surveys, however, have indicated that the levee has settled about 2 feet and now requires upgrading. The Corps proposes to remove material from borrow pits in the project vicinity to bring the existing levee to design specifications. Only the impacts associated with the new borrow sites are addressed herein; all other impacts were addressed in the 1975 Environmental Impact Statement.

The Corps has investigated five alternative plans (including the no action alternative) for upgrading the Reach C levee. Alternative 1, i.e., the recommended plan, proposes to use material hauled from borrow pits located within the Pointe a la Hache Relief Outlet and the Poverty Point Plantation area (Figures 2 and 3). The pit created at the former area would fill in naturally with river sediment in the batture (i.e., the riverfront area between the river channel and the adjacent river levee); the pit at the latter area would remain as open water. Alternative 2 is identical to Alternative 1 except that the pit created at the Poverty Point Plantation site would be backfilled with material dredged from the Mississippi River. Under Alternative 3, materials would be hauled from two nearby upland pits, one near the northern end of Reach C and one near the southern end. The pits would be backfilled with material dredged from the Mississippi River. Alternative 4 would involve use of a dragline to obtain material from the marsh adjacent to the existing levee. Alternative 5 is the no action alternative.

Alternatives 1 and 2 would impact about 134 acres of scrub-shrub and wooded wetlands; Alternative 3 would impact 126 acres of upland, and Alternative 4 would impact 400 acres of marsh. Cost estimates for the four alternatives are $15 million, $16.5 million, $17 million, and $20 million, respectively.

The recommended plan would use material from borrow pits located at each end of the Reach C alignment. On the northern end, a pit would be located in the Poverty Point Plantation area (adjacent to mile 60 Above Head of Passes). The borrow area would be 64 acres in size. The borrow pit would remain as open water habitat. On the southern end of the Reach C alignment a borrow site would be located within the Pointe a la Hache Relief Outlet area (mile 44 Above Head of Passes). Sixty-three acres of batture land in this area have already been designated for use as a borrow site; the impacts of that borrow site were addressed in an April 9, 1986, Environmental Assessment and Finding of No Significant Impact and, on a preliminary basis, in our April 25, 1986, Planning Aid Letter that responded to those documents. An additional borrow site (the impacts of which were addressed in a December 9, 1986, Environmental Assessment and unsigned Finding of No

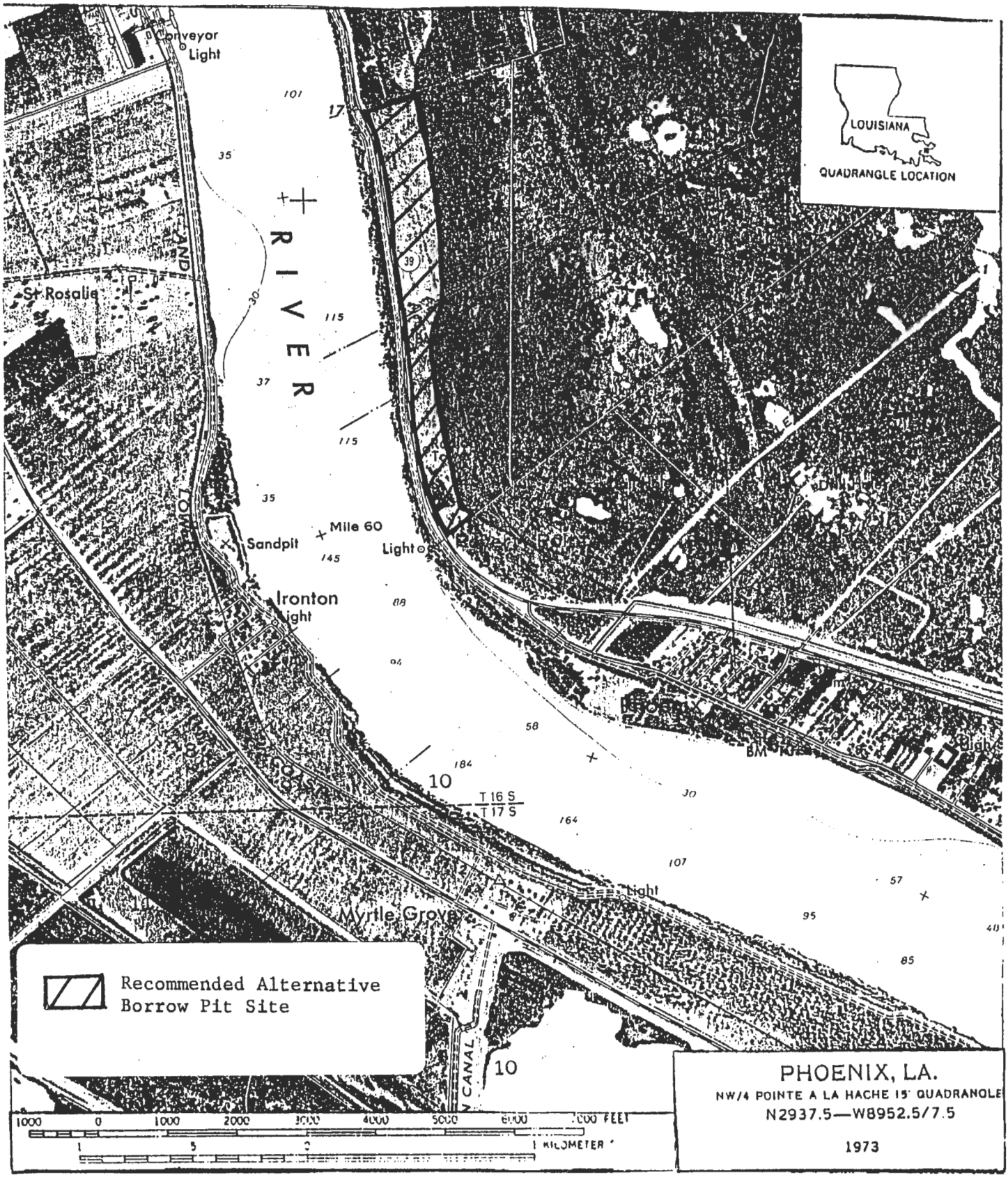

Figure 2. Project site location of the Poverty Point borrow area for the Reach "C" feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project.

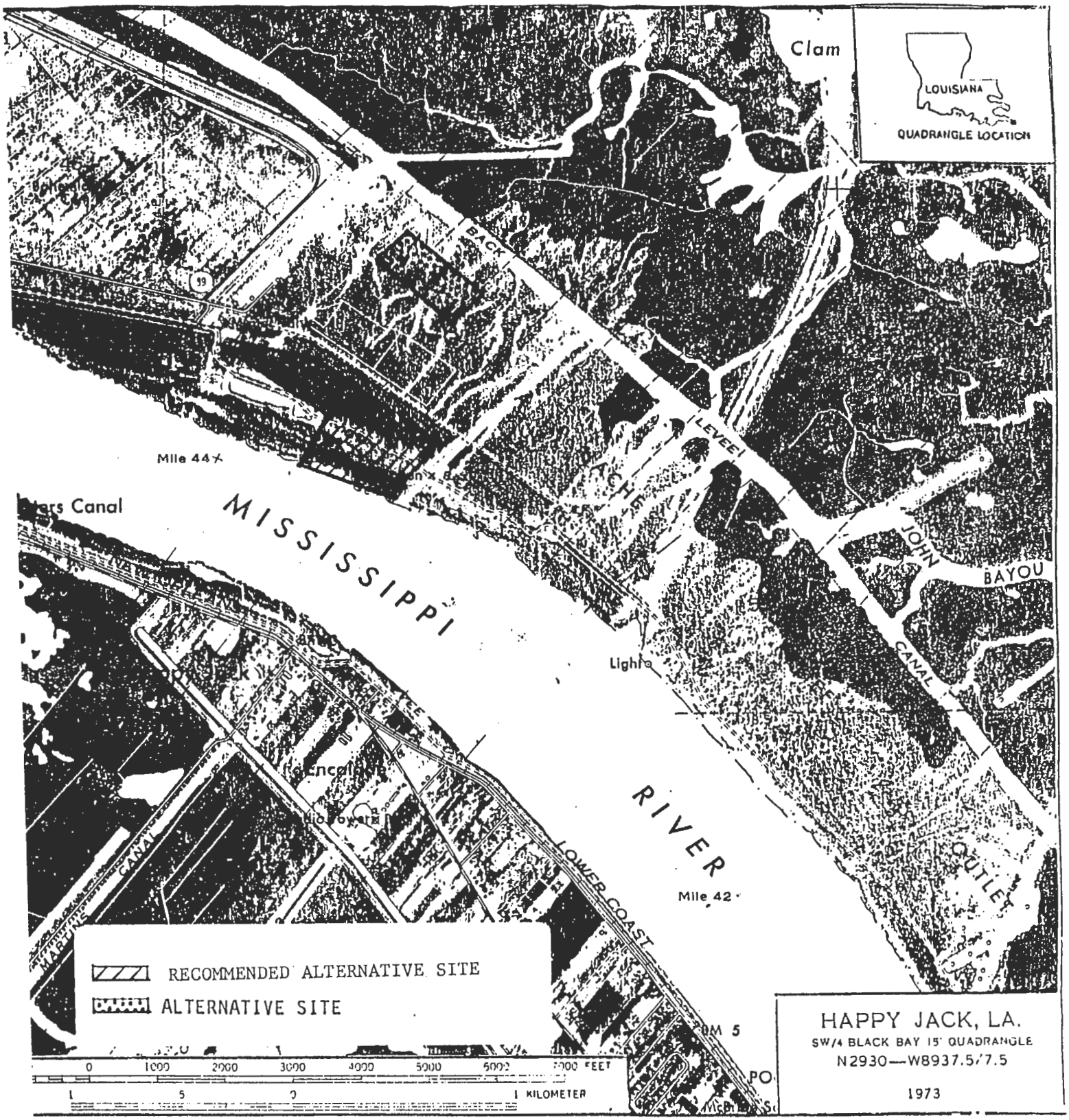

Figure 3. Project site location of the Pointe a la Hache borrow area for the Reach "C" feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project.

Significant Impact and, on a preliminary basis, in our January 22, 1987, Planning Aid Letter that responded to those documents) would be located at the Relief Outlet, either adjacent to the previously mentioned batture site or on the natural levee ridge east of the batture. The batture site would impact 70 acres of woodlands, whereas the ridge site would impact 45 acres. For all pits, material would be removed to a depth of minus 15 feet National Geodetic Vertical Datum. The batture site is expected to fill in naturally with river sediment within a 10-year period; we predict that vegetation will reach, as a result of natural succession, pre-project conditions in approximately 90 years (see Appendix A for acreage projections).

Barrier Feature

According to the Corps, developed areas adjacent to the west bank of the Mississippi River between City Price and Venice are vulnerable to storm surges from the east. The Corps has evaluated two alternatives to provide hurricane protection to those areas: the East Bank Barrier plan and the West Bank River Levee plan.

The East Bank Barrier plan was proposed as part of the original project and is discussed in the 1975 Environmental Impact Statement. The plan consists of constructing a new levee on the east bank between Baptiste Collette Bayou (mile 10 Above Head of Passes) and Bohemia (mile 44 Above Head Passes) and upgrading of the existing levee on the west bank between Venice (mile 10 Above Head of Passes) and Fort Jackson (mile 20 Above Head of Passes). Approximately 532 acres would be required for levee construction, and 600 acres would be required for borrow material.

Under the West Bank River Levee plan (the recommended alternative), the existing Mississippi River and Tributaries levee between City Price and Venice would be enlarged (Figure 4). Levee material would be barged from borrow areas on the east bank. The borrow areas would include part of the Mississippi River channel shoreward of the minus 15-foot contour and would extend to a point approximately 100 feet riverward of the existing road, between miles 10 and 44. Approximately 1,241 acres of riverine open water and batture woodlands would be impacted by the borrow areas on the east bank; those areas would be excavated in two lifts over a 20-year period. An additional 850 acres of forested and developed lands would be impacted on the west bank due to levee widening.

DESCRIPTION OF STUDY AREA

The study area for Reach C and the Barrier Feature (Figure 1) is located in Plaquemines Parish, Louisiana, along the Mississippi River.

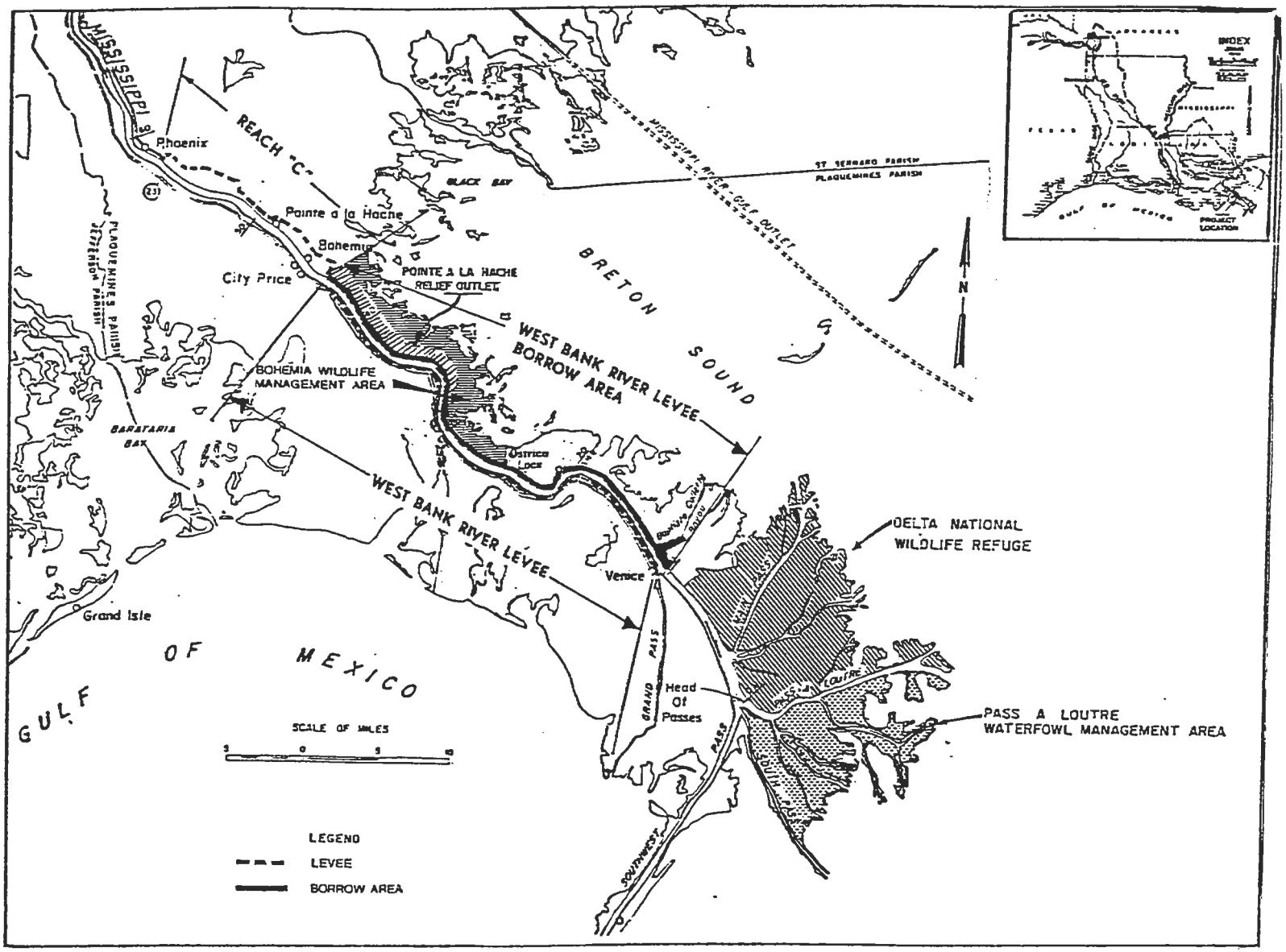

Figure 4. Vicinity map of the Reach "C" and Barrier Feature (West Bank River Levee Plan) of the New Orleans to Venice, Louisiana, Hurricane Protection Project.

On the east bank of the river, the study area extends from Phoenix (mile 60 Above Head of Passes) to just south of Baptiste Collette Bayou (mile 10 Above Head of Passes); on the west bank the study area extends from City Price (mile 44 Above Head of Passes) to Venice (mile 10 Above Head of Passes). The lands immediately adjacent to the Mississippi River (i.e., the natural levee ridge) represent the highest lands in Plaquemines Parish. They were formed via sediment deposition that resulted from overbank river flooding over hundreds of years. Most of those lands are now developed as agricultural, residential, or commercial/industrial areas, although some remain forested. Most of the developed areas along the natural levee ridge are now protected from Mississippi River flooding by the Mississippi River and Tributaries levee system and from tidal flooding and storm surges by a back levee system.

The land between the Mississippi River and Tributaries levee and the river is called the batture area; the batture is predominantly forested land and is subject to overbank flooding from the river. Lands adjacent to the natural levee ridge on the side opposite the river consist primarily of estuarine emergent marsh with scattered estuarine scrub-shrub and palustrine emergent marsh areas.

Wildlife Management Areas in the project vicinity include Bohemia and Pass a Loutre Wildlife Management Areas; those areas are operated by the Louisiana Department of Wildlife and Fisheries. Delta National Wildlife Refuge, operated by the Fish and Wildlife Service (Service), is also in the project vicinity (Figure 4).

FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

Description of Habitats

The major habitat types in the study area can be classified as estuarine emergent marsh, estuarine scrub-shrub wetlands, palustrine forested wetlands, open water, and upland developed.

The estuarine emergent marsh that would be impacted by the project is presently vegetated primarily with big cordgrass, with scattered eastern baccharis and saltmeadow cordgrass also present. The latter species is expected to become predominant in the estuarine emergent marsh areas as elevations decrease due to continued subsidence.

The estuarine scrub-shrub habitat type in the study area is dominated by eastern baccharis; associated vegetation includes big cordgrass, saltmeadow cordgrass, common reed, aster, goldenrod, and sedge. This habitat type is expected to succeed to estuarine emergent marsh as elevations decrease due to continued subsidence.

Palustrine forested habitat in the study area was divided into three habitat types based on successional stage and dominant vegetation: riverfront hardwoods, and mid-successional and subclimax bottomland hardwoods. Riverfront hardwoods are dominated by black willow and/or Chinese tallow. The willow-dominated areas are largely ungrazed and have an understory of elderberry, wax myrtle, persimmon, trumpet creeper, peppervine, ladies' eardrop, elephant ear, false nettle, purple mist flower, and water hyacinth (in the wetter areas). Areas that are heavily grazed have an overstory of black willow and Chinese tallow with wax myrtle present in the mid-story. The understory is sparsely vegetated with peppervine, poison ivy, bull thistle, blackberry, goldenrod, elephant ear, and false nettle; water hyacinth and arrowhead are present in the wetter areas.

Mid-successional bottomland hardwood areas have an overstory of black willow, sycamore, sugarberry, cottonwood, honey locust, sweet pecan, and occasionally live oak. Understory species include rough leaf dogwood, wax myrtle, elderberry, peppervine, trumpet creeper, honeysuckle, poison ivy, wild grape, shield fern, blackberry, and elephant ear. The understory is generally sparse due to the dense canopy, although ground cover is more abundant where openings in the canopy occur.

Subclimax bottomland hardwood forest areas in the study area are dominated by an overstory of water oak, live oak, American elm, green ash, sugarberry, and sweet pecan. Midstory species include honey locust, rough leaf dogwood, persimmon, deciduous holly, and elderberry. The understory is vegetated with poison ivy, peppervine, trumpet creeper, Virginia creeper, honeysuckle, wild grape, blackberry, elephant ear, and dayflower.

Riverine open water habitat in the study area consists of the Mississippi River and Baptiste Collette Bayou, plus numerous small canals and borrow ditches. Estuarine open water habitat also exists in the study area as marsh ponds and shallow open water areas. Open water areas are largely unvegetated, but they may contain areas of floating and/or submersed aquatic vegetation such as water hyacinth, water lilies, lotus, duckweed, frogbit, bladderwort, coontail, and widgeon grass. Upland developed habitat consists of existing levees, roads, agricultural areas, residential areas, and commercial/industrial areas.

Fishery Resources

A diverse sport and commercial estuarine fishery is associated with the study area. The tidal marshes, aquatic vegetation beds, and shallow estuarine waters provide valuable spawning and nursery habitat

to a variety of species of crustaceans and finfishes. Vegetated wetlands also provide valuable organic detritus to adjacent estuarine waters; the detritus is extremely important in the maintenance of fish and shellfish productivity. Common estuarine fish and shellfish species associated with the project area include Gulf menhaden, blue catfish, gafftopsail catfish, sea catfish, sheepshead, black drum, Atlantic croaker, spotted seatrout, sand seatrout, red drum, spot, striped mullet, southern flounder, American oyster, white shrimp, brown shrimp, and blue crab. In addition, the forested areas adjacent to the Mississippi River serve as spawning, nursery, and feeding areas during high water periods to commercially important riverine fish species such as channel, blue, and flathead catfish, gars, smallmouth and bigmouth buffalo, gizzard shad, carp, and freshwater drum.

Wildlife Resources

Migratory waterfowl and other wetland gamebirds are common in the marshes, open water bodies, and flooded forested wetlands of the study area. The greatest concentrations of dabbling ducks occur in the marshes, shallow water bodies, and flooded woodlands, while diving ducks prefer deeper bays and lagoons. Migratory dabbling ducks include mallard, northern pintail, blue-winged teal, green-winged teal, gadwall, American wigeon, and northern shoveler. Common divers include lesser scaup, redhead, ring-necked duck, red-breasted merganser, common merganser, and hooded merganser. The resident mottled duck nests and winters in the marshes of the project area. The lesser snow goose also utilizes the marshes of the project area. Other wetland gamebirds in the study area are the king rail, clapper rail, sora, Virginia rail, American coot, common snipe, and American woodcock.

Non-game birds in the study area include several species of wading birds, seabirds, shorebirds, and songbirds. Common wading birds include the little blue heron, great blue heron, great egret, snowy egret, cattle egret, white-faced ibis, white ibis, green-backed heron, and yellow-crowned night heron. Seabirds include white pelican, black skimmer, herring gull, laughing gull, and several species of terns. Common shorebirds in the project area include killdeer, American avocet, black-necked stilt, American oystercatcher, common snipe, and numerous sandpipers. Other non-game birds in the project marshes include marsh wren, boat-tailed grackle, belted kingfisher, red-winged blackbird, and seaside sparrow. Forested habitats also support numerous species of raptors (e.g., red-tailed hawk, red-shouldered hawk, barred owl), woodpeckers (e.g., pileated, downy, hairy, and red-bellied woodpeckers), and songbirds (e.g., northern parula, yellow-rumped warbler, prothonotary warbler, red-eyed vireo, Carolina chickadee, tufted titmouse).

The project area supports a high diversity of mammal species. White-tailed deer, the only big game animal in the study area, is found in the marshes, scrub-shrub, and forested habitat types. Small game mammals such as swamp rabbit, gray squirrel, and raccoon also utilize those habitats. Commercially important furbearers in the project area include muskrat, nutria, mink, river otter, raccoon, bobcat, and gray fox. Muskrat and nutria are most abundant in the marshes while river otter and mink utilize marsh, scrub-shrub, and forested habitats in close proximity to open water. Numerous species of small rodents, insectivores, and bats inhabit the area, as do other mammals such as the Virginia opossum, and nine-banded armadillo.

Various species of frogs, turtles, and snakes are common in the project area. Representative species include pig frog, bronze frog, green tree frog, red-eared turtle, Mississippi mud turtle, speckled kingsnake, broad-banded water snake, and western cottonmouth. The American alligator also occurs in the project area.

Endangered Species

The American alligator, which is common on the study area, is listed as threatened under the Similarity of Appearance clause of the Endangered Species Act (Federal Register 1981, Vol. 46, pp. 40664-40669). The bald eagle, an endangered species, uses project area wetlands for foraging and is known to nest within 10 miles of the project area.

FISH AND WILDLIFE CONCERNS IN THE STUDY AREA

The acreage of palustrine forested wetlands in the Mississippi Alluvial Plain declined by more than 50 percent between 1937 (12 million acres) and 1977 (5 million acres) (MacDonald et al. 1979). At the same time, coastal marshes in the Mississippi Deltaic Plain Region are being converted to open water and, to some extent, upland habitat types at a rate of approximately 40 square miles per year (Wicker et al. 1980). A major factor contributing to this habitat decline is the loss of sediments, nutrients, and freshwater recharge formerly associated with overbank flooding from the Mississippi River and its associated distributary channels. Overbank flooding has been virtually eliminated by levees and flood control projects such as this one. The loss of overbank flooding has led to an increase in

subsidence and saltwater intrusion, which accelerate the rate of marsh deterioration; the elimination of flooding has also resulted in extensive clearing of bottomland hardwoods in the protected areas. Channel training works for navigation along the lower Mississippi River have led to minimization of the land-building process in the batture and in the active delta. Most of the sediments carried by the river are shunted into Gulf waters that are too deep to allow land-building to occur. Increased canalization in recent years has also contributed significantly to marsh loss via direct destruction of habitat from construction impacts and through indirect losses due to hydrological alterations, including interruption of sheet flow, increased frequency and amplitude of water level fluctuations and subsequent increases in erosion.

Land loss and habitat conversions, and their projected increase in future years, have serious biological and socioeconomic impacts. Aquatic animals, although they gain available open water habitat, are adversely affected by the decreases in productivity, nursery habitat, and detrital export associated with wetland loss and its associated decreased food supplies for those species. Terrestrial animals are affected by the loss of reproductive and/or feeding habitat and escape cover.

EVALUATION METHODOLOGY

An assessment of project-related impacts to fish and wildlife resources was completed via a habitat acreage projection analysis, the Service's Habitat Evaluation Procedures, and a man-day/monetary analysis. The fundamental tool used for this assessment is the projection of acreage trends for each habitat type on the study area under future with-project and future without-project conditions. The methodology used for those projections and for the Habitat Evaluation Procedures analysis is discussed in Appendix A; the methodology used for the man-day/monetary analysis is discussed in Appendix B.

PROJECT IMPACTS

The average annual acreages of each cover type expected to be impacted by the recommended plan for Reach C and Barrier features are presented in Tables 1 and 2, respectively. Those acreages represent the direct impacts associated with borrow pit excavation and levee widening; the acreages were calculated by subtracting the future without-project condition acreage (annualized over the project life) from the future with-project condition annualized acreage for each cover type (see

Table 1. Annualized acreage of each cover type[1] impacted by the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection project, under future with-project (FWP) and future without-project conditions (FWOP).

	FWP	FWOP	Change[2]
EM	0	11	-11
SS	0	6	-6
RFH	18	15	+3
MSBLH	9	13	-4
SCBLH	0	31	-31
Total	27	76	-49

[1]RFH = riverfront hardwoods; MSBLH = mid-successional bottomland hardwoods; SCBLH = subclimax bottomland hardwoods; SS = scrub/shrub; EM = emergent marsh.

[2]Change = FWP acreage minus FWOP acreage.

Table 2. Annualized acreage of each cover type[1] impacted by the Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection project, under future with-project (FWP) and future without-project conditions (FWOP).

	FWP	FWOP	Change[2]
RFH	95	802	-707
MSBLH	1	9	-8
SCBLH	1	4	-3
Total	97	815	-718

[1]RFH = riverfront hardwoods; MSBLH = mid-successional bottomland hardwoods; SCBLH = subclimax bottomland hardwoods; SS = scrub/shrub; EM = emergent marsh.

[2]Change = FWP acreage minus FWOP acreage.

Appendix A for acreage values for each target year). A total of 891 average annual acres of wildlife habitat would be impacted by the recommended plan for the two features: 815 average annual acres for the Barrier Feature, and 76 average annual acres for Reach C. Of that total, 767 average annual acres of existing cover types would be permanently lost over the life of the project. The most extensive impacts would be to riverfront hardwoods (a loss of 704 average annual acres).

Fishery impacts associated with the recommended plan would result from the loss of batture lands from the riverine system, the loss of scrub-shrub habitat (and brackish marsh as the area of existing scrub-shrub habitat continues to subside) from the estuarine system, and the conversion of those habitats to open water (borrow pits). Due to the presence of the Mississippi River and Tributaries levee system and the absence of tributary streams that would otherwise provide access to backwater areas, the batture provides the only available spawning and nursery habitat for Mississippi River fishes along the main stem of the river. Trees and other vegetation in the batture decrease water velocity during overbank flooding; accordingly, the area can be used as a refuge from the mainstream current for spawning adults. In addition, vegetation in the batture provides points of attachment for sessile aquatic invertebrates which serve as food for young fishes. The small fishes are in turn preyed upon by many larger fishes (as well as reptiles, birds, and mammals). Hence, most feeding activity in the riverine system during high water periods is concentrated in the batture. By the time the water recedes, the young fish are large enough to survive in the mainstream current until the next high water period, when they will return to the batture to spawn and feed.

When batture lands are converted to open water borrow pits, their value as spawning, nursery, and feeding areas is greatly reduced due to the absence of vegetation. As the borrow pits silt in and begin to revegetate, that value will return. However, as part of the sediment load that the river normally carries would be deposited in the borrow areas, less sediment would be available for marsh building in the active delta downstream. Although the presence of an open water borrow pit adjacent to the river would increase the total area of available aquatic habitat during low water periods, it is believed that overall fish production in the riverine system would be reduced due to the loss of vegetated batture lands.

Based on the average annual commercial harvest of shrimp, menhaden, and other estuarine species produced in the Breton Sound Basin, and the acreage of wetlands that support that harvest, it is estimated that the Breton Sound Basin wetlands yield approximately 144 pounds of harvestable estuarine fishes and shellfishes per acre of marsh (see Appendix B for calculations). Accordingly, the annualized loss of 11 acres of marsh with the proposed project would result in an annualized loss of 1,584 pounds of commercial fisheries harvest, valued at $950. Those wetland losses would also result in the loss of an estimated 142 man-days per year of recreational fishing potential, valued at $632 per year (Appendix B). A nominal amount of commercial and

recreational fisheries harvest will also be lost from the annualized loss of nine acres of estuarine scrub-shrub habitat.

The Habitat Evaluation Procedures analysis (Appendix A) indicates that implementation of the proposed project would adversely impact all seven evaluation species (Tables 3 and 4). Greatest losses would be to the downy woodpecker and swamp rabbit, both heavily impacted by the loss of forested lands. The man-day/monetary analysis (Appendix B) shows that implementation of the two project features would result in an annual loss of 222 man-days of sport hunting valued at $1,809 and 297 man-days of wildlife-oriented recreation (including nature photography, bird watching, etc.) valued at $1,323. Project implementation would also result in a loss of $468 per year in commercial harvest of furbearers and alligators.

EVALUATION OF ALTERNATIVE PLANS

Of the alternatives presented for Reach C, the recommended plan (Alternative 1) would not be the one that is least damaging to fish and wildlife resources. The least damaging alternative (not including the "no action" alternative) would be Alternative 3. Under the latter alternative, borrow material would be short-hauled from two non-wetland sites, and the borrow pits thus created would be backfilled with material pumped from the Mississippi River. The borrow sites that would be used under that alternative are presently being used as pasture lands; accordingly, fish and wildlife impacts there would be minimal. Alternative 2 (identical to Alternative 1 except that one pit would be backfilled with material dredged from the Mississippi River) would also be less damaging than the recommended plan because the backfilled site would revegetate and average annual losses there would be minimized. Alternative 4 (the use of material from the marsh adjacent to the existing levee) would be more damaging to fish and wildlife resources than the recommended plan.

Of the two alternatives presented for the Barrier Feature, the one recommended (West Bank River Levee plan) would be the least damaging to fish and wildlife resources. The other alternative (East Bank Barrier plan) would have unacceptable impacts to the marshes to the east. Those marshes presently benefit from the nourishment that comes from the river, during high water, via overtopping and flowing through gaps in the locally constructed levee extending between Baptiste Collette Bayou and the Pointe a la Hache Relief Outlet. Those marshes would deteriorate at an accelerated rate if that nourishment were blocked via levee construction. Impacts associated with the Barrier Feature could be further reduced if upland (pasture) sites adjacent to the existing Mississippi River and Tributaries levee on the West Bank were used for borrow.

Table 3. Net loss of Average Annual Habitat Units (AAHUs) for each evaluation species by cover type[1] under future with-project (FWP) condition for the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection project.

	EM	SS	RFH	MSBLH	SCBLH	Total
Gray squirrel			+0.2	-0.9	-17.1	-17.8
Downy woodpecker			+2.6	-4.2	-33.3	-34.9
Swamp rabbit		-0.7	+1.3	-0.5	-23.7	-23.6
Common yellowthroat		-0.9				-0.9
North American mink	-10.1	-3.0				-13.1
Great egret	-6.3					-6.3
Mottled duck	-2.9					-2.9
Total						-99.5

[1] RFH = riverfront hardwoods; MSBLH = mid-successional bottomland hardwoods; SCBLH = subclimax bottomland hardwoods; SS = scrub-shrub; EM = estuarine marsh.

Table 4. Net loss of Average Annual Habitat Units (AAHUs) to each evaluation species by cover type[1] under future with-project (FWP) condition for the Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection project.

	RFH	MSBLH	SCBLH	Total
Gray squirrel	-42.4	-1.6	-1.3	-45.3
Downy woodpecker	-565.3	-7.9	-2.5	-575.7
Swamp rabbit	-282.7	-1.1	-1.7	-285.5
Total				-906.5

[1]RFH = riverfront hardwoods; MSBLH = mid-successional bottomland hardwoods; SCBLH = subclimax bottomland hardwoods; SS = scrub-shrub; EM = estuarine marsh.

FISH AND WILDLIFE CONSERVATION MEASURES

The President's Council on Environmental Quality defined the term "mitigation" in the National Environmental Policy Act regulations to include:

> (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) compensating for the impact by replacing or providing substitute resources or environments.

The Service supports and adopts this definition of mitigation and considers its specific elements to represent the desirable sequence of steps in the mitigation planning process.

Impacts to certain habitats deemed to be of high value to fish and wildlife resources will be avoided via the planned use of alternatives that would impact habitats of lower value. Impacts to estuarine emergent marsh and subclimax bottomland hardwoods at the Poverty Point site (Reach C) will be reduced via the planned use of the scrub-shrub and upland borrow sites instead of the marsh and alluvial ridge site. Impacts to 45 acres of subclimax bottomland hardwood forest will be avoided by utilization of the batture site at the Relief Outlet (Reach C). All direct marsh impacts (553 acres estuarine emergent marsh and 64 acres palustrine emergent marsh), as well as unquantified but severe indirect impacts, associated with the Barrier Feature will be avoided via the planned use of the West Bank River Levee plan in lieu of the East Bank Barrier plan.

Impacts associated with both Reach C and the Barrier Feature could be further avoided if upland borrow sites were used. Sites currently used for pasture or other agricultural uses are of little value to fish and wildlife; their selection would serve to avoid most project-related impacts. Additionally, this alternative is the only one that fulfills all the planning objectives. Implementation of any of the other alternatives would result in the loss of marsh and native flora and fauna.

Fish and wildlife impacts associated with the Barrier Feature batture borrow area on the east side of the river could be minimized by modification of the configuration of the borrow area such that forested strips are left along the length of the borrow pit at 1.5 to 2 mile intervals. The presence of these forested strips would facilitate natural siltation in the borrow pits and would thus speed

the establishment of vegetation. Conversely, if some forested area is not left in the borrow area, as per the current proposal, the mainstream velocity would keep most sediments in suspension and the borrow areas would probably not silt in enough to allow revegetation.

Project impacts could be rectified via backfilling all borrow pits with material pumped from the Mississippi River. This could be done in conjunction with other dredging projects on the river. The natural re-establishment of vegetation on such backfilled sites would rectify a large percentage of the impacts that would otherwise persist for a long period of time. Those impacts could be rectified even further if the backfilled pits were planted with bottomland hardwood tree species of high value to wildlife.

Impacts associated with the Reach C batture sites will be somewhat reduced over time via the natural riverine sedimentation process. This fact made batture habitat more favorable than other habitat types for selection as borrow sites. However, the above-described modification is needed to promote this natural sedimentation process in the Barrier Feature borrow area.

Impacts to fish and wildlife resources that would still remain after the above measures have been considered should be compensated by a mitigation plan that would involve preservation and/or management of existing wetlands. The Service Mitigation Policy (Federal Register, Vol. 46, pp. 7644-7663, January 23, 1981) provides guidance to insure that the level of mitigation recommended will be consistent with the fish and wildlife resource values involved. Project impacts to estuarine emergent marshes and mid-successional and subclimax bottomland hardwood habitat types should be mitigated in-kind because of their high wildlife resource value and their relative scarcity in the Lower Mississippi Alluvial Plain. Forested wetlands in that ecoregion section presently cover about 20 percent of their original acreage (MacDonald et al. 1979). The coastal marshes of the Mississippi River Deltaic Plain are being lost at the rate of approximately 40 square miles per year (Wicker et al. 1980). Riverfront hardwood, estuarine scrub-shrub, and open water habitat types in the study area are considered to have a medium value overall. Therefore unavoidable losses of these habitat types should be compensated through creation of additional forested and/or marsh habitat of equal or higher value to fish and wildlife.

A suitable mitigation plan for this project would ideally include preservation and/or management of bottomland hardwoods and emergent marsh such that the animal species negatively impacted by the project would be benefitted by the mitigation plan. The mitigation benefits associated with preservation would be derived from prevention of conversion of bottomland hardwoods to pasture or developed lands.

Our preliminary survey indicates that there are several large tracts of forested lands in the project area that would be suitable for off-site mitigation. However, some of these tracts are not adjacent to publicly owned lands and may be difficult to manage for mitigation purposes. The woodlands located on Bohemia Wildlife Management Area

are already under management, hence, those lands would theoretically have little, if any, management potential above and beyond their existing potential.

Due to the limited number of manageable tracts of forested lands, unavoidable losses to bottomland hardwood may be compensated for by conversion of open lands to bottomland hardwoods, possibly by management of lands within the project vicinity, or by management of lands well outside of the project vicinity. The former could be accomplished by selective planting of bottomland hardwood tree species on existing openlands in the project area. The only such openlands that would be dry enough to support bottomland hardwoods are located within the protective levee system; open lands outside the levee system are vegetated with emergent marsh species.

Implementation of Reach C and the Barrier Feature would require selective planting of 47 acres or preservation of 60 acres of bottomland hardwoods (threatened by development) to compensate for losses to 46 acres of mid-successional and subclimax bottomland hardwood forests (see Appendix A). Unless the lands were adjacent to an existing wildlife management area or other public lands, management of such a small tract would not be feasible. Accordingly, compensation credits would be derived only via creation and preservation of habitat. The trees could be planted and maintained at project expense for a 10-year period to insure their growth to a survivable size. After that time the tract should be preserved in its natural state. This could be accomplished either through fee title acquisition or via preservation easements. The habitat value to most of the animal species impacted by the project would increase as the trees mature.

Impacts to 11 average annual acres of brackish marsh can be mitigated via marsh creation in the active delta. The excavation of artificial crevasses (gaps) in the ridges adjacent to distributary channels has been successfully used for this purpose in recent years. Sediment laden water from the channel is diverted into a large open water area, where it subsequently slows down and drops its sediment load. We have found that approximately 76 (average annual) acres of marsh can be created for a single crevasse over the project life if the crevasse is maintained through Target Year 60 of the project life. One such crevasse would compensate for the marsh losses associated with this project. An alternative to marsh creation would be management of existing marsh to preserve vegetated wetlands and to improve the value to fish and wildlife resources. The managed acreage necessary to mitigate for brackish marsh must be based on site specific information that is not available until potential mitigation sites have been identified.

Compensation requirements for the 710 acres of medium value habitat losses (riverfront hardwood and estuarine scrub-shrub habitats) could be added to either of the above two off-site mitigation plans. If they were added to the forestation plan, the total area required to mitigate bottomland hardwoods and all medium value habitat losses would be 483 acres or 603 acres if existing bottomland hardwood lands

are preserved. On the other hand, 388 acres of marsh would have to be created to mitigate for estuarine marshes and all medium value habitat losses.

The Corps estimates the acquisition cost for pasture land adjacent to Bohemia Wildlife Management Area to be $5,000/acre. We estimate the cost of forestation to be $75/acre (based on a 12 foot-by-12 foot spacing of seedlings to allow mechanized weed and brush control). Initial development of the area would cost an additional $30/acre. Thus the initial cost for purchase, planting, and development of open lands for forestation would be approximately $5,105/acre, or a total of $239,935 for the 47 acres needed to compensate for losses to bottomland hardwoods ($2,465,715 if medium value habitat type compensation is added). If existing forested land is preserved to compensate for bottomland hardwoods loss, it would cost $5,000/acre for a total of $300,000 ($3,015,000 if medium value habitat type compensation is added). If forested land were acquired outside the project area adjacent to the State-owned Salvador Wildlife Management Area, acquisition costs would be reduced to about $500 to $750 per acre. Although that area is located about 27 miles from the project area, it is located in the same drainage basin as the area to be protected by the Barrier Feature, and acquisition of land there would allow management by the Louisiana Department of Wildlife and Fisheries.

The Corps estimates the cost of marsh creation via crevasse excavation at $50,000/crevasse. Costs of compensating for estuarine marsh losses would thus cost approximately $50,000; if compensation of all medium value habitat type losses were added to this total, it would cost an additional $250,000. Medium value habitat type losses could be compensated for by management of existing marsh. Costs of management can not be estimated until the potential management site has been identified. Annual management cost for mitigation lands would be about $7/acre for forested lands and negligible for marshes created via crevasse excavation.

RECOMMENDATIONS

Based on our review of plans for the New Orleans to Venice Hurricane Protection Project (Reach C and Barrier Features), the Service recommends that the following mitigation measures be implemented in the interest of fish and wildlife conservation:

1. The least environmentally damaging reasonable alternative, i.e., the use of open, non-wetland sites for obtaining borrow materials (Alternative 3), should be selected. This action would eliminate the need for additional mitigation and would be the only alternative that would fulfill all the planning objectives.

2. Impacts on fish and wildlife resources should be minimized by leaving strips of batture woodlands intact along the length of the Barrier Feature borrow area. These wooded strips should be 500 feet wide and spaced at intervals of 1.5 to 2 miles.

3. All borrow pits should be backfilled with material dredged from the Mississippi River channel (possibly in conjunction with ongoing construction of the other project reaches) to facilitate revegetation. Backfilled pits should be planted with bottomland hardwood species where conditions would be conducive to their growth.

4. Unavoidable impacts to bottomland hardwood habitat should be fully compensated in-kind via planting of existing open lands and preservation of those newly forested areas for the life of the project, or by preservation of an existing tract of bottomland hardwoods threatened by development. The actual acreage required for mitigation will depend on the extent to which measures recommended by the Service to minimize and rectify adverse impacts on bottomland hardwood habitat are incorporated into the final plan.

5. Unavoidable impacts to estuarine marsh losses should be fully compensated via excavation of crevasses, installation of sediment fences, or implementation of marsh management features to create and/or preserve marsh.

6. Unavoidable losses to riverfront hardwoods and scrub-shrub habitats should be fully compensated through creation of additional forested and/or marsh habitat via the above-cited methods or by preservation of marsh or existing forested lands.

7. Mitigation features should be implemented simultaneously with other project features.

8. The initial development, replacement, and annual operation and maintenance costs for the mitigation features shall be borne as an integral project expense.

9. Detailed design of the hurricane protection and mitigation features shall be coordinated with the Service and other interested natural resource agencies.

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NEW ORLEANS TO VENICE, LOUISIANA,

HURRICANE PROTECTION PROJECT:

FISH AND WILDLIFE COORDINATION ACT REPORT

ON

REACH C AND BARRIER FEATURE

APPENDIX A

HABITAT EVALUATION PROCEDURES ANALYSIS OF PROJECT IMPACTS

ON FISH AND WILDLIFE RESOURCES

The Fish and Wildlife Service's (Service) Habitat Evaluation Procedures were developed to help document the quality and quantity of available habitat for fish and/or wildlife species in a given area. Habitat Evaluation Procedures is a standardized, species-based methodology that enables the habitat quality and quantity to be measured for baseline conditions and predicted for future without-project and future with-project habitat conditions. A numeric comparison of each future condition can then be made and project-induced impacts on fish and wildlife resources estimated. The 1980 version of Habitat Evaluation Procedures, which has become the most widely accepted technique for assessing wildlife impacts, was used for this project.

For the purpose of impact assessment and mitigation planning, the Reach C and Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project have been included in this appendix.

Cover types used in this Habitat Evaluation Procedures analysis include riverfront hardwoods, mid-successional bottomland hardwoods, subclimax bottomland hardwoods, wet scrub-shrub, and estuarine emergent marsh. Descriptions of these cover types and project site locations are provided in the "Area Setting" section of the main report. The New Orleans District Corps of Engineers (Corps) provided the estimates of cover type acreages within the study area under existing conditions. Impacts to these cover types will result from excavation of borrow areas and widening of the existing Mississippi River and Tributaries Levee (referred to in this report as the Barrier Feature). Table A-1 lists the existing acreage of each cover type by proposed impact and project.

Species that are economically important and/or are representative of specific guilds within the project area were selected as evaluation elements. Gray squirrel, downy woodpecker, and swamp rabbit were used to evaluate riverfront hardwoods, mid-successional bottomland hardwoods, and subclimax bottomland hardwoods; swamp rabbit, North American mink, and common yellowthroat were used to evaluate scrub-shrub; and North American mink, great egret, and mottled duck were used to evaluate estuarine emergent marsh.

In the application of Habitat Evaluation Procedures, habitat suitability is based on field measurements of various parameters that limit the relative population density of a particular species. During October 30 and 31 and November 13, 14, and 18, 1986, a team of biologists representing the Corps, Louisiana Department of Wildlife and Fisheries, and the Service evaluated several sample sites within each of the cover types.

Data collected in the field were used to calculate Habitat Suitability Indices for each evaluation species. Habitat Suitability Indices are a measure of habitat quality scaled from 0.00 to 1.00, with 0.00 providing no habitat value and 1.00 representing optimum habitat. Habitat parameters and mathematical formulas used to calculate Habitat Suitability Indices were taken from models developed by the Service's National Ecology Center (formerly Western Energy and Land Use Team),

Table A-1. Existing acreages of cover types to be impacted by the Reach C and Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection project.

	Reach C[2]		Barrier Feature[3]		Total
	Poverty Point	Relief Outlet	Levee	Borrow	
Riverine			4	577	577
Scrub-Shrub	64				64
Riverfront Hardwoods[1]		15	147	655	817
Mid-successional BLH[1]		55		9	64
Subclimax BLH			13		52
Total	64	70	164	1,241	1,574

[1]BLH = Bottomland hardwoods

[2]Impacts from the Reach C feature result from excavation of the Poverty Point and Pointe a la Hache Relief Outlet borrow sites.

[3]Impacts from the Barrier Feature result from excavation for borrow material and expansion of the width of the existing West Bank River Levee.

the Service's National Wetland Research Center (formerly National Coastal Ecosystems Team), or Service field personnel. Evaluation species models, field data sheets, sample site locations, and calculations of Habitat Suitability Indices are on file in the Service's Lafayette, Louisiana, field office. The Habitat Suitability Index values for each evaluation species by cover type are given in Table A-2 and Table A-3.

In completing the Habitat Evaluation Procedures analysis, target years were established to identify significant changes in habitat quality and/or quantity at specific points in time throughout the project life under future with-project and future without-project conditions. The target years were selected to indicate project impacts associated with excavation of borrow material, construction of the Barrier Feature, shoaling of the Reach C borrow areas, and subsequent revegetation of those borrow areas. Target years were also selected to identify habitat changes expected under future without-project conditions due to subsidence and natural vegetative succession.

The future with-project condition for Reach C includes the excavation of a 64-acre borrow pit in the Poverty Point area and excavation of a 70-acre borrow pit in the Pointe a la Hache Relief Outlet (hereafter referred to as the Relief Outlet). Excavation of a 1,241-acre borrow area in and adjacent to the Mississippi River from Bohemia south to Baptiste Collette Bayou (hereafter referred to as the Barrier Feature borrow area) and widening the Mississippi River and Tributaries levee on the west side of the river from Tropical Bend to Venice (Figures 2, 3, and 4, and Table A-1) were included in the future without-project condition for the Barrier Feature. Material excavated from the Barrier Feature borrow area will be taken from 664 acres of batture woodlands (riverfront hardwoods and mid-successional bottomland hardwoods) and from 577 acres of the riverbed that lies adjacent to the batture. Impacts to fish and wildlife resources that will result from dredging the riverbed were considered minimal and were not included in this impact assessment.

Several assumptions were used to make future acreage projections under future with-project and future without-project conditions. Under future with-project conditions, excavation of the Reach C borrow pits will occur during the first five years of construction (Table A-4). Of those borrow pits, the existing cover type will be replaced with deep open water in the Poverty Point area, while the Relief Outlet borrow pit is expected to fill-in through natural sedimentation within 10 years and will then revegetate in black willow. Portions of the Relief Outlet proposed borrow area that supported mid-successional bottomland hardwood vegetation before excavation will return to that cover type as mid-successional bottomland hardwood tree species invade the willow stands. It was assumed that it would take 90 years for the present age mid-successional bottomland hardwood cover type to become re-established. The Barrier Feature borrow area will be excavated over a 20-year period and is not expected to refill (Table A-5).

Under future without-project conditions, the Corps expects the Poverty Point borrow area to subside at a rate of 2.3 feet per 100 years.

Table A-2. Habitat Suitability Index (HSI) values[1] for each evaluation species by cover type[2] in Reach C and Barrier Feature Habitat Evaluation Procedures analysis.

Species	EM	SS	RFH	MSBLH	SCBLH
Gray squirrel	____	____	0.06	0.20	0.41
Downy woodpecker	____	____	0.80	1.00	0.80
Swamp rabbit	____	0.17	0.40	0.13	0.57
Common yellowthroat	____	0.21	____	____	____
North American mink	0.92	0.70	____	____	____
Great egret	0.49	____	____	____	____
Mottled duck	0.24	____	____	____	____

[1]HSI values within all habitat types except estuarine marsh were assumed to remain constant throughout the project life.

[2]RFH = riverfront hardwoods; MSBLH = mid-successional bottomland hardwoods; SCBLH = Subclimax bottomland hardwoods; SS = scrub-shrub; EM = estuarine marsh.

Table A-3. Habitat Suitability Index (HSI) values for evaluation species by estuarine marsh subtype[1] in Reach C and West Bank River Levee Habitat Evaluation Procedures analysis.

	Estuarine Marsh	
	Intermediate Marsh	Brackish/Saline Marsh
North American mink	0.92	0.86
Great egret	0.49	0.68
Mottled duck	0.24	0.30

[1]HSI values in estuarine marsh will change as the species of dominant vegetation changes in response to increased salinities and hydroperiod.

Table A-4. Acreage available to evaluation species by cover type[1] under future with-project conditions for the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection project.

Target year	SS	RFH	MSBLH
1988	64	15	55
1989	51	12	44
1993	0	0	0
2013	0	0	0
2023	0	35	0
2033	0	70	0
2043	0	15	0
2073	0	15	0
2083	0	15	55
2093	0	15	55
Annualized	0	18	9

[1] RFH = riverfront hardwoods; MSBLH = mid-successional bottomland hardwoods; SCBLH = subclimax bottomland hardwoods; SS = scrub-shrub; EM = emergent marsh.

Table A-5. Acreage available to evaluation species by cover type[1] under future with-project conditions for the Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection project.

Target year	RFH	MSBLH	SCBLH
1988	802	9	13
1989	770	9	13
1993	641	7	10
2003	320	4	3
2013	0	0	0
2093	0	0	0
Annualized	95	1	1

[1] RFH = riverfront hardwoods; MSBLH = mid-successional bottomland hardwoods; SCBLH = subclimax bottomland hardwoods; SS = scrub-shrub; EM = emergent marsh.

Future acreage projections were thus based on current relative elevations of each cover type and the expected subsidence rate (Table A-6). The scrub-shrub wetlands will succeed to estuarine emergent marsh. The estuarine emergent marsh plant community would be expected to succeed from big cordgrass (Spartina cynosuroides) to saltmeadow cordgrass (Spartina patens) and later to saltmarsh cordgrass (Spartina alterniflora) as subsidence results in higher water levels and salinities. As this succession proceeds the Habitat Suitability Index values would be expected to change accordingly (Table A-3).

Under future without-project conditions in the Relief Outlet borrow area, the mid-successional bottomland hardwood cover type will succeed to the subclimax bottomland hardwood cover type within 50 years. The riverfront hardwoods of the Barrier Feature and Reach C borrow areas are located in the Mississippi River batture. Based on a comparison of 1956 and 1978 habitat type maps (Wicker et al. 1980) and information from the Corps, it was assumed that the riverfront hardwoods acreage would stay constant over the project life (Tables A-6 and A-7).

The 13 acres of subclimax bottomland hardwoods on the west side of the Mississippi River that will be eliminated by the widening of the Barrier Feature would be expected, under future without-project conditions, to be cleared for development sometime in the future. The future rate of development was assumed to continue at a rate equal to the 3 percent annual rate of forested upland loss in Plaquemines Parish, as calculated from the 1956 and 1978 Service habitat type maps (Wicker et al. 1980) (Table A-7).

Total project-related acreage changes and habitat trends expected to occur with and without the proposed project are listed in Tables A-4, A-5, A-6, and A-7. These acreages were averaged, by cover type, over the life of the project to obtain the average annual acreage of each cover type to be impacted by the proposed project under future with-project conditions and the average annual acreage that would exist if the project was not implemented (future without-project condition). It should be noted that for the Reach C feature the riverfront hardwood cover type actually increases under the future with-project condition. Without the project the acreage of this type would remain constant but under the future with-project condition succession is set back in the area that supports mid-successional bottomland hardwoods under future without-project conditions. Because of this set-back in succession, a large acreage supports the riverfront hardwood type is present over a large acreage in the Relief Outlet area under the future with-project condition.

The Habitat Unit is the basic unit utilized in the Habitat Evaluation Procedures for measuring project effects on wildlife. Habitat Units are the product of the evaluation species' Habitat Suitability Index (i.e., habitat quality) and the acreage of available habitat (i.e., habitat quantity) in a given target year. Future Habitat Units change according to changes in habitat quality and/or quantity; these changes are predicted for various target years over the project life, for

Table A-6. Acreage available to evaluation species by cover type[1] under future without-project conditions for the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection project.

Target year	EM	SS	RFH	MSBLH	SCBLH
1988	0	64	15	55	0
1989	0	64	15	54	1
1993	4	60	15	49	6
2003	64	0	15	39	16
2013	38	0	15	28	27
2023	13	0	15	17	38
2033	0	0	15	6	49
2043	0	0	15	0	55
2093	0	0	15	0	55
Annualized	11	6	15	13	31

[1] RFH = riverfront hardwoods; MS = mid-successional BLH; SCBLH = subclimax BLH; SS = scrub-shrub; EM = estuarine marsh.

Table A-7. Acreage available to evaluation species by cover type[1] under future without-project conditions for the Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection project.

Target year	RFH	MSBLH	SCBLH
1988	802	9	13
1989	802	9	13
1993	802	9	11
2003	802	9	8
2013	802	9	6
2093	802	9	0
Annualized	802	9	4

[1] RFH = riverfront hardwoods; MSBLH = mid-successional bottomland hardwoods; SCBLH = subclimax bottomland hardwoods; SS = scrub-shrub; EM = emergent marsh.

future without-project and future with-project conditions. The Habitat Units are annualized over the project life to determine the Average Annual Habitat Units available for each species. The change (increase or decrease) in Average Annual Habitat Units under future with-project conditions, compared to future without-project conditions, provides a quantitative estimate of project impacts that are expected to occur with project implementation. The changes in Average Annual Habitat Units due to the proposed project features are presented in Tables A-8 and A-9. An increase in Average Annual Habitat Units indicates that the project is beneficial to the evaluation species; a decrease in Average Annual Habitat Units indicates that the project is damaging to the evaluation species. For the Reach C feature, adverse impacts to the evaluation species in the subclimax bottomland hardwoods are the greatest as this cover type will be eliminated. Greatest adverse impacts will occur to downy woodpecker and swamp rabbit in the riverfront hardwoods for the Barrier Feature. This is due to the fact that the largest acreage to be impacted will be the willow batture along the eastern side of the Mississippi River.

The same procedure used to evaluate project impacts was applied to several hypothetical mitigation plans to obtain the expected gain in Average Annual Habitat Unit value, for each species by cover type, that can be attributed to each mitigation plan. Mid-successional and subclimax bottomland hardwoods were combined into one category to determine mitigation requirements because both are bottomland hardwoods that require in-kind mitigation for project impacts. Impacts to the fish and wildlife resources of those bottomland hardwood cover types could be mitigated by either obtaining cleared land and planting it in bottomland hardwood tree species or by preserving existing bottomland hardwoods presently under threat of development. Under both plans, marsh would be created via artificial crevasses in pass banks in the lower Mississippi River delta to mitigate for Average Annual Habitat Unit losses in estuarine marsh. Losses in riverfront hardwoods and scrub-shrub cover types could be compensated by creating marsh, planting bottomland hardwoods, and/or preserving bottomland hardwoods.

To calculate Average Annual Habitat Units that would be gained by implementation of these mitigation alternatives, hypothetical acreages of 50 acres for the lands to be planted, 100 acres for the lands to be preserved, and 76 acres of the marsh to be created were assumed. After Average Annual Habitat Units gained on these hypothetical acreages were calculated, it was then possible to calculate how many acres, under each mitigation scenario, would be necessary to compensate for fish and wildlife resource losses within each cover type. A complete description of the formulas used to calculate compensation acreage begins on page A-18.

Target years and Habitat Suitability Index values were established for the hypothetical mitigation area that would be planted in bottomland hardwoods to represent vegetation succession and associated changes in habitat values. The following is a brief habitat description at the

Table A-8. Net loss or gain of average annual habitat units for each evaluation species by cover type[1] for the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection project.

	EM			SS			RFH			MSBLH			SCBLH		
	FWP	FWOP	Change	FWP	FWOP	Change	FWP	FWOP	Change[2]	FWP	FWOP	Change	FWP	FWOP	Change
Gray squirrel							1.1	0.9	+0.2	1.8	2.7	-0.9	0.0	17.1	-17.1
Downy woodpecker							14.6	12	+2.6	9.2	13.4	-4.2	0.0	33.3	-33.3
Swamp rabbit				0.3	1.0	-0.7	7.3	6	+1.3	1.2	1.7	-0.5	0.0	23.7	-23.7
Common yellowthroat				0.3	1.2	-0.9									
North American mink	0.0	10.1	-10.1	1.1	4.1	-3.0									
Great egret	0.0	6.3	-6.3												
Mottled duck	0.0	2.9	-2.9												
Total			-50.1			-4.6			+4.1			-5.6			-74.1

[1]RFH = riverfront hardwoods; MSBLH = mid-successional bottomland hardwoods; SCBLH = Subclimax bottomland hardwoods; SS = scrub-shrub; EM = estuarine marsh.

[2]Change = Future with-project (FWP) minus future without-project (FWOP).

Table A-9. Net loss or gain of average annual habitat units for each evaluation species by cover type[1] for the Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection project.

	RFH			MSBLH			SCBLH		
	FWP	FWOP	Change[2]	FWP	FWOP	Change	FWP	FWOP	Change
Gray squirrel	5.7	48.1	-42.4	0.2	1.8	-1.6	0.5	1.8	-1.3
Downy woodpecker	76.3	641.6	-565.3	1.1	9.0	-7.9	1.1	3.6	-2.5
Swamp rabbit	38.1	320.8	-282.7	0.1	1.2	-1.1	0.8	2.5	-1.7
Total			-890.4			-10.6			-5.5

[1]RFH = riverfront hardwoods; MSBLH = mid-successional bottomland hardwoods; SCBLH = Subclimax bottomland hardwoods; SS = scrub-shrub; EM = estuarine marsh.

[2]Change = Future with-project (FWP) minus future without-project (FWOP).

selected target years. Associated Habitat Suitability Index values are provided in Table A-10.

Target Year 0 - The acreage of cleared land has been acquired but the planting has not yet begun. Habitat Suitability Index values are 0 for all species.

Target Year 5 - Selective plantings have been completed and these areas have also been colonized by shrubs, vines, and tree species from adjacent areas. Habitat is good for swamp rabbit but minimal for gray squirrel and downy woodpecker.

Target Year 15 - The shrub and small tree species have matured along with continued growth of mast-producing oaks and colonization by vines and herbaceous species. Habitat is improved for gray squirrel, remains good for swamp rabbit but is minimal for downy woodpecker.

Target Year 25 - The habitat is significantly enhanced for gray squirrel due to fruit and acorn production. Swamp rabbit habitat quality remains high but downy woodpeckers are limited by lack of snags.

Target Year 50 - The area is now vegetated in mature bottomland hardwoods with mast production approaching optimum levels. Gray squirrel and downy woodpecker habitat is significantly improved. Swamp rabbit habitat is limited by lack of understory.

The predicted Average Annual Habitat Units for the proposed mitigation area to be planted are listed in Table A-11. Under a future without-mitigation condition the hypothetical mitigation area would be expected to provide negligible habitat value; therefore, all the Average Annual Habitat Units produced by planting the area would provide compensation.

It was assumed that, as an alternative to planting, 100 acres of bottomland hardwoods could be obtained and preserved to mitigate for bottomland hardwood losses. Several sites in forested tracts on the west side of the river were evaluated to determine Habitat Suitability Index values for this hypothetical mitigation area. From this evaluation the following HSIs were calculated: 0.71 for gray squirrel, 0.74 for swamp rabbit, and 1.0 for downy woodpecker. It was further assumed that Habitat Suitability Index values for the entire 100 acres would remain constant over the life of the project. Without the mitigation plan, the tract would be expected to be developed at a rate of 3 percent per year. The Average Annual Habitat Units for the future without-mitigation condition were subtracted from the Average Annual Habitat Units available under the future with-mitigation condition to calculate the gain in Average Annual Habitat Units to be

Table A-10. Evaluation species' projected Habitat Suitability Indices (HSIs) for a hypothetical mitigation area that would be planted in bottomland hardwood trees.

Target year	Gray squirrel	Swamp rabbit	Downy woodpecker
0	0	0	0
5	0.05	0.9	0.05
15	0.4	0.8	0.1
25	0.6	0.7	0.5
50	0.9	0.6	0.9
100	0.9	0.6	1.0

Table A-11. The predicted Average Annual Habitat Units (AAHUs) for mitigation plans (based on a hypothetical 50 acres for planting, 100 acres for preservation, and 76 acres for marsh creation) under future with mitigation (FWM) and future without mitigation (FWOM) conditions.

	Planting Bottomland Hardwoods			Preserving Bottomland Hardwoods			Marsh Creation		
	FWM AAHUs	FWOM AAHUs	Gain in AAHUs	FWM AAHUs	FWOM AAHUs	Gain in AAHUs	FWM AAHUs	FWOM AAHUs	Gain in AAHUs
Gray squirrel	35.6	0	35.6	71	23.3	47.7			
Swamp rabbit	32.2	0	32.2	74	24.3	49.7			
Downy woodpecker	34.4	0	34.4	100	32.8	67.2			
North American mink							18.2	0	18.2
Great egret							30.2	0	30.2
Mottled duck							26.5	0	26.5
Muskrat							74.1	0	74.1
Snow goose							49.2	0	49.2
Northern pintail							59.7	0	59.7

[1]Gain = the difference in AAHUs under FWM versus FWOM conditions.

expected if 100 acres of bottomland hardwoods would be protected from future development (Table A-11).

The deltaic marsh created by crevasse excavation would support freshwater three-square, gooseweed, and delta duck potato with black willow on the highest portions of the new delta. Because estuarine marsh is a high value, relatively scarce habitat type, the Service mitigation policy requires that it be mitigated in-kind. Therefore, Northern American mink, great egret, and mottled duck were used to evaluate the proposed marsh to determine the in-kind estuarine marsh mitigation requirement. Several sites in existing delta splay marsh were evaluated to obtain Habitat Suitability Index values for the hypothetical marsh. The Habitat Suitability Index for mottled duck was 0.35, for northern mink was 0.24, and for great egret was 0.40. Medium value habitats can be mitigated out-of-kind. Species that are characteristic of deltaic marsh were used to determine the mitigation requirement for these habitat types. These species and their Habitat Suitability Indices were muskrat, 0.98; snow goose, 0.65; and northern pintail, 0.79.

To determine the annualized acreage of the proposed marsh, it was assumed that one crevasse would create about 100 acres of marsh. The crevasse would seal itself off through sedimentation in 12 years. The Corps would re-open the crevasse when necessary to insure continued marsh building until Target Year 60. After Target Year 60 the marsh would be allowed to subside naturally to open water by the end of the project life (Target Year 100). Under this scenario, the annualized acreage for one crevasse is about 76 acres. Average Annual Habitat Units to be gained by creating marsh are listed in Table A-11.

After determining the increase in Average Annual Habitat Units that would result from the hypothetical mitigation plans, the acreage that would actually be required to compensate for project losses were calculated. The Service mitigation policy requires that high value, relatively scarce habitat type losses be mitigated in-kind, i.e., no net loss of in-kind habitat value is allowed. Our compensation goal in such a case is to precisely offset the Habitat Unit losses for each evaluation species.

The ideal compensation plan would provide, for each individual species, an increase in Habitat Unit equal in magnitude to the Habitat Unit losses. A mathematical expression of this goal is:

$$\sum_{i=1}^{n} (M_i + I_i)^2 = 0$$

where M = Average Annual Habitat Units gained through mitigation for a target species,
I = Average Annual Habitat Unit losses (due to project impacts) for same species;
i = species number, and
n = total number of identified species.

Because it would be virtually impossible to devise a mitigation plan that would precisely compensate for each evaluation species, the optimum compensation area minimizes the total Average Annual Habitat Unit over-compensation and under-compensation by a sum of squares technique and is calculated by the following formula:

$$\text{Optimum Compensation Area} = -A\left(\sum_{i=1}^{n} M_i I_i \sum_{i=1}^{n} M_i^2\right)$$

where M, I, i, and n conform to previous usage, and
A = size of hypothetical mitigation area.

Using this formula, the compensation area required to mitigate for losses of bottomland hardwood forest by planting bottomland hardwood species is calculated to be 39 acres or by preserving bottomland hardwood is calculated to be 50 acres for Reach C; the compensation acreage required to mitigate for estuarine marsh by marsh creation is 18 acres (Table A-12). For the Barrier Feature 8 acres of planted bottomland hardwoods or 10 acres of preserved bottomland hardwoods would compensate for bottomland hardwood forest losses (Table A-13).

Losses of riverfront hardwoods and scrub-shrub can be mitigated out-of-kind and therefore can be compensated by preserving or planting bottomland hardwoods or by creating marsh. The equation to calculate mitigation needs for medium value, relatively abundant habitat type is:

$$\left(\sum_{i=1}^{n} I_i \Big/ \sum_{i=1}^{n} Mi\right) \text{ acres} = \text{Compensation Area (acres)}$$

where acres = hypothetical mitigation plan acreage.

Impacts on medium value habitat types as a result of the Reach C feature were negligable, therefore compensation requirements were not calculated. For the riverfront hardwood habitat impacted by the Barrier Feature, 890 Average Annual Habitat Units (from Table A-9) can be compensated for with 436 acres of planted cleared land, 543 acres of existing bottomland hardwoods, or 370 acres of created marsh (Table A-14).

In summary, the acreage required to compensate for impacts on fish and wildlife resources that will result from implementation of the Reach C and Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection project will be dependent on the type of mitigation chosen. To compensate for high value, scarce habitat type losses would require 47 acres of planted bottomland hardwoods and 18 acres of created estuarine marsh or 60 acres of preserved bottomland hardwoods and 18 acres of created marsh. Medium value, relatively abundant cover type losses can be mitigated with 436 acres of planted bottomland hardwoods, 543 acres of preserved bottomland hardwoods, or 370 acres of created marsh.

Table A-12. Compensation requirements for the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project Resource Category 2 losses: I_i = change in Average Annual Habitat Units (AAHUs) for evaluation species i resulting from project impacts; M_i = mitigation gains (based on a hypothetical 50 acres for planting, 100 acres for preservation, and 76 acres for marsh creation); and compensation required = (hypothetical acreage) ($\Sigma M_i I_i / \Sigma M_i^2$).

	Planting Bottomland Hardwoods				Preserving Bottomland Hardwoods				Estuarine Marsh			
	I_i	M_i	M_i^2	$M_i I_i$	I_i	M_i	M_i^2	$M_i I_i$	I_i	M_i	M_i^2	$M_i I_i$
Gray squirrel	-18	+36	1,296	-648	-18	+48	2,304	-864				
Downy woodpecker	-38	+34	1,156	-1,292	-38	+67	4,489	-2,546				
Swamp rabbit	-24	+32	1,024	-768	-24	+50	2,500	-1,200				
North American mink									-10	+18	324	-180
Great egret									-6	+30	900	-180
Mottled duck									-3	+26	676	-78
Total	-80	102	3,476	-2,708	-80	165	9,293	-4,610	-19	74	1,900	-438
Compensation required			39 acres				50 acres				18 acres	

Table A-13. Compensation requirements for the Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project Resource Category 2 losses: I_i = change in Average Annual Habitat Units (AAHUs) for evaluation species i resulting from project impacts; M_i = mitigation gains (based on a hypothetical 50 acres for planting, 100 acres for preservation; and compensation required = (hypothetical acreage) ($\Sigma M_i I_i / \Sigma M_i^2$).

	Planting Bottomland Hardwoods				Preserving Bottomland Hardwoods			
	I_i	M_i	M_i^2	$M_i I_i$	I_i	M_i	M_i^2	$M_i I_i$
Gray squirrel	-3	+36	1,296	-108	3	+48	2,304	-144
Downy woodpecker	-10	+34	1,156	-340	-10	+67	4,489	-670
Swamp rabbit	-3	+32	1,024	-96	-3	+50	2,500	-150
Total	-16	102	3,476	-544	-16	165	9,293	-964
Compensation required			8 acres				10 acres	

Table A-14. Resource Category 3 compensation requirements for the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection project: I = Average Annual Habitat Unit (AAHU) losses (due to project impacts) for a target species; M = AAHU mitigation gains for same species (based on a hypothetical 50 acres for planting, 100 acres for preservation, and 76 acres for marsh creation); i = species number; n = total number of evaluation species; and Acres = hypothetical mitigation plan acreage.

Mitigation Plan	$\sum_{i=1}^{n} I$	$\sum_{i=1}^{n} M$	Acres	Compensation[1] required (acres)
Planting BLH	0.5	102	50	6
Preserving BLH	0.5	164	100	8
Marsh creation	0.5	183	76	5

[1] Compensation required (acres) = $\left(\sum_{i=1}^{n} I / \sum_{i=1}^{n} M\right)$ Acres

LITERATURE CITED

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NEW ORLEANS TO VENICE, LOUISIANA,

HURRICANE PROTECTION PROJECT:

FISH AND WILDLIFE COORDINATION ACT REPORT

ON

REACH C AND BARRIER FEATURE

APPENDIX B

MAN-DAY/MONETARY EVALUATION OF

PROJECT IMPACTS ON FISH AND WILDLIFE RESOURCES

INTRODUCTION

This appendix presents a summary of the anticipated monetary effects of the tentatively selected alternatives for the Reach C and Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project on sport fishing, commercial fishing, sport hunting, trapping, and non-consumptive wildlife-oriented recreation. These estimates were developed by determination of the carrying capacity and corresponding monetary value of each habitat type on a per-acre basis, and by predicting future values based on the area of available habitat under future without-project and future with-project conditions.

FISHERY RESOURCES

The sport and commercial fishery resources of the Breton Sound Basin estuary are extremely valuable. The importance of the wetlands of that estuarine complex to estuarine-dependent fishery resources cannot be over-emphasized. Those wetlands produce vast amounts of organic detritus; this detritus is transported into adjacent estuarine waters and serves as a primary component of the estuarine food web. The marshes and shallow ponds in the Breton Sound Basin also provide nursery habitat that is critical to the production of numerous estuarine-dependent fishes and shellfishes. Therefore, the basic premise of our evaluation of project impacts on fishery resources is that wetland acreage is the most important factor influencing estuarine-dependent fisheries production. In estimating the commercial fishery value of those wetlands, the following additional assumptions were made:

1. the fish and shellfish production attributable to the marshes in the project area is currently being harvested at or near maximum sustainable yield;

2. commercial estuarine fish and shellfish resources produced in the project area are harvested throughout the Breton Sound Basin and in adjacent offshore waters; and

3. project-related wetland losses will cause a proportional loss in the commercial fisheries harvest.

The sport and commercial fishery resource value of the batture area (riverfront hardwoods and mid-successional bottomland hardwoods) was not estimated. Although the batture area does support fish use during high water periods, particularly as a spawning and nursery area, the fishery value of the narrow band of willows that border the lower

Mississippi River, particularly in Plaquemines Parish, has not been quantified.

The minimal average annual acreage of scrub-shrub wetlands affected by the recommended plan resulted in negligible impacts to fishery resources; therefore project impacts to sport or commercial fishing were estimated only for the estuarine marsh cover type. It was assumed that fish produced from each acre of marsh provided 12.9 man-days of sportfishing per year (U.S. Army Corps of Engineers 1977). The annualized acreage of estuarine marsh within the area of direct project impact under future without-project and future with-project conditions was multiplied by the appropriate man-day figure to estimate the average annual man-days of sport-fishing. Thus, 11 acres of estuarine marsh (future without-project conditions) would produce 142 man-days of sport fishing annually. The monetary value of that recreational effort was calculated by multiplying the man-days of sport fishing by $4.45 (U.S. Army Corps of Engineers, New Orleans District, personal communication, April 1987) which is the estimated monetary value for a man-day of sport fishing in the Breton Sound Basin. Implementation of the proposed project would result in the complete replacement of estuarine marsh with deep, open water. Therefore, under future with-project conditions average annual sport fishing activity would be reduced by 142 man-days, valued at $632.

To calculate the average commercial fishery harvest per acre, the estimated total harvest of estuarine-dependent fish and shellfish (i.e., shrimp, blue crab, menhaden, Atlantic croaker, seatrout, spot, and red drum) attributable to the Breton Sound Basin were divided by the number of acres of marsh in that basin (Soileau 1984: pp. B-2 and B-7). The annualized marsh acreage that would be directly impacted was then multiplied by the average harvest of fish and shellfish per marsh acre to obtain total pounds of harvest attributable to that acreage. The total pounds estimated was multiplied by $0.60, i.e., the weighted average value per pound of the Breton Sound Basin harvest for those species (Soileau 1984: p. B-7). The average annual commercial fishery harvest expected to be produced in the area of impact under future without-project conditions is estimated at 1,584 pounds having a gross value of $950; that harvest would be lost with implementation of the recommended plan.

WILDLIFE RESOURCES

Sport Harvest

Analysis of the man-day and monetary value of sport hunting in the project impact area is based on the ability of the habitat types to support stable wildlife populations, and on the assumption that a certain portion of the wildlife population can be harvested at a sustainable annual rate without adversely impacting that population. Potential sport hunting man-days per acre of habitat were computed using the following equations:

population density (animals/acre)	x	maximum sustainable annual harvest rate	=	harvestable population (animals/acre)
harvestable population	x	hunter success rate (man-days effort/ animal harvested)	=	potential number of man-days of sport hunting/acre/year

The species used for this analysis include those that occur within the project area in numbers sufficient to be sought by hunters. Rabbit, squirrel, and woodcock hunting were combined into small game hunting. Deer hunting and waterfowl hunting were kept in separate categories. Potential man-day usage and monetary values for these species are provided, by habitat type, in Tables B-1, B-2, B-3, and B-4.

Under each future condition, habitat acreages and associated wildlife populations are expected to change. A corresponding change in potential man-day usage and monetary values of these resources is also expected. A comparison of these future conditions is provided in Tables B-3 and B-4.

The values used for deer population densities were 1 deer per 60 acres in mid-successional bottomland hardwoods and 1 deer per 30 acres in subclimax bottomland hardwoods (U.S. Army Corps of Engineers 1977). Values for the cottonwood-sycamore cover type reported in U.S. Army Corps of Engineers (1977) were used for the mid-successional bottomland hardwood cover type in this report. These values were reduced appropriately for riverfront hardwoods and scrub-shrub. The population density in riverfront hardwoods and scrub-shrub was assumed to be 1 deer per 100 acres. The sustained annual harvest rate used for deer was 33 percent. The hunter success rate (i.e., average number of days of hunting to kill a deer) used in this analysis was 23.7 for riverfront and bottomland hardwood cover types. This value was derived from the Louisiana Department of Wildlife and Fisheries Deer Kill Survey (1980-81 season).

Population density values used for rabbits were 1 animal per 2 acres in the riverfront, scrub-shrub, and bottomland hardwood cover types and 1 per 2.5 acres in estuarine marsh. These values were taken from Louisiana Department of Wildlife and Fisheries surveys. The sustained annual harvest rate used for rabbits was 60 percent. A hunter success rate of 0.55 was used for all habitat types, as reported in the Louisiana Department of Wildlife and Fisheries Statewide 1977-1978 small game survey, based on statistics for District 8.

A population density of 1 squirrel per 15 acres in mid-successional bottomlands and 1 squirrel per 1 acre in subclimax bottomland hardwoods was taken from U.S. Army Corps of Engineers (1977). The population density of squirrels in riverfront hardwoods was assumed to be 50 percent less than in mid-successional bottomland hardwoods, or 1 per 30 acres. A sustained annual harvest rate of 60 percent was used. The hunter success rate of 0.57 was taken from the Louisiana

Table B-1. Average annual potential man-day usage under future with-project (FWP) and future without-project (FWOP) conditions, by cover type and various sport hunting activities for the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project.

Project condition	Habitat type	Sport hunting activity	Potential effort per acre (man-days)[3]	Annualized acreage	Potential effort in project area[4]
FWP	Riverfront hardwoods	small game[2]	0.18	18	3
		deer	0.07		1
		waterfowl	0.01		0
	Mid-successional BLH[1]	small game	0.19	9	2
		deer	0.12		1
		waterfowl	0.01		0
	Subclimax BLH	small game	0.50	0	0
		deer	0.24		0
		waterfowl	0.02		0
	Scrub-shrub	small game	0.17	0	0
		deer	0.07		0
		waterfowl	0.01		0
	Estuarine marsh	small game	0.32	0	0
		deer	neg.		0
		waterfowl	0.38		0
	Total	small game			5
		deer			2
		waterfowl			0
					7

Continued.

Table B-1. continued.

Project condition	Habitat type	Sport hunting activity	Potential effort per acre (man-days)[3]	Annualized acreage	Potential effort in project area[4]
FWOP	Estuarine marsh	small game[2]	0.32	11	4
		deer	neg.		neg.
		waterfowl	0.38		4
	Scrub-shrub	small game	0.17	6	1
		deer	0.07		0
		waterfowl	0.01		0
	Riverfront hardwoods	small game	0.18	15	3
		deer	0.07		1
		waterfowl	0.01		0
	Mid-successional BLH[1]	small game	0.19	13	2
		deer	0.12		2
		waterfowl	0.01		0
	Subclimax BLH	small game	0.50	31	16
		deer	0.24		7
		waterfowl	0.02		1
	Total	small game			26
		deer			10
		waterfowl			5
					41
	Net change				-34

[1]Bottomland hardwoods.
[2]Small game hunting includes hunting for rabbit, squirrel, woodcock, and marsh birds.
[3]Assumptions regarding calculation of sport hunting potential are provided within the text of this appendix.
[4]Potential effort in project area (man-days) is the product of the potential effort per acre and annualized acreage.

Table B-2. Average annual potential man-day usage under future with-project (FWP) and future without-project (FWOP conditions, by cover type and various sport hunting activities for the Barrier Feature of the New Orlean to Venice, Louisiana, Hurricane Protection Project.

Project condition	Habitat type	Sport hunting[2] activity	Potential effort per acre (man-days)[4]	Annualized acreage	Potential effort in project area
FWP	Riverfront hardwoods	small game[3]	0.18	95	17
		deer	0.07		7
		waterfowl	0.01		1
	Mid-successional BLH[1]	small game	0.19	1	0
		deer	0.12		0
		waterfowl	0.01		0
	Subclimax BLH	small game	0.50	1	1
		deer	0.24		0
		waterfowl	0.02		0
	Total	small game			18
		deer			7
		waterfowl			1
					26

Continued.

Table B-2. continued.

Project condition	Habitat type	Sport hunting[2] activity	Potential effort per acre (man-days)[4]	Annualized acreage	Potential effort in project area
FWOP	Riverfront hardwoods	small game[3]	0.18	802	144
		deer	0.07		56
		waterfowl	0.01		8
	Mid-successional BLH[1]	small game	0.19	9	2
		deer	0.12		1
		waterfowl	0.01		0
	Subclimax BLH	small game	0.50	4	2
		deer	0.24		1
		waterfowl	0.02		0
	Total	small game			148
		deer			58
		waterfowl			8
					214
	Net change				-188

[1]Bottomland hardwoods.
[2]Small game hunting includes hunting for rabbit, squirrel, woodcock, and marsh birds.
[3]Assumptions regarding calculation of sport hunting potential are provided within the text of this appendix.
[4]Potential effort in project area (man-days) is the product of the potential effort per acre and annualized acreage.

Table B-3. A comparison of sport hunting man-day and monetary values under future with-project (FWP) and future without-project (FWOP) conditions for the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project.

Project condition	Sport hunting activity[1]	Potential effort in project area (man-days)[2]	Value per man-day[3] ($)	Value of project area[4] ($)
FWP	small game	5	$4.45	$22
	deer	2	16.00	32
	waterfowl	0	16.00	0
	Total	7		54
FWOP	small game	26	$4.45	$116
	deer	10	16.00	160
	waterfowl	5	16.00	80
	Total	41		356
	Net change	-34		-$302

[1] Small game hunting includes hunting for rabbit, squirrel, and woodcock.
[2] Data from Table B-1 have been summed to derive total potential effort in the project area for all habitat types.
[3] U.S. Army Corps of Engineers, New Orleans District (April 1987 personal communication).
[4] Value of the project area is the product of potential effort in project area and value per man-day.

Table B-4. A comparison of sport hunting man-day and monetary values under future with-project (FWP) and future without-project (FWOP) conditions for the WBRL[1] feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project.

Project condition	Sport hunting activity[2]	Potential effort in project area[3] (man-days)	Value per man-day[4] ($)	Value of project area[5] ($)
FWP	small game	18	$4.45	$80
	deer	7	16.00	112
	waterfowl	1	16.00	16
	Total	26		208
FWOP	small game	148	$4.45	$659
	deer	58	16.00	928
	waterfowl	8	16.00	128
	Total	214		1,715
	Net change	-188		-$1,507

[1] WBRL = West Bank River Levee.
[2] Small game hunting includes hunting for rabbit, squirrel, and woodcock.
[3] Data from Table B-1 have been summed to derive total potential effort in the project area for all habitat types.
[4] U.S. Army Corps of Engineers, New Orleans District (April 1987 personal communication).
[5] Value of the project area is the product of potential effort in project area and value per man-day.

Department of Wildlife and Fisheries's 1977-78 Game Survey for District 8.

Significant populations of woodcock in the project area are limited to bottomland hardwoods. A man-day per acre value of 0.01 for bottomland hardwoods was taken from U.S. Army Corps of Engineers (1977). Potential man-days of waterfowl hunting was based on a population density of 1 bird per 20 acres in the riverfront hardwoods and mid-successional bottomland hardwoods and 1 bird per 10 acres in subclimax bottomlands, a sustained annual harvest rate of 40 percent, and a hunter success rate of 0.625 (U.S. Army Corps of Engineers 1977 and best professional judgement). Potential man-days of waterfowl hunting in estuarine marsh was 0.38 as reported in Soileau 1984.

Potential marsh bird hunting includes game birds other than waterfowl that are commonly found in the marsh (i.e., coots, rails, snipe). The man-day value per acre for these species in estuarine marsh is 0.19 (Soileau 1984; B-11) and 0.01 in scrub-shrub. Populations and man-day usage of these species in bottomland hardwoods is negligible.

Under future without-project conditions, the Reach C project area will support an average of 26 man-days of small game hunting, 10 man-days of deer hunting, and 5 man-days of waterfowl hunting annually for the remainder of the project life; the Barrier Feature project area will support an average of 148 man-days of small game, 58 man-days of deer, and 8 days of waterfowl hunting for the remainder of the project life (Tables B-1 and B-2). This potential man-day usage, totaling 41 man-days for the Reach C feature and 214 man-days for the Barrier Feature, is valued at $356 and $1,715 per year respectively for the two features (Table B-3 and B-4). Under future with-project conditions, 34 man-days of sport hunting valued at $302 would be lost annually due to the Reach C feature and 188 man-days of sport hunting valued at $1,507 would be lost annually due to the Barrier Feature over the life of the two projects.

Commercial Harvest

An analysis of project impacts on commercial wildlife (i.e., furbearers and alligator) was completed for future without-project and future with-project scenarios, using recent records of fur catch per acre and monetary values per pelt or hide (Tables B-5, B-6, and B-7). As with each of the analyses presented in this appendix, populations are assumed to be directly related to available habitat; our predictions of future harvest are based solely on the availability of suitable habitat. Although habitat loss is anticipated under each condition, habitat destruction associated with the project is expected to further reduce the annual fur harvest. The average annual value of the furbearer harvest is $93 in the area impacted by the Reach C project feature and $450 in the area impacted by the Barrier Feature

Table B-5. Fur harvest and value by habitat type for the Reach C and Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project area.

Species	Habitat Type				
	EM[4]	SS	RFH	MSBLH	SCBLH
Muskrat					
mean catch/acre[1]	0.0844	0.007	0.007	neg.	neg.
value/pelt[2]	$5.70	$5.43	$5.43	---	---
value/acre	$0.48	$0.04	$0.04	---	---
Nutria					
mean catch/acre	0.0864	0.021	0.021	0.021	0.021
value/pelt	$7.76	$7.39	$7.39	7.39	7.39
value/acre	$0.67	$0.16	$0.16	0.16	0.16
Mink					
mean catch/acre	0.0011	0.011	0.011	0.021	0.021
value/pelt	$14.36	$13.67	$13.67	13.67	13.67
value/acre	$0.02	$0.15	$0.15	0.29	0.29
Otter					
mean catch/acre	0.0002	neg.	neg.	neg.	neg.
value/pelt	$46.80	---	---	---	---
value/acre	$0.01	---	---	---	---
Raccoon					
mean catch/acre	0.0078	0.017	0.017	0.079	0.079
value/pelt	$12.03	$11.46	$11.46	11.46	11.46
value/acre	$0.09	0.19	0.19	0.90	0.90
Alligator					
mean catch/acre[3]	0.0032	neg.	neg.	neg.	neg.
value/animal	$215.21	---	---	---	---
value/acre	$0.69	---	---	---	---
Gross value/acre	$1.96	$0.54	$0.54	1.35	1.35

[1]Source: Palmisano
[2]Source: U.S. Army Corps of Engineers (1984, p. F-9) for estuarine marsh; Strader (1984, p. C-14) for the remainder.
[3]Source: U.S. Army Corps of Engineers (1984, p. F-8).
[4]EM = estuarine marsh; SS = scrub-shrub; RFH = riverfront hardwoods; MSBLH = mid-successional bottomland hardwoods; SCBLH = subclimax bottomland hardwoods.

Table B-6. A comparison of fur harvest by cover type in the area of project impact for the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project under future with-project (FWP) and future without-project (FWOP) conditions.

Project condition	Habitat type	Value per acre[2]	Acres (annualized)	Value in project area[3]
FWP	Estuarine marsh	1.96	0	$0
	Scrub-shrub	0.54	0	0
	Riverfront hardwoods	0.54	18	10
	Mid-Successional BLH	1.35	9	12
	Subclimax BLH	1.35	0	0
	Total			22
FWOP	Estuarine marsh	1.96	11	22
	Scrub-shrub	0.54	6	3
	Riverfront hardwoods	0.54	15	8
	Mid-Successional BLH	1.35	13	18
	Subclimax BLH	1.35	31	42
	Total			$93
	Net change			-$71

[1]Taken from Table B-3.
[2]Value in project area is the product of value per acre and the number of acres in area of direct project impact.

Table B-7. A comparison of fur harvest by cover type in the area of project impact for the Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project under future with-project (FWP) and future without-project (FWOP) conditions.

Project condition	Habitat type	Value per acre[1]	Acres (annualized)	Value in project area[2]
FWP	Riverfront hardwoods	0.54	95	$51
	Mid-Successional BLH	1.35	1	1
	Subclimax BLH	1.35	1	1
	Total			53
FWOP	Riverfront hardwoods	0.54	802	433
	Mid-Successional BLH	1.35	9	12
	Subclimax BLH	1.35	4	5
	Total			$450
	Net change			-$397

[1]Taken from Table B-3.
[2]Value in project area is the product of value per acre and the number of acres in area of direct project impact.

under future without-project. With implementation of the proposed project, the average annual furbearer harvest would decrease by $71 due to the Reach C feature and $397 due to the Barrier Feature (Tables B-6 and B-7).

Wildlife-Oriented Recreation

Participation and monetary values of non-consumptive wildlife-oriented recreation was considered (Tables B-8 and B-9). Estimates of man-day participation in wildlife-oriented recreation was made by multiplying the average man-day per acre value by the appropriate habitat acreage. The man-day per acre value for mid-successional bottomland hardwoods was reduced by 25 percent for riverfront hardwoods and by 50 percent for scrub-shrub as an estimate of the man-day per acre value.

Under future without-project conditions, there would be an estimated average of 25 man-days of wildlife-oriented recreation expended annually in the Reach C feature impact area and 312 man-days of wildlife-oriented recreation expended annually in the Barrier Feature impact area. This usage rate has a monetary value of about $156 for the Reach C feature and $1,388 for the Barrier Feature. Implementation of the project would reduce average annual usage by about 23 man-days, valued at $103 for the Reach C feature and 274 man-days, valued at $1,220 for the Barrier Feature.

SUMMARY

The loss of habitat associated with implementation of the two project features is anticipated to reduce the man-day usage and monetary value of fish and wildlife resources in the area of project impact. Under future without-project conditions for the Reach C and Barrier Feature, an average of 744 man-days of sport fishing, sport hunting and wildlife oriented recreation valued at $4,247 will be available annually in the area of project impact (Tables B-10 and B-11). Reach C and the Barrier Feature project implementation will result in the average annual loss of 661 man-days of sport fishing, sport hunting and wildlife-oriented recreation and a loss of $5,182 in average annual revenues generated from these activities and commercial trapping and fishing (Tables B-10 and B-11).

Table B-8. A comparison of wildlife-oriented recreation by cover type under future with-project (FWP) and future without-project (FWOP) conditions for the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project.

Project condition	Habitat type	Man-days per acre[2]	Annualized acreage	Total man-days[3]	Value per man-day[4] ($)	Total value[5] ($)
FWP	Estuarine marsh	0.35	0	0	$4.45	$0
	Scrub-shrub	0.25	0	0	4.45	0
	Riverfront hardwoods[1]	0.38	18	7	4.45	31
	Mid-Successional BLH	0.50	9	5	4.45	22
	Subclimax BLH	0.50	0	0	4.45	0
	Total			12		53
FWOP	Estuarine marsh	0.35	11	4	4.45	18
	Scrub-shrub	0.25	6	2	4.45	9
	Riverfront hardwoods	0.38	15	6	4.45	27
	Mid-Successional BLH	0.50	13	7	4.45	31
	Subclimax BLH	0.50	31	16	4.45	71
	Total			35		156
	Net change			-23		-$103

[1] BLH = Bottomland hardwoods.
[2] Source: U.S. Army Corps of Engineers (1977) and best professional judgement.
[3] Total man-days were calculated by multiplying man-days per acre and the annualized acreage.
[4] Source: U.S. Army Corps of Engineers, New Orleans District (April 1987 personal communication).
[5] Total value is the product of total man-days and value per man-day.

Table B-9. A comparison of wildlife-oriented recreation by cover type under future with-project (FWP) and future without-project (FWOP) conditions for the Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project.

Project condition	Habitat type	Man-days per acre[2]	Annualized acreage	Total man-days[3]	Value per man-day[4] ($)	Total value[5] ($)
FWP	Riverfront hardwoods	0.38	95	36	$4.45	$160
	Mid-Successional BLH[1]	0.50	1	1	4.45	4
	Subclimax BLH	0.50	1	1	4.45	4
	Total			38		168
FWOP	Riverfront hardwoods	0.38	802	305	4.45	1,357
	Mid-Successional BLH	0.50	9	5	4.45	22
	Subclimax BLH	0.50	4	2	4.45	9
	Total			312		1,388
	Net change			-274		-$1,220

[1] BLH = Bottomland hardwoods.
[2] Source: U.S. Army Corps of Engineers (1977) and best professional judgement.
[3] Total man-days were calculated by multiplying man-days per acre and the annualized acreage.
[4] Source: U.S. Army Corps of Engineers, New Orleans District (April 1987 personal communication).
[5] Total value is the product of total man-days and value per man-day.

Table B-10. Comparison of average annual man-day/monetary impacts associated with future with-project (FWP) and future without-project (FWOP) conditions for the Reach C feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project.

Activity	FWP		FWOP		Net change[1]	
	Man-days	Value ($)	Man-days	Value ($)	Man-days	Value ($)
Sport fishing	0	$0	142	$632	-142	-$632
Commercial fishing	---	0	---	950	---	-950
Sport hunting[2]	7	54	41	356	-34	-302
Trapping[3]	---	22	---	93	---	-71
WOR[4]	12	$53	35	156	-23	-103
Total	19	$129	218	$2,187	-199	-$2,058

[1]Net change under FWP conditions when compared to the FWOP conditions.
[2]Data taken from Table B-2.
[3]Data taken from Table B-4.
[4]Wildlife oriented recreation data taken from Table B-5.

Table B-11. Comparison of average annual man-day/monetary impacts associated with future with-project (FWP) and future without-project (FWOP) conditions for the Barrier Feature of the New Orleans to Venice, Louisiana, Hurricane Protection Project.

Activity	FWP		FWOP		Net change[1]	
	Man-days	Value ($)	Man-days	Value ($)	Man-days	Value ($)
Sport hunting[2]	26	208	214	1,715	-188	-1,507
Trapping[3]	---	53	---	450	---	-397
WOR[4]	38	168	312	1,388	-274	-1,220
Total	64	$429	526	$3,553	-462	-$3,124

[1] Net change under FWP conditions when compared to the FWOP conditions.
[2] Data taken from Table B-2.
[3] Data taken from Table B-4.
[4] Wildlife oriented recreation data taken from Table B-5.

LITERATURE CITED

Palmisano, A.W. 1973. Habitat preference of waterfowl and fur animals in the northern gulf coast marshes. Pages 163-190 in R.H. Chabreck, ed., Proceedings of the coastal marsh and estuary management symposium. Louisiana State University Division of Continuing Education. Baton Rouge.

Soileau, D.M. 1984. Louisiana coastal area, Louisiana: freshwater diversion to Barataria and Breton Sound Basins, Fish and Wildlife Coordination Act Report. U.S. Fish and Wildlife Service, Lafayette Ecological Services Office, Lafayette, LA. 51 pp. + appendices.

Strader, R.W. 1984. Lake Pontchartrain, Louisiana, and Vicinity Hurricane Protection Project, Fish and Wildlife Coordination Act Report. U.S. Fish and Wildlife Service, Lafayette Ecological Services Office, Lafayette, LA. 144 pp.

U.S. Army Corps of Engineers. 1977. Value of wetlands and bottomland hardwoods. Mimeograph report. Environmental Quality Section, New Orleans, 4 pp. + tables.

U.S. Army Corps of Engineers. 1984. Louisiana coastal area, Louisiana: freshwater diversion to Barataria and Breton Sound Basins. Volume 3. Appendices E-K. New Orleans District. 434 pp.

APPENDIX B

WATER QUALITY

Martha A. Madden
SECRETARY

OFFICE OF WATER RESOURCES

J. DALE GIVENS
ASSISTANT SECRETARY

August 18, 1987

WQC 870618-07

U.S. Army Corps of Engineers
Planning Division (CELMN-PD-RE)
P.O. Box 60267
New Orleans, La. 70160-0267

Attention: Mr. Ken Froehlich

Gentlemen:

RE: Proposal for raising the Mississippi River Levee (MR&T) to hurricane grade from City Price (R.M. 44) to Venice (R.M. 10) in Plaquemines Parish, La. In raising the levee a wave berm would be constructed to aid in wave energy dissipation. Approx. 14 acres of wooded batture wetlands would be covered with 95,000 cy of material and approx. 6 acres of Mississippi River bottom would be filled with 2,600 cy of material.

This is to acknowledge receipt of "Proof of Publication" of public notice, above reference, forwarded to you with our letter dated June 26, 1987 and to advise that no complaints relative to this project have been received by this agency within the ten day period stipulated in the notice.

It is our opinion that your proposed project will not violate water quality standards of the State of Louisiana; therefore, we offer no objection to the activities proposed therein provided turbidity during dredging in State waters is kept to a practicable minimum.

In accordance with statutory authority contained in the Louisiana Revised Statutes of 1950, Title 30, Chapter 11, Part IV, Section 1094 A(3) and provisions of Section 401 of the Clean Water Act (

to expect that water quality standards of Louisiana provided for under Section 303 of P.L. 95-217 will not be violated.

Very truly yours,

J. Dale Givens

J. Dale Givens, Assistant Secretary
Office of Water Resources

JDG/LW/mp
cc: Corps of Engineers
Coastal Zone Management

SECTION 404(b)(1) EVALUATION

New Orleans to Venice Hurricane Protection Project
Levee Upgrade, West Bank (R.M.44-10)

The following short form 404(b)(1) evaluation follows the format designed by the Office of the Chief of Engineers, (OCE). As a measure to avoid unnecessary paperwork and to streamline regulation procedures while fulfilling the spirit and intent of environmental statutes, New Orleans District is using this format for all proposed project elements requiring 404 evaluation, but involving no significant impact.

PROJECT DESCRIPTION. The West Bank River Levee Plan involves raising the existing Mississippi River and Tributaries (MR&T) levee to hurricane protection grade from City Price (R.M. 44) to Venice (R.M. 10), Louisiana (Figure 1). The majority of the work would be a setback of the existing levee. The 404(b)(1) action is as follows: approximately 147 acres of wooded batture wetlands would be covered with 95,000 cubic yards of material and approximately 4 acres of Mississippi River bottom would be filled with 2,600 cubic yards to construct the levee wave berm. The berm would be armored with 100,000 cubic yards of shell and 500,000 tons of rip rap.

1. Review of Compliance (§230.10 (a)-(d)).	Preliminary	Final
A review of this project indicates that:		
a. The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose (if no, see section 2 and information gathered for environmental assessment alternative);	(YES) NO	(YES) NO
b. The activity does not appear to: (1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the Clean Water Act; (2) jeopardize the existence of Federally listed endangered or threatened species or their habitat; and (3) violate requirements of any Federally designated marine sanctuary (if no, see section 2b and check responses from resource and water quality certifying agencies);	(YES) NO	(YES) NO
c. The activity will not cause or contribute to significant degradation of waters of the United States including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, esthetic, and economic values (if no, see section 2);	(YES) NO	(YES) NO
d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem (if no, see section 5).	(YES) NO	(YES) NO

2. Technical Evaluation Factors (Subparts C-F).

	N/A	Not Significant	Significant
a. Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C).			
(1) Substrate impacts.		X	
(2) Suspended particulates/turbidity impacts.		X	
(3) Water column impacts.		X	
(4) Alteration of current patterns and water circulation.		X	
(5) Alteration of normal water fluctuations/ hydroperiod.		X	
(6) Alteration of salinity gradients.		X	

	N/A	Not Significant	Significant
b. Biological Characteristics of the Aquatic Ecosystem (Subpart D).			
(1) Effect on threatened/endangered species and their habitat.	x		
(2) Effect on the aquatic food web.	x		
(3) Effect on other wildlife (mammals, birds, reptiles, and amphibians.		x	x[1]
c. Special Aquatic Sites (Subpart E).			
(1) Sanctuaries and refuges.	x		
(2) Wetlands.		x	x[1]
(3) Mud flats.	x		
(4) Vegetated shallows.	x		
(5) Coral reefs.	x		
(6) Riffle and pool complexes.	x		
d. Human Use Characteristics (Subpart F).			
(1) Effects on municipal and private water supplies.		x	
(2) Recreational and commercial fisheries impacts.	x		
(3) Effects on water-related recreation.	x		
(4) Esthetic impacts.		x	
(5) Effects on parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves.	x		

Remarks. Where a check is placed under the significant category, preparer has attached explanation. x1 Direct effects would not be significant, but secondary ones may be significant.

3. Evaluation of Dredged or Fill Material (Subpart G).

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material.

(1) Physical characteristics	x
(2) Hydrography in relation to known or anticipated sources of contaminants	x
(3) Results from previous testing of the material or similar material in the vicinity of the project	
(4) Known, significant sources of persistent pesticides from land runoff or percolation	x
(5) Spill records for petroleum products or designated (Section 311 of CWA) hazardous substances	
(6) Other public records of significant introduction of contaminants from industries, municipalities, or other sources	x
(7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities	
(8) Other sources (specify)	

Appropriate references:

b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants, or the material meets the testing exclusion criteria.

(YES) NO

APPENDIX C

THREATENED and ENDANGERED SPECIES

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
9450 Koger Boulevard
St. Petersburg, FL 33702

September 22, 1986 F/SER23:PWR:dcp

Mr. Cletis R. Wagahoff
Chief, Planning Division
New Orleans District, COE
P. O. Box 60267
New Orleans, LA 70160-0267

Dear Mr. Wagahoff:

This responds to your undated letter that we received September 8, 1986, regarding the preparation of a Supplemental Environmental Impact Statement (SEIS) for the East-bank Barrier feature of the New Orleans to Venice Hurricane Protection Project. The proposed project involves the construction of a levee on the bank of the Mississippi River to protect the developed portions of the west bank of Plaquemines Parish, Louisiana from flooding during storms. A biological assessment (BA) was transmitted pursuant to Section 7 of the Endangered Species Act of 1973 (ESA).

We have reviewed the BA and concur with your determination that populations of endangered/threatened species under our purview would not be affected by the proposed action.

This concludes consultation responsibilities under Section 7 of the ESA. However, consultation should be reinitiated if new information reveals impacts of the identified activity that may affect listed species or their critical habitat, a new species is listed, the identified activity is subsequently modified or critical habitat determined that may be affected by the proposed activity. If you have any new information or questions concerning this consultation, please contact Mr. Paul Raymond, Fishery Biologist, at FTS 826-3366.

Sincerely yours,

Paul W. Raymond
for
Charles A. Oravetz, Chief
Protected Species Management Branch

cc: F/M412
F/SER11

United States Department of the Interior

FISH AND WILDLIFE SERVICE

JACKSON MALL OFFICE CENTER
300 WOODROW WILSON AVENUE, SUITE 316
JACKSON, MISSISSIPPI 39213

September 18, 1986

IN REPLY REFER TO:
Log No. 4-3-86-681

Mr. Cletis R. Wagahoff
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, LA 70160-0267

Dear Mr. Wagahoff:

This responds to your recent letter concerning a Supplemental Environmental Impact Statement for the East-bank Barrier feature of the New Orleans to Venice Hurricane Protection Project. We have reviewed the information you enclosed relative to the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

We concur with your assessment that the proposed action would have no effect on endangered or threatened species or their critical habitat.

If you require further information regarding this project, please contact Mike Dawson of our staff, telephone 601/965-4900.

We appreciate your participation in the efforts to enhance the existence of endangered species.

Sincerely yours,

Dennis B. Jordan

Dennis B. Jordan
Field Supervisor
Endangered Species Field Office

cc:
Department of Wildlife & Fisheries, New Orleans, LA
ES, FWS, Lafayette, LA

Mr. Clark/bj/2521

Planning Division
Environmental Analysis Branch

Mr. Dennis Jordan
U.S. Fish and Wildlife Service
Office of Endangered Species
300 Woodrow Wilson Avenue
Suite 3185
Jackson, Mississippi 39201

Dear Mr. Jordan:

The New Orleans District of the U.S. Army Corps of Engineers is currently preparing a Supplemental Environmental Impact Statement (SEIS) for the East-bank Barrier feature of the New Orleans to Venice Hurricane Protection Project. The purpose of this feature is to construct a levee on either the east or west bank of the Mississippi River to protect the developed portion of the west bank of Plaquemines Parish, Louisiana from flooding and surges induced by storms striking the area from the east. A SEIS filed in April 1985 evaluated the environmental consequences of constructing a back levee to provide protection from storms striking the area from the west. The document included a Biological Assessment (BA) which was provided your agency in October 1981, and concluded that work in the project area would have no impact on any endangered or threatened species or their critical habitat (Log No. 4-3-81-115). A copy of the BA is included for your reference. Based on this previously prepared BA, we have concluded work in the area of the proposed action would have no effect on any endangered or threatened species or their critical habitat.

Questions may be directed to Mr. E. Scott Clark, telephone (504) 862-2521.

Sincerely,

Cletis R. Wagahoff
Chief, Planning Division

Mr. Clark/bj/2521

Planning Division
Environmental Analysis Branch

Mr. D. R. Ekberg
National Marine Fisheries Service
9450 Koger Boulevard
St. Petersburg, Florida 33702

Dear Mr. Ekberg:

The New Orleans District of the U.S. Army Corps of Engineers is currently preparing a Supplemental Environmental Impact Statement (SEIS) for the East-bank Barrier feature of the New Orleans to Venice Hurricane Protection Project. The purpose of this feature is to construct a levee on either the east or west bank of the Mississippi River to protect the developed portion of the west bank of Plaquemines Parish, Louisiana from flooding and surges induced by storms striking the area from the east. A SEIS filed in April 1985 evaluated the environmental consequences of constructing a back levee to provide protection from storms striking the area from the west. The document included a Biological Assessment (BA) which was provided your agency in October 1981, and concluded that work in the project area would have no impact on any endangered or threatened species or their critical habitat (F/SER 61:AM). A copy of the BA is included for your reference. Based on this previously prepared BA, we have concluded work in the area of the proposed action would have no effect on any endangered or threatened species or their critical habitat.

Questions may be directed to Mr. E. Scott Clark, telephone (504) 862-2521.

Sincerely,

Cletis R. Wagahoff
Chief, Planning Division

BIOLOGICAL ASSESSMENT
OF THREATENED AND ENDANGERED SPECIES
NEW ORLEANS TO VENICE, LOUISIANA
HURRICANE PROTECTION

I. INTRODUCTION

This assessment addresses the threatened and endangered species which may be affected by the US Army Corps of Engineers' New Orleans to Venice, Louisiana, Hurricane Protection project. The species potentially affected are listed in Table 1. No threatened or endangered plants are known to occur in the project area.

TABLE 1

ENDANGERED AND THREATENED SPECIES FOUND IN THE VICINITY OF THE NEW ORLEANS TO VENICE, LOUISIANA, HURRICANE PROTECTION PROJECT, PLAQUEMINES PARISH, LOUISIANA

ENDANGERED SPECIES

Kemp's Ridley Sea Turtle	Sperm Whale
Leatherback Sea Turtle	Humpback Whale
Eastern Brown Pelican	Sei Whale
Bald Eagle	Fin Whale
Arctic Peregrine Falcon	Black Right Whale
Eskimo Curlew	

THREATENED SPECIES

Green Sea Turtle	Atlantic Loggerhead Sea Turtle

Due to Similarity of Appearance

American Alligator

The proposed project would affect the wetland areas parallel to the Mississippi River, Plaquemines Parish, Louisiana. A levee would be constructed by the hydraulic method and would consist of a sand core covered with a clay blanket. Construction would be accomplished by first excavating a trench for the sand core adjacent to and on the flood side of the existing levee. Sand would then be pumped from a borrow area in the Mississippi River into the excavated trench. Hydraulic clay fill from a marsh borrow area would be pumped on top of the sand core between retaining dikes. After the hydraulic clay fill has dried sufficiently, this material and material from the existing levee would be shaped over the sand core to the ultimate levee design section plus some overbuild to compensate for additional settlement. This method of construction would be essentially the same as is being used on the other reaches of the project.

This assessment is the result of three visits to the area, conversations and correspondences with knowledgeable persons, and a review of current literature. The historic and current occurrences in Louisiana are summarized; potential impacts, and cumulative effects of the project upon each species are examined. No difficulties were encountered in obtaining data and completing the study; however, information on sea turtles in Louisiana was found to be inadequate.

II. SPECIES ASSESSMENT

a. Kemp's Ridley Sea Turtle. Because of the Kemp's Ridley (Lepidochelys kempii) is a diurnal nester on a single Mexican beach, the small marine turtle is particularly suspectable to extinction. From April to August, small aggregations (arribads) of turtles lay eggs on a 14-mile stretch of beach (Rancho Nuevo) in Tamalipos. Estimates of the populations were 40,000 nesting females in 1947; however, the number has declined to about 500 as of 1978. Taking the Ridley for eggs and skins has played a major part in decline (Pritchard and Marquez, 1973). Although the Mexican Government has prohibited harvesting and protects the colony with armed guards, no upward population trend has been noted. Natural predation of hatchlings is also high. Adults are primarily restricted to the Gulf of Mexico, although juveniles have been reported as far north as Massachusetts.

The ridley is often observed foraging in shallow, rich estuarine and shore areas. The turtle consumes a variety of invertebrates, including crabs, shrimp, snails, sea urchins, fish, and marine plants. Portunid crabs (Callinectes spp.) are favored. Because of the turtles preferred prey, they are often caught during commercial fishing and shrimping activities. The ridley feed in the highly productive white shrimp-portunid crab beds of Louisiana from Marsh Island to the Mississippi delta. An examination of two females captured off the Louisiana coast in 1952 found the turtles had consumed Callinectes spapidus, and C. ornatus, as well as small molluscs of the genera Nassarius, Nuculana, Corbula, and Mulinia (Dobie et al., 1961). Recovery of adults tagged in Tamaulipas, Mexico, has indicated Louisiana and Campeche, Mexico, have the highest nonnesting ridley concentrations. Between 1952 and 1958, 14 ridleys were captured in Louisiana waters. Of 1,038 turtles tagged between 1966 and 1969, 51 were recaptured outside the tagging location. About 30 percent of those recaptures were off the Louisiana coast, and slightly over 50 percent of those recaptures in the United States were from Louisiana (Zwinenburg, 1977). Pritchard found about two-thirds of those turtles tagged in 1970 were recovered off the Louisiana coast (Pritchard and Marquez, 1973). In the last year, no ridleys have been observed during FWS aerial surveys; however, a dead turtle was found in May 1981 on Grand Terre Island (McGehee, personal communication, 1981).

The turtle may overwinter in a dominant state while buried in the silts in the shallow water estuarine systems of the Gulf of Mexico. Although winter torpor has not been adequately documented for the ridley, Florida ridleys are often reported covered with mud during the spring (Pritchard and Marquez, 1973).

It is improbable a dredge would encounter a ridley; however, the possibility cannot be discounted. It is felt the project would not influence the Kemp's Ridley population.

b. Leatherback Sea Turtle. The largest of all turtles, the Leatherback Sea Turtle (Dermochelys coriacea), is one of the rarest marine species, second only to Kemp's Ridley. The pelagic turtle, which is distributed throughout the world, is a powerful swimmer and ranges further north of any other marine turtle. The general population reduction is due to our harvesting of eggs and adults increased beach development, and hatching predation. The present population is estimated to be 29,000 to 40,000 animals (Pritchard, 1971, in NFWL, 1981).

Nesting in the United States is now restricted to the sloping, sandy beaches of Florida near deep water. During the spring and summer months, about 25 clutches are layed each year in Florida. The nocturnally nesting females may lay up to six clutches at 2- or 3-year intervals. On the gulf coast, nests or hatchlings have been reported in Walton and Okaloosa Counties of Florida.

The omnivorous leatherback is often associated with schools of Cabbagehead Jellyfish (Stomolophus meleagris) which are the turtles' preferred prey. They also feed on sea urchins, squids, crustaceans, tunicates, fish, and seaweed.

In 1951, two females were netted by fishermen off southeastern Louisiana, (Dunlap, 1955, in NFWL, 1981) and the species has been reported near Plaquemines Parish. The leatherback is extremely rare in Louisiana, and it has not been observed by NFWL personnel during recent monthly surveys (NFWL, personal communication, 1981). The project would leave no effect on this turtle species.

c. Brown Pelican. Historically, Brown Pelicans (Pelecanus occidentalis) occurred throughout coastal Louisiana and nested on several sites in the Mississippi delta. Estimates of the original pelican population were quite high. Bailey (1919) in Clapp et. al. (in press) reported a pelican population of 50,000 birds on the Mississippi River mud lumps, and Arthur (1931) in the same reference concluded the total Louisiana population was 75,000 to 85,000 birds. Oberholser (1938) estimated a breeding population of 11,500 birds in 1933, and this figure is probably more accurate. Although "thousands of adults along with young of all ages" were reported in 1958, by 1962 there were none (Lowery, 1974). The apparent cause of this sharp decline is unknown; however, pollution, freezing temperatures, hurricanes, and diseases are most likely (Blus, et al. 1979).

During the period 1968 to the 1970's, juvenile birds from Florida were transplanted to Louisiana, and released at several locations (Nesbit, 1978). Breeding in Louisiana is presently confined to the black mangrove and shell bank areas of Queen Bess Island in lower Barataria Bay,

(Figure 1) as well as North Island in the Chandeleurs. In 1981, 200 to 250 pairs of bird breed on Queen Bess and 40 on North Island. North Island is beyond the study area. Breeding often begins in November and continues through the spring. Pelicans use isolated sand spits and clumps of mangroves for loafing and roosting (McNease, personal communication, 1981).

Brown Pelicans forage predominantly by plunge-diving. Although pelicans generally feed in shallow estuarine waters within 5 miles off the coast, they have been observed 20 miles (32 kilometers) or more out to sea (Schreiber, 1978). During the nesting season, the birds feed near the colony; however, they have been observed foraging 45 miles from the breeding site. The pelicans' diet is primarly fish, especially menhaden which may form as much as 90 percent of their diet. Other fish consumed are pinfish, thread herring, top minnow, crevalle, silversides, sheepshead, and mullet (Palmer, 1962). During the summer months, Louisiana pelicans are frequently observed feeding on schooling mullet and menhaden in Barataria Bay, and in the winter they are often noted feeding along the beaches and coastal islands from Timbalier Island eastward.

Because of the Brown Pelicans ability to range over a large area and the poor quality foraging areas found in the construction site, impacts on the Brown Pelican are negligible. The nearest construction would be about 20 miles away from the colony.

d. Bald Eagle. The Southern Bald Eagle (Haliaeetus leucocephalus leucocephalus) is a large raptor which has undergone a pronounced population decline since the late 1940's. Including the northern races, there were an estimated 750 active nests in the continental United States in 1975 (Snow, 1973).

The greatest factor in the eagle decline is the reduced reproduction caused by pesticide accumulation through the food chain. It appears that high residue levels, especially of dieldrin, have resulted in thin eggshells. Other factors affecting the population are shooting, electrocution, severe weather, habitat loss, and human disturbance.

The opportunistic Bald Eagle is generally found in coastal areas or along rivers and lakes where they feed on dead, dying, or live prey. Although the eagles' food is variable, they forage largely on fish and birds. The fish species captured include shad, bass, catfish, gar, mullet, and sunfish, while birds are primarly ducks and coots. The eagle prefers fish to birds, and brown bullhead (Ictalurus nebulosus) to other fish (Wright, 1953 in Snow, 1973).

Eagles prefer to nest in the largest tree of a stand and place the nest below the crown. Usually a clear flight path to water, a good perching tree, and open view of the surrounding area are selected. In the southeast, nests are generally constructed in living trees. The eagle is highly site tenancious. In Alaska, the territorial area varies from 28 to 112 acres, and averages 57 (Snow, 1973).

During the turn of the century, the Bald Eagle was common along the coastal and wetland areas of southern Louisiana (Bailey, 1919, in Dugoni, 1980). Concern for the eagle began in the 1930's, and by the early 1970's, the bird was uncommon (Lowery, 1974). Eagles' nests in Louisiana are predominantly located in flooded, second growth bald cypress-tupelogum and mixed hardwood swamps. These areas are common on the backslopes of reminant deltaic distributaries, and most of the nests are in the old delta between the Mississippi River and the Atchafalaya River. During the 1977-1980 breeding seasons, 30 eagle nests were known to exist in Louisiana, and all of these, but one, were in Terrebonne, Assumption, St. Mary, Jefferson, and St. Charles Parishes. Of these 30 nests, 19 were active and 8 were alternate sites. The remainder were inactive or the status was unknown. The predominant nesting tree in Louisiana is the bald cypress (93 percent) and the remainder live oaks. The nesting season in Louisiana is from September through May (Dugoni, 1980).

Of 10 active Louisiana nests examined, the eagles were found to feed largely on birds (42 percent) and fish (42 percent). The predominant prey, which accounted for about half the birds diet, were freshwater catfish and American Coots (Dugoni, 1980). Their prey is typical of that found in shallow waters.

Organochlorine residue analysis of four prey items indicated 86 percent contained residues (Dugoni, 1980). Subnormal clutch size and hatching failure may be responsible for the reduced reproductive output in Louisiana. High nest success and average annual production of young fledged/active nest suggests clutch failures, not nestling mortality, inhibit the eagle population in Louisiana.

One possible Bald Eagle nest site is located in the project vicinity, and is near Venice. This is nest No. 27 of Dugoni (1980), and is located at longitude 89° 22' 22"; latitude 29° 16' 40". The nest is in a dead bald cypress and about 8 meters above the ground. About three-fourths of the land surrounding the site is marsh, and the remainder wet marsh and ponds. The nest is inactive and, because the tree is dead, will probably not be used by eagles. A one-half- to three-fourths-mile buffer has been left around the tree. Since at least the mid-70's, this nest has been sucessfully used by ospreys. The nearest active Bald Eagle nests are in two dead live oak trees near Lafitte in Jefferson Parish (No. 2 - 90° 6' 30"; 29° 38' 29"; and No. 3 - 90° 6' 25"; 29° 37' 22"). The location of these nests can be seen in Figure 1. There would be no influence on these nests by construction.

e. Arctic Peregrine Falcon. The Arctic Peregrine Falcon (Falco peregrians tundrius) is a migratory, medium-sized raptor which nests in the tundra area of North America and winters in Central and South America. The majority of these falcons migrate along the Atlantic coast; however, some utilize the interior of the continent. Coastal habitat are extensively used for temporary stopovers during migration, and a few individuals may overwinter along the gulf coast (Enderson, 1965).

The Peregrine Falcon hunts over open areas such as waterways, swamps, marshes, and fields where it takes a variety of avian prey. Although shorebirds and waterfowl are eaten, the food of the falcon is predominantly small passerines such as jays, flickers, sparrows, and thrushes (Cade, 1961). It appears food is not a limiting factor.

The principal cause of the Peregrine Falcon decline appears to be chlorinated pesticides, especially DDT and DDE, which have accumulated in the birds as a result of feeding on contaminated prey. Cade et al. (1971 in NFWL, 1980) found residues of organochlorines in tissues and eggs were near the abnormal reproductive threshold, and eggshell thinning approached 20 percent.

The project would have no effect on the Peregrine Falcon as it is a transient species which is endangered because of pesticide loads. It is felt the construction would have no effect on the birds food resources in the delta area.

f. Eskimo Curlew. The Eskimo Curlew (Numenius borealis) is a medium-sized shorebird which nests in the Arctic tundra. In the fall the bird migrates along the Atlantic coast on its way to South America and then returns in the spring through the central United States. The curlew feeds in a variety of habitat including: open grasslands, prairies, meadows, pastures, and plowed lands. During migration it uses intertidal zones and marshes to a large extent. It appears food is not a limiting factor for the bird.

Although the Eskimo Curlew was once considered abundant, no estimates of the former populations are available. The last reported sighting of a bird was in 1976 (Hagar and Anderson, 1977), and the species may be extinct. The principal cause of the decline was unrestricted market hunting during the late 1800's. Severe storms during migration and habitat alterations also may have been a contributing factor (Banks, 1977).

The Eskimo Curlew historically migrated through Louisiana during the spring, and was seen in vast numbers in the southern part of the state. Wagonloads of dead birds were shipped to markets. Although a bird was observed on the gulf coast of Texas in 1962 (Emanuel, 1962 in NFWL, 1980), the last curlew known to be in Louisiana was a bird killed in March 1889 near Acadia Parish (Lower, 1974). The project is not expected to have any effect on the Eskimo Curlew.

g. American Alligator. The American Alligator (Alligator mississippiansis) population reached a low point in the late 1950's and early 1960's because of over harvesting and loss of habitat. Although alligators are found in almost all fresh and brackish water habitats, they prefer large marshes. Joanen (1974 in NFWL, 1980) found the extensive coastal marshes of southern Louisiana may support the highest population anywhere. For this reason, and the population increase in alligators in Louisiana, the "gator" in coastal Louisiana has been

placed in a "threatened due to similarity of appearance to endangered and threatened population" classification (40 FR 37132, 35, 25 June 1979).

Although some marsh will be permanently converted to openwater, it is not felt it will influence the alligator population in this area.

h. Green Sea Turtle. The Green Sea Turtle (Chelonia mydas) is distributed throughout tropical waters, and is found in shallow lagoons and shoals of the Altantic coast and Gulf of Mexico. The turtle population has been declining as a result of overexploitation of both adults and eggs, development of beaches, and drowning as a result of net entanglement.

Nesting by Green Sea Turtles in the United States is limited to the east coast of Florida and primarily during the summer months. The nocturnal turtles lay up to seven clutches each season and nest on a sloping beach with open ocean exposure. The female may only lay every 2 to 4 years (NWFL, 1981).

The herbivorous turtles forage on marine grasses and algae, although mollusks, sponges, crustaceaus, and jellyfish are occassionally consumed. The turtles are migrant, and may be observed in the open sea moving from the feeding grounds to nesting beaches. The green turtle may bury in mud and remain dominant during the winter. A small, but significant, fisheries of "greens" occurred in Louisiana and Texas during the late 1800's and first half of this century. Currently, they are rarely seen in Louisiana, and none had been noted in the last year during NFWL surveys (McGehee, personal communication, 1981). The project would have no effect on the Green Sea Turtle.

i. Loggerhead Sea Turtle. The Loggerhead Sea Turtle (Caretta caretta caretta) is an extremely cosmopolitan species which wanders widely throughout the temperate and tropical oceans. The current population decline is a result of drowning in commercial fishery and shrimping travels, predation of eggs and adults by natural/human predators, and reduction in nesting beaches. Lund (1974) estimated 22,000 nests in the United States. Because the turtles may nest several times each season, the number of females would be much lower.

In the United States, the nocturnally nesting loggerhead lays its eggs from May to September on various barrier islands and beaches from Virginia south to the Florida Keys and into the Gulf of Mexico. The gulf breeding is quite low and restricted to barrier islands. Three to four clutches are layed on the same beach during the summer; however, the females may only lay every 2 to 3 years (Lund, 1974).

The loggerhead is primarily carnivorous and feeds on crabs, clams, mussels, fish, sponges, and jellyfish. Marine grasses are occassionally consumed.

In Louisiana, nesting occurs on the Chandeleur Island. As many as 29 crawls have been recorded; however, many of these may be false crawls because the high shell content of the beach may make nesting difficult (Lund, 1974). Although a few loggerheads have been seen off the Louisiana coast during NFWL censuses, no nesting was observed here in 1980 (McGehee, personal communication, 1981). Like the ridley, the loggerhead may overwinter in a dormant state while buried in silts and muds. It appears as though they prefer channels and deeper holes to the shallow estuarine bottom.

The chance of encountering this turtle is remote. The project would have no effect on the Loggerhead Sea Turtle.

j. Whales. Although the Finback Whale, Humpback Whale, Right Whale, Sei Whale, and Sperm Whale are generally confined to the deeper water of the Gulf of Mexico, they have been sighted in the nearshore waters, and stranded on the Louisiana coast (Schmidly, 1981). Because the project impacts are limited to the marshes and shallow waters along the Mississippi River, the project should have no impact on any whales.

III. SUMMARY OF IMPACTS

Two of the sea turtles, the ridley and loggerhead, could be affected by the project; however, it is unlikely. Both of these turtles forage on vertebrate species in small estuarine waters and may overwinter in the estuarine silts. Because little information is known on the sea turtles populations in Louisiana, impacts to these species are speculative. Although some marsh habitat would be destroyed, the project would have minimal effects on the abundant alligator population.

The project would have minimal effects on birds, especially the raptors. Because the Brown Pelican forge in the project area, prey availability in the immediate project area might be reduced because of turbidity. This effect is minor and of short duration. The nearest construction would be about 20 miles away from the pelican colony.

Although whales have been sighted in the gulf, none are expected to occur in the shallow estuarine areas.

IV. CONCLUSION

The impacts of the New Orleans to Venice project are expected to be negligible on the endangered and threatened species examined in this assessment. Temporary, localized effects of the project would include turbidity from the dredging operations and a release of nutrients. Long-term impacts would be a loss of marsh due to the construction of ponding and borrow areas.

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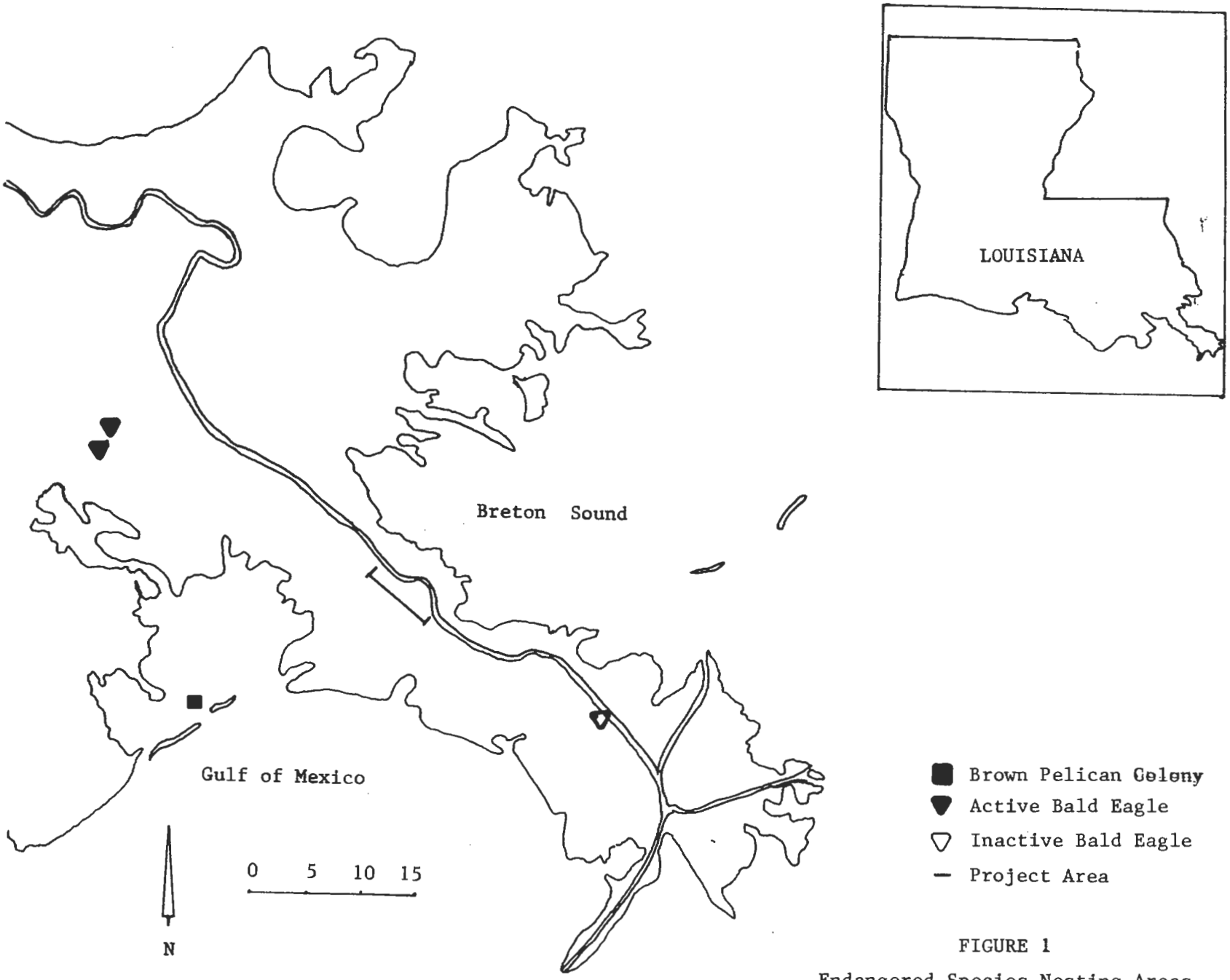

FIGURE 1

Endangered Species Nesting Areas
Near the N.O. to Venice Project.

APPENDIX D

FARMLAND CONVERSION IMPACT RATING

The Farmland Protection Policy Act (FPPA), Public Law 97-98, was promulgated to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses. The act is administered by the U.S. Department of Agriculture - Soil Conservation Service (SCS). The primary purpose of the act is to prevent the loss of prime or unique farmlands by requiring Federal agencies to identify and take into account the adverse effects of their programs, consider alternative actions that could lessen adverse effects, and ensure that their programs are compatible with state and local programs and policies to protect farmland. Prime farmland is land that produces the most food and fiber with the least production and environmental cost, and unique farmland is land, other than prime farmland, used for the production of specific high-value food and fiber crops.

The procedure developed to evaluate a Federal agency's actions consists of land evaluation criteria and site assessment criteria. The land evaluation criteria are based on soil surveys, soil potential and productivity ratings, land capability classifications, and important farmland determinations. The site assessment criteria evaluate the suitability of each proposed site or design alternative for protection of farmland. The use of these criteria on Form AD-1006 yields a Relative Value Rating. Those alternatives or sites having a high farmland value (a combined score of 160 or more) must be given consideration for protection. For scores under 160, no further consideration is required.

The West-bank River Levee plan has a score of 128, and the East-bank Barrier Levee plan has a score of 25. No additional consideration of these plans under the FPPA is necessary.

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 23 Sept. 87
Name Of Project New Orleans to Venice	Federal Agency Involved Corps of Engineers
Proposed Land Use Hurricane Protection Levee	County And State Plaquemines Parish, LA
PART II *(To be completed by SCS)*	Date Request Received By SCS 10/9/86

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply – do not complete additional parts of this form).* Yes ☒ No ☐		NOT Irrigated REQUIRED	Average Farm Size 375
Major Crop(s) (Soybeans) Vegetables, Fruit, Cattle	Farmable Land In Govt. Jurisdiction Acres: 29000 % 4.6	Amount Of Farmland As Defined in FPPA Acres: 29000 % 4.6	
Name Of Land Evaluation System Used Plaquemines Parish, La.	Name Of Local Site Assessment System None	Date Land Evaluation Returned By SCS 11/17/86	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A 1/	Site B 2/	Site C	Site D
A. Total Acres To Be Converted Directly	1007	1101		
B. Total Acres To Be Converted Indirectly	0	0		
C. Total Acres In Site	1007	1101		
PART IV *(To be completed by SCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	0	34		
B. Total Acres Statewide And Local Important Farmland	0	0		
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0	.001		
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	100	2.5		
PART V *(To be completed by SCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	0	96		

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use	15	15	15		
2. Perimeter In Nonurban Use	10	10	10		
3. Percent Of Site Being Farmed	20	0	3		
4. Protection Provided By State And Local Government	20	0	0		
5. Distance From Urban Builtup Area	--	--	--		
6. Distance To Urban Support Services	--	--	--		
7. Size Of Present Farm Unit Compared To Average	10	0	0		
8. Creation Of Nonfarmable Farmland	25	0	0		
9. Availability Of Farm Support Services	5	0	3		
10. On-Farm Investments	20	0	1		
11. Effects Of Conversion On Farm Support Services	25	0	0		
12. Compatibility With Existing Agricultural Use	10	0	0		
TOTAL SITE ASSESSMENT POINTS	160	25	32		
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	96		
Total Site Assessment *(From Part VI above or a local site assessment)*	160	25	32		
TOTAL POINTS *(Total of above 2 lines)*	260	25	128		

Site Selected: B	Date Of Selection 20 Nov. '86	Was A Local Site Assessment Used? Yes ☐ No ☒

Reason For Selection:

Site B is the Tentatively Selected Plan based on both economic and environmental constraints. This alternative would result in the loss of about 60 acres of farmland or wooded sites suitable for clearing within the protected area.

(See Instructions on reverse side) Form AD-1006 (10-83)

1/ East-bank Barrier (East-bank) Plan

2/ West-bank River Levee (West-bank) Plan

C

United States
Department of
Agriculture

Soil
Conservation
Service

Belle Chasse Field Office
205 Main Street
Belle Chasse,La. 70037

November 18, 1986

Mr. Scott Clark
Planning Division
Environmental Analysis Branch
Department of the Army
New Orleans District, Corps of Engineers
P. O. Box 60267
New Orleans, La. 70160-0267

I have completed Parts II, IV and V of the Farmland Conversion Impact Rating, as requested. Please note that the figures you supplied in Part III need to be adjusted, as per our conversation on November 14, 1986. Please return one copy to me after you have made those adjustments.

Thank you for your cooperation and assistance in completing this impact rating.

Allen J. Bolotte
District Conservationist

AJB:btt

Enclosure

Planning Division
Environmental Analysis Branch

Mr. Allen Bolotte
District Conservationist
USDA-Soil Conservation Service
205 Main Street
Belle Chase, Louisiana 70037

Dear Mr. Bolotte:

Reference is made to the U.S. Department of Agriculture's final rules for the implementation of the procedural provisions of the Farmland and Protection Policy Act of 1981.

The U.S. Army Corps of Engineers is authorized to prevent hurricane induced tidal damages along the Mississippi River in Plaquemines Parish, Louisiana, by increasing the height of existing back levees, altering the present drainage facilities, and modifying the main river levee. The New Orleans District is currently preparing a supplemental Environmental Impact Statement to assess the impacts of providing hurricane protection to the west bank area between City Price and Venice, Louisiana, from storms striking the area from the east. Three alternatives for this feature are currently under evaluation and are described below:

a. East-bank Barrier (East-bank) Alternative. This alternative consists of a levee constructed along the east bank of the Mississippi River from Mile 44 Above Head of Passes (AHP) near Bohemia, Louisiana, to River Mile 10 AHP near Venice, Louisiana, and an enlarged Mississippi River and Tributaries (MR&T) levee on the west bank of the Mississippi River from Fort Jackson to Venice, Louisiana. The east-bank levee would be constructed with about 8 million cubic yards of uncompacted fill material removed from a 150-foot wide by 20-foot deep opposite borrow pit, and cast directly onto a 150- to 200-foot wide levee and berm section to a final design elevation of 16 feet National Geodetic Vertical Datum (NGVD) near Bohemia to 14.6 feet near Venice. About 400,000 cubic yards of shell and 1.3 million tons of rip-rap are necessary for slope and foreshore protection. The west bank levee would be upgraded within the existing MR&T rights-of-way with 350,000 million cubic yards of semicompacted fill to an elevation of 13 to 15 feet. For this work, about 1 million cubic yards of material would be obtained from a 50-acre batture area borrow pit on the east side of the river.

b. West-bank River Levee (West-bank) Alternative. This alternative involves raising of the existing MR&T levee to the hurricane

shell and 500,000 tons of rip-rap. Where possible, the landside toe of the new levee would coincide with the existing MR&T levee toe. In those sections were stability conditions do not permit the use of the existing MR&T alignment, levee setbacks or floodwalls would be used to provide the necessary protection. The levee and associated berms would be constructed with about 6.2 million cubic yards of fill. To obtain the necessary fill, about 19 million cubic yards of material would need to be removed from about 700 acres of borrow pits located in the batture area of the east side of the river.

c. No Action. With this alternative, no work would be conducted.

The east-bank alternative work on the west side of the Mississippi River would not impact any additional acreage because construction would be confined to existing rights-of-ways. The west-bank alternative work landside of the existing MR&T levee would impact about 25 acres of woodland, and 35 acres of agricultural and pasture land.

Enclosed are three copies of Form AD-106 with Parts I and III completed. It is requested you make a determination as to whether the areas impacted by the above alternatives contain prime, unique, statewide, or locally important farmland. Questions may be addressed to Mr. E. Scott Clark, (504) 862-2521.

Sincerely,

Cletis R. Nagahoff
Chief, Planning Division

APPENDIX E

HABITAT ANALYSIS

APPENDIX E-1

HABITAT EVALUATION PROCEDURE

A Habitat Evaluation Procedure (HEP) was used to evaluate project impacts. The HEP is a habitat-based procedure conducted by Federal and state biologists to describe baseline habitat conditions upon which predictions can be made about future conditions of the project area. The HEP analysis was developed by the U.S. Fish and Wildlife Service to provide a method for describing present and future habitat conditions and to assess project impacts. This system is based on the assumption that all habitat has inherent and measurable value to wildlife. In implementing the HEP, a representative list of species is selected for the area, and these animals are used as evaluation elements in determining habitat quality. The species selected for marsh were the North American mink, great egret, and mottled duck; for the remaining habitats, the grey squirrel, downy woodpecker, and swamp rabbit. The habitat suitability for each species is rated, and the scores within a particular habitat type are used to calculate a Habitat Suitability Index (HSI) for the habitat. The HSI for each habitat is then multiplied by the total number of impacted acres to get Habitat Units (HU's). HU's are thus a product of quality (HSI) and quantity (area) of the habitat and provide a standardized basis for comparing habitat changes over time and space. The HU values are then annualized to obtain an Average Annual Habitat Unit (AAHU) figure for each habitat under the future-with-project and future-without-project conditions. Details of the HEP performed for this project can be found in the U.S. Fish and Wildlife Service Coordination Act presented in Appendix A. Results of the analysis can be found in Table E-1 and E-2. From these tables, it can be seen that the WBRL plan would have a net annualized loss of 916 habitat units, and the EBBL would have an annual loss of 27,640 habital units.

TABLE E-1

HSI AND HUV's FOR THE NEW ORLEANS TO VENICE
WBRL PLAN

	BATTURE FOREST						LEVEE FOREST		
	Willow			Cottonwood /Sycamore					
	FWOP	FWP	Change	FWOP	FWP	Change	FWOP	FWP	Change
Acreage									
Existing	802	802		9	9		13	13	
Annualized	802	87		9	0.5		3.4	1.5	
Evaluation Species HSI									
Grey Squirrel	.06	.06		0.20	0.20		0.41	0.41	
Downy Woodpecker	.80	.80		1.00	1.00		0.80	0.80	
Swamp Rabbit	.40	.40		0.13	0.13		0.57	0.57	
Average Annual Habitat Units									
Grey Squirrel	48.1	5.2	- 42.9	1.8	0.10	- 1.7	1.4	0.6	-0.8
Downy Woodpecker	641.6	69.6	-572.0	9	0.50	- 8.5	2.7	1.2	-1.5
Swamp Rabbit	305.2	25.6	-286.0	1.2	0.0	- 1.2	1.9	0.9	-1.0
			-900.9			-11.4			-3.3
Total				-915.6					

TABLE E-2

HSI AND HUV's FOR THE NEW ORLEANS TO VENICE
EBBL PLAN

	MARSH						BATTURE		
	Direct Impacts			Indirect Impacts					
	FWOP	FWP	Change	FWOP	FWP	Change	FWOP	FWP	Change
Acreage									
Existing	617	617		30,335	30,335		311	311	
Annualized	522	102		28,345	10,955		311	29	
Evaluation Species									
HSI									
Grey Squirrel							.06	.06	
Downy Woodpecker							.80	.80	
Swamp Rabbit							.40	.40	
North American Mink	0.92	.86		0.92	.86				
Great Egret	0.49	.68		0.49	.68				
Mottled Duck	0.24	.30		0.24	.30				
Average Annual Habitat Units									
Grey Squirrel									
Downy Woodpecker									
Swamp Rabbit									
North American Mink	480	88	-392	26,077	9,421	-16,656	19	2	- 17
Great Egret	256	69	-187	13,889	7,449	- 6,440	249	23	-226
Mottled Duck	125	31	- 94	6,803	3,287	- 3,516	124	12	-112
			-673			-26,612			-355
Total					-27,640				

The graphics shown were primarily based on data generated by Wicker (1980) and information provided by the USFWS, Coordination Act (Appendix A). The FWOP changes in habitat types were based on applying the rate of change in the project area from 1956 to 1978, to the base acreage shown in Table 5.2.3. For the FWOP condition of the WBRL, the Mississippi River, batture woodlands, and levee were assumed to remain stable, and the levee forest to decline at 3 percent per year, with a corresponding increase in developed land. For the FWOP of the EBBL, the batture forest and levee were assumed to remain stable. The developed land present would decline to 50 percent of that available during the first 25 years, then decline at a rate of 1.2 percent thereafter. Directly impacted marsh would decline at a rate of about 1.2 percent per year, then stabilize once the remaining existing levees subsided. The indirectly impacted marsh along leveed areas would decline at a rate of 2.8 percent per year and the unleveed segments would accrete at 0.02 percent per year. For the FWP conditions, all impacts (except indirectly impacted marsh) were assumed to occur linearly over the period of project construction, and to terminate at project completion. The base acreage used to estimate the indirectly impacted marsh for the EBBL plan was the area of marsh within the 1:24,000 USGS quadrangle maps adjacent the east bank of the Mississippi River.

APPENDIX E-2

HABITAT GRAPHICS

The graphics shown were primarily based on data generated by Wicker (1980) and information provided by the USFWS, Coordination Act (Appendix A). The FWOP changes in habitat types were based on applying the rate of change in the project area from 1956 to 1978, to the base acreage shown in Table 5.2.3. For the FWOP condition of the WBRL, the Mississippi River, batture woodlands, and levee were assumed to remain stable, and the levee forest to decline at 3 percent per year, with a corresponding increase in developed land. For the FWOP of the EBBL, the batture forest and levee were assumed to remain stable. The developed land present would decline to 50 percent of that available during the first 25 years, then decline at a rate of 1.2 percent thereafter. Directly impacted marsh would decline at a rate of about 1.2 percent per year, then stabilize once the remaining existing levees subsided. The indirectly impacted marsh along leveed areas would decline at a rate of 2.8 percent per year and the unleveed segments would accrete at 0.02 percent per year. For the FWP conditions, all impacts (except indirectly impacted marsh) were assumed to occur linearly over the period of project construction and to terminate at project completion. The base acreage used to estimate the indirectly impacted marsh for the EBBL plan was the area of marsh within the 1:24,000 USGS quadrangle maps adjacent the east bank of the Mississippi River. Habitat graphics can be found in Figure 5.2.1, pages EIS-50 to EIS-53.

APPENDIX F

MAN-DAY ANALYSIS

TABLE F-1

MAN-DAY AND DOLLAR VALUE
FOR THE FWOP AND FWP CONDITIONS
WBRL PLAN
(1986 Dollars)

	FUTURE WITHOUT PROJECT			FUTURE WITH PROJECT		
	Batture Woodland		Levee Forest	Batture Woodland		Levee Forest
	cottonwood/ willow	sycamore		cottonwood/ willow	sycamore	
Annualized Area (Acres)	802	9	3.4	87	0.5	1.1
Man-days/Acre 1/						
Big Game	0.07	0.12	0.24	0.07	0.12	0.24
Small Game	0.18	0.19	0.50	0.18	0.19	0.50
Waterfowl	0.01	0.01	0.02	0.01	0.01	0.02
Total Man-days 2/						
Big Game	56.1	1.1	0.8	6.1	0.1	0.3
Small Game	144.4	1.7	0.4	15.7	0.1	0.6
Waterfowl	8.0	0.1	0.0	0.9	0.0	0.0
Value ($) 3/						
Big Game	898	18	13	97	2	5
Small Game	643	8	2	70	0	3
Waterfowl	128	2	0	14	0	0
SUBTOTAL ($)	1669	28	15	181	2	8
TOTAL ($)		$1,712			$191	

1/ U.S. Fish and Wildlife Coordination Act Report; Appendix

2/ Annualized Area multiplied by the Man-day/Acre

3/ Value per man-day based on: big game, $16.00; small game, $4.45; waterfowl, $16.00; multiplied by the total man-days. The 1986 Unit Day Values (UDV) selected were based on a point value of 60 as determined from the criteria and standards prescribed in the Water Resource Council's Principles and Guidelines.

TABLE F-2

MAN-DAY AND DOLLAR VALUE

FOR THE FWOP AND FWP CONDITIONS

EBBL PLAN

(1986 Dollars)

	FUTURE WITHOUT PROJECT			FUTURE WITH PROJECT		
	Marsh		Batture Woodland	Marsh		Batture Woodland
	direct	indirect		direct	indirect	
Annualized Area						
(Acres)	522	28,345	311	102	10,955	2.9
Man-days/Acre 1/						
Small Game	0.32	0.32	0.18	0.32	0.32	0.18
Waterfowl	0.38	0.38	0.01	0.38	0.38	0.01
Total Man-days 2/						
Small Game	167.0	9070.4	56.0	32.6	3505.6	5.2
Waterfowl	198.4	10771.1	3.1	38.8	4162.9	0.3
Value ($) 3/						
Small Game	743	40363.	249	145	15,600	23
Waterfowl	3174	172,338	50	620	66,606	5
SUBTOTAL ($)	3917	212,701	299	765	82,206	28
TOTAL ($)		$216,917			$82,999	

1/ U.S. Fish and Wildlife Coordination Act Report; Appendix

2/ Annualized Area multiplied by the Man-day/Acre

3/ Value per man-day based on: big game, $16.00; small game, $4.45; waterfowl, $16.00; multiplied by the total man-days.