



DEPARTMENT OF THE ARMY  
LOWER MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS

P. O. BOX 80  
VICKSBURG, MISSISSIPPI 39180-0080

REPLY TO  
ATTENTION OF:

Planning Division

02 JAN '87

SUBJECT: Final Mitigation Report for the Larose to Golden Meadow,  
Louisiana, Hurricane Protection Project

Commander, New Orleans District

1. Subject Final Mitigation Report is approved as a basis for preparation of plans and specifications subject to satisfactory resolution of the comments enclosed (Encl 1), completion of required public and agency review of supporting NEPA documents, and any minor revisions to the recommended plan that may be necessary as a result of public and agency coordination.
2. Please provide this office with five information copies of the revised report after the changes required to resolve the enclosed comments are incorporated. Brief explanation of how the issues raised in the comments were resolved should also be provided.
3. Preparation of Plans and Specifications for the approved mitigation features should proceed expeditiously following the close of the period of public and agency review so that budgeting and construction of the mitigation features can proceed concurrently with the building of the remaining elements of the basic hurricane protection project.

1 Encl

THOMAS A. SANDS  
Major General, USA  
Commanding





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VI

ALLIED BANK TOWER AT FOUNTAIN PLACE

1445 ROSS AVENUE

DALLAS, TEXAS 75202

AUG 11 1987

REPLY TO: 6E-FF

Mr. E. Scott Clark  
Environmental Analysis Branch, LMNPD-RE  
P.O. Box 60267  
New Orleans, Louisiana 70160-0267

Dear Mr. Clark:

In complying with Section 309 of the Clean Air Act, as amended, we have completed our review of your agency's Finding of No Significant Impact and Environmental Assessment relating to the Mitigation Report for the Larose to Golden Meadow, Louisiana, Hurricane Protection project.

The mitigation plan describes the efforts to offset the wildlife and fishery habitat losses associated with the hurricane protection project currently under construction. We encourage this effort, in particular the management of the area to reduce saltwater intrusion and reduce marsh loss. Louisiana is experiencing large losses of coastal wetlands, attributable to saltwater intrusion and subsidence. Without the mitigation management plan, it is expected that this 4600 acre marsh area would continue to undergo further deterioration. Therefore, we support the marsh management program related to this area; however, we believe that close monitoring of vegetation, water levels and salinity should be incorporated to assure the plan is working and to identify changes or necessary modifications.

Thank you for your for the opportunity to comment on this project.

Sincerely yours,

A handwritten signature in cursive script that reads "Norm Thomas".

Norm Thomas  
Chief  
Federal Activities Branch (6E-F)





## SUMMARY

The New Orleans District, U.S. Army Corps of Engineers, proposes to mitigate for adverse fish and wildlife impacts resulting from the construction of the Larose to Golden Meadow, Louisiana, Hurricane Protection project by assisting the State of Louisiana in the management of about 4,600 marshland acres within the publicly owned Pointe-au-Chien Wildlife Management Area. The proposed mitigation plan involves the construction of a levee and three water-control structures (weirs) to improve habitat quality by retarding the movement of saltwater into a tract of existing public marshland north of Grand Bayou. The improved retention of fresh water within the leveed area would reduce marsh losses due to saltwater intrusion, and enhance the growth of quality emergent and submergent vegetation in the open-water areas. Fish and wildlife would, in turn, be benefitted by the favorable water levels, abundant food supply, and adequate nesting and nursery areas. Private lands north of the management area would also receive residual benefits.

A Habitat Evaluation Procedure (HEP) was used to assess the hurricane protection project impacts and mitigation requirements. This project would result in a net annual loss of about 83,000 habitat units. Eight alternative mitigation plans were evaluated, and the management of existing public lands alternative was selected. The selected plan would compensate for almost all lost habitat units.

A draft mitigation report describing a similar recommendation was included in the draft Supplemental Environmental Impact Statement for the Larose to Golden Meadow, Louisiana, project which was circulated to interested parties in July of 1984. Because two of the three weirs described in the draft mitigation report were constructed as recommended by the Louisiana Department of Wildlife and Fisheries prior to approval of the Corps' mitigation plan, and due to the immediate need to provide environmental compliance for ongoing hurricane protection work, this ~~is~~ <sup>is</sup> ~~document~~ <sup>document</sup> ~~is~~ <sup>is</sup> ~~revised~~ <sup>revised</sup>

*Scott Clark has  
approval Document  
2 Jan 87  
He stated that they  
make comment changes  
and then the cover date  
is when released to the public*

mitigation report was necessary. The Environmental Assessment that accompanies this report examines the impacts of the revised mitigation plan. About 75 acres of marsh and 10 acres of open water would be degraded as a result of the levee construction proposed as part of this plan. This adverse impact would be more than offset by the monetary and nonmonetary benefits of the proposed mitigation plan.

The mitigation features, including first costs, operation and maintenance, and replacements, are cost-shared with the local assuring agency at the same 70-percent Federal / 30-percent non-Federal ratio as the project and at the same authorized 3-1/4-percent interest rate. Mitigation first costs are estimated to be \$2.9 million. The capitalized (present worth) value of annual maintenance and periodic replacements is approximately \$1.3 million and \$30,000, respectively.

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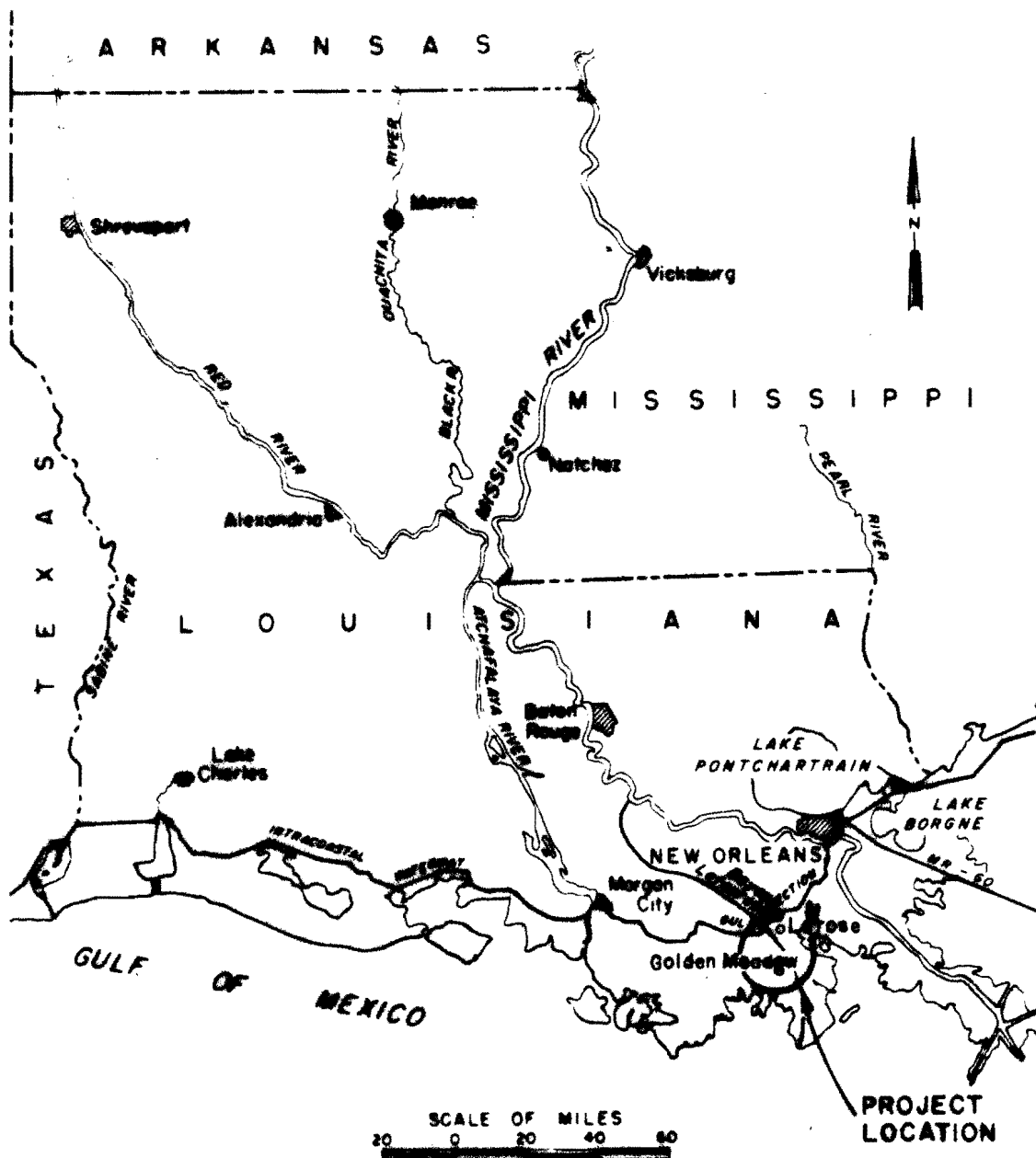
## INTRODUCTION

This mitigation report summarizes studies performed by the U.S. Army Corps of Engineers in cooperation with state and Federal agencies responsible for fish and wildlife resources in Louisiana. The focus of the study is wetland losses caused by the construction of the Larose to Golden Meadow, Louisiana, Hurricane Protection Project as authorized by Public Law 298 in 1985, and modified under discretionary authority of the Chief of Engineers in 1984. The report documents the hurricane protection project's contribution to fish and wildlife habitat losses, examines alternatives to compensate for these losses, and presents the recommendations of the District Engineer, New Orleans District, Corp of Engineers.

A draft mitigation report generally describing the measures recommended in this document was circulated along with a Draft Supplemental Environmental Impact Statement (DSEIS) to the public. The DSEIS was filed with the Environmental Protection Agency (EPA) on July 20, 1984, and the Final Supplemental Environmental Impact Statement (FSEIS) was filed on March 1, 1985. Because of a severe saltwater intrusion problem in the proposed mitigation site, the Louisiana Department of Wildlife and Fisheries had two of three Corps proposed water-control structures (weirs) constructed prior to final approval of the Corps report. As a result, major revisions of the mitigation plan were anticipated and the Final EIS for the hurricane protection project was issued independently of the mitigation report so ongoing work could continue in full environmental compliance. After field investigations of the weirs, it was determined their useful life was less than initially anticipated due to the eroding banks to which the structures were tied; therefore, only minor revisions of the mitigation plan were necessary. The general project area is shown in Figure 1.

## AUTHORITY

Mitigation is allowed by Public Law 85-624, Fish and Wildlife Coordination Act of 1958 (FWCA); Public Law 91-90, National Environmental Policy Act



LAROSE TO GOLDEN MEADOW, LOUISIANA  
HURRICANE PROTECTION PROJECT

## PROJECT LOCATION

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS

AUGUST 1982

FILE NO. H-2-29491

Figure 1

(NEPA); and guided by U.S. Army Corps of Engineers' Engineering Policy (EP) 1165-2-1, Engineering Regulation (ER) 200-2-2 and ER 1105-2-50.

ER 1105-2-10, Chapter 2, Section 2-5 (a)(5) delegates approval authority to the Division Commander for the addition of fish and wildlife mitigation measures to authorized projects, provided no land acquisition is required, or where the required lands will be acquired voluntarily by local interests.

### **PURPOSE**

The purpose of this mitigation report is to examine fish and wildlife losses occurring as a result of this hurricane protection project, and to evaluate alternative means to compensate for these losses. It is also used to establish whether, and to what extent, the authorized project should be modified to include justifiable mitigation measures for fish and wildlife purposes so as to obtain maximum overall project benefits. The Environmental Assessment (EA), which accompanies this report, evaluates the impacts of mitigation alternatives.

### **PRIOR REPORTS**

In 1974, a Final EIS evaluating the environmental impacts of the Larose to Golden Meadow, Louisiana, Hurricane Protection project was filed with the Council on Environmental Quality. During the process of achieving compliance with Section 404 of the Federal Water Pollution Control Act, the Corps incorporated alignment changes which reduced impacts on wetlands, and the Environmental Protection Agency approved the Corps' plan on the condition that an acceptable mitigation plan be developed. In June of 1984, a Draft Mitigation Report (DMR) and a Draft Supplemental Environmental Impact Statement (DSEIS) were released to the public. The mitigation plan in the DMR described the construction of three weirs and a low levee to reduce marsh losses on the the Pointe-au-Chien Wildlife Management Area. Because two of the three weirs were subsequently constructed by private interests as mitigation for oil exploration related

damages, a revision of the mitigation plan became necessary. The mitigative aspects of the project were thus split from the DSEIS and the final SEIS was issued only for the hurricane protection aspects of the project. This revised Mitigation Report and EA were prepared as the decision documents on mitigation for the hurricane protection project to fulfill requirements of the FWCA Act and NEPA.

## **HURRICANE PROTECTION PROJECT DESCRIPTION**

### **AUTHORITY**

Public Law 298, 89th Congress, 1st Session, approved October 27, 1965, authorized the project "Grand Isle, Louisiana and Vicinity" to provide protection in accordance with the recommendations of the Chief of Engineers in his report entitled "Grand Isle and Vicinity, Louisiana," and contained in House Document No. 184, 89th Congress, 1st Session. The Chief's report included recommendations for: 1) raising the height of existing levee to provide hurricane protection, 2) constructing two navigable floodgates in Bayou Lafourche, and 3) placing seven multi-barrelled culverts for interior drainage. During post authorization planning, local interests requested that pumping stations replace culverts.

### **PRESENTLY AUTHORIZED PROJECT FOR HURRICANE PROTECTION**

The presently authorized project (AP) involves the construction of a hurricane protection levee from Larose, Louisiana, to Golden Meadow, Louisiana. The protection levee, as originally authorized in 1965, is under construction, and when complete will extend approximately 21 miles on the west bank of Bayou Lafourche (including about 3 miles of existing levee at Golden Meadow) and 22 miles on the east bank of Bayou Lafourche. Modification of the original project to protect two additional areas, Clovelly Farms and the Louisiana Land and Exploration Company (LL&E) properties, was approved in 1984 under discretionary authority of the Chief



of Engineers. These two areas are located on the east bank of Bayou Lafourche between Larose and Golden Meadow. The finished levee system will have a net grade of elevation +13.0 feet National Geodetic Vertical Datum (NGVD) at Golden Meadow and will vary to elevation +9.5 feet NGVD at Larose. Floodwalls will be constructed where levee construction is not possible because of the congested nature of the area and limited rights-of-way at transitions from levees to floodgates or roadgates. Two floodgates have been built, one at Larose and one at Golden Meadow, to prevent tidal surges in Bayou Lafourche.

#### PROJECT AREA

The project area lies entirely within Lafourche Parish and is situated in an ancient lobate delta of the Mississippi River, the Lafourche Delta. Many of the delta area bayous are former distributaries of the Mississippi River, including Bayou Lafourche which was a distributary of the Mississippi River until 1904 when river access to the bayou was blocked. Soils are typically river deposited clays, silts, and sands near the bayous. The marshes of the study area have soft, highly organic deposits ranging from organic/clay to peat. The elevations vary between 0.0 and 1.0 foot NGVD in the marshes to 3.0 and 8.0 NGVD at the crests of the natural levee ridges. The climate of the area is greatly influenced by the proximity of the Gulf of Mexico. Southeasterly winds from the gulf moderate the climate and give it a humid, sub-tropical character. Air temperature varies with monthly averages of 57°F in January and February to 83°F in August. Tidal effects have been observed up Bayou Lafourche as far north as Larose. The tides are normally diurnal and range less than 1 foot. Hurricane tides have been recorded up to 5.5 feet NGVD at Larose.

The habitat types in the project area include bottomland hardwood forest, wooded swamp, fresh/intermediate marsh, brackish marsh, open water, and agricultural/pastureland. The important animal species of the wetlands include brown and white shrimp and blue crabs; freshwater fish such as

largemouth bass and catfish; estuarine fish such as menhaden and croakers; American alligators; waterfowl; and mammals such as white-tailed deer, nutria, and muskrat. The marshes and forests in the study area provide areas for recreational hunting and fishing.

#### EXISTING CONDITIONS IN THE HURRICANE PROTECTION AREA

Although some fresh/intermediate and brackish marshes still exist within the hurricane protection project area, much of the marsh within the levee alignment was drained long ago and converted to drier habitat types. The fresh/intermediate marshes with a salinity range from 0 to 6 parts per thousand (ppt) are dominated by bulltongue, bullwhip, Cyperus, wiregrass, and narrow leaf cattails (Chabreck, 1972). This marsh type is utilized by nutria, wading birds, migratory ducks and geese, numerous fish, and alligators. Various estuarine fish and shellfish use the intermediate marsh as a nursery area, and the detritus produced in the marsh is a vital part of the food base of the aquatic ecosystem. Brackish marsh with a salinity range of 1 and 10 ppt is dominated by wiregrass, oystergrass, and saltgrass (Chabreck, 1972). This marsh type is utilized by muskrat, moderate numbers of migratory waterfowl, wading birds, and a few reptiles and amphibians. It is an important nursery habitat for certain estuarine organisms, notably menhaden and shrimp. The detritus produced by brackish marsh is flushed into adjacent water bodies where it provides an important food source. About 1,100 acres of fresh to intermediate marsh and 900 acres of brackish marsh exist in the project area.

The fresh to intermediate bayous, canals, and open water within the area to be protected support a variety of recreationally and commercially important fish and wildlife. The brackish water bodies provide less valuable habitat for migratory waterfowl, furbearers, and freshwater fish. However, these estuarine waters provide nursery areas for many commercially and recreationally important estuarine fish and shellfish. There are about

1,800 acres of open water in the project area, of which 1,600 acres are associated with marsh.

Wooded swamp and bottomland hardwoods are the predominant forest types in the project area. Bald cypress and tupelogum are the dominant trees in the swamps, with red maples along the drier edges. Important trees present in bottomland hardwoods are red maple, green ash, hackberry, and sweetgum. These forested wetlands provide habitat for waterfowl, wading birds, deer, rabbits, squirrels, and songbirds. About 150 acres of the project area are wooded swamps and 900 acres are bottomland hardwoods.

There are no known endangered or threatened species that reside in the project area. Several endangered birds, such as the brown pelican, bald eagle, peregrine falcon, and Eskimo curlew, might be seen occasionally as transient visitors. The American alligator has been removed from the endangered species list, although it is still listed as threatened due to similarity of appearance. Although several species of plants from Louisiana are being reviewed for endangered or threatened species status, none of them occurs in the project area.

#### FUTURE CONDITIONS WITHOUT THE HURRICANE PROTECTION PROJECT

Without project construction, the area of natural marshes within the project area would severely decrease due to factors such as erosion, land subsidence, and saltwater intrusion. About 20 acres of fresh to intermediate marsh, and 350 acres of brackish marsh would remain in the project area at the end of the project life in the year 2096. An annualized 298 acres of fresh/intermediate marsh and 685 acres of brackish marsh would be present over the project life. Open-water bodies in the project area would increase significantly due to the same factors affecting marsh loss. In addition, salinity levels in the marshes and open-water areas would continue to rise. Nutrient levels would be expected to increase as more lands are put into agricultural uses. An annualized

2,594 acres of open water would occur over the project life. Wooded swamp and bottomland hardwoods would be drastically reduced by the year 2096. An annualized 32 acres of wooded swamp and 456 acres of bottomland hardwoods would occur over the project life.

Under future without project conditions, wildlife diversity in the area would decrease as vital habitat is lost due to urban and agricultural expansion, saltwater intrusion, and subsidence and erosion. Freshwater and estuarine fish productivity and harvest would decrease as essential fresh/intermediate and brackish marshes are lost. Urban and agricultural development also would occur in the area, but at a slow rate. The number of transient endangered and threatened species, and habitat available to these species, would decline.

#### HURRICANE PROTECTION PROJECT IMPACTS

The project has resulted in the direct loss of habitats due to levee construction and borrow rights-of-way. Habitats also have been lost as a result of the enhanced drainage provided within the levee system and the subsequent conversion of these areas to agricultural, residential, or commercial development. Minor degradation of water quality parameters has occurred during construction. Existing hydrologic flows have been disrupted. The aerial extent of habitats impacted by borrow, levee rights-of-way, or enclosed by the project can be found in Table 1, and the impacts with and without the project in Table 2.

The project has directly (levee and borrow rights-of-way) and indirectly destroyed or modified 1,938 acres of marsh, 1,022 acres of forest, and 1,638 acres of open water and 217 acres of agricultural land. The U.S. Fish and Wildlife Service (Appendix A) indicated project implementation would cause an average annual loss of 540,000 pounds of commercial fishery harvest valued at over \$144,000; 3,286 man-days of sportfishing valued

TABLE 1. A comparison of the potential habitat losses in the immediate hurricane protection project area (Data based on acres present in base-year 1975).

| HABITAT                     | AREA <sup>1/</sup>    |            |            | TOTAL      |
|-----------------------------|-----------------------|------------|------------|------------|
|                             | Levee<br>Right-of-way | Borrow     | Enclosed   |            |
| Fresh/Intermediate<br>Marsh | 216                   | 154        | 723        | 1,093      |
| Brackish Marsh              | 186                   | 105        | 554        | 845        |
| Open Water                  | 230                   | 284        | 1,124      | 1,638      |
| Wooded Swamp                | 10                    | 9          | 122        | 141        |
| Bottomland Hardwoods        | <u>152</u>            | <u>108</u> | <u>621</u> | <u>881</u> |
| Total Acreage Impacted      | 794                   | 660        | 3,144      | 4,598      |

<sup>1/</sup> About 217 acres of agricultural lands would be impacted, but not mitigated, therefore are not included in the analysis.

TABLE 2. A comparison of the existing, future without, and future with project conditions and annualized area for each.

| HABITAT                  | CONDITION <sup>1/</sup> |  |                                     | ANNUALIZED ACREAGES          |                           |               |
|--------------------------|-------------------------|--|-------------------------------------|------------------------------|---------------------------|---------------|
|                          | Existing<br>(1975)      | Future<br>Without<br>Project<br>(2096) | Future<br>With<br>Project<br>(2096) | Future<br>Without<br>Project | Future<br>With<br>Project | Net<br>Change |
| Fresh/Intermediate Marsh | 1,093                   | 21                                     | 0                                   | 298                          | 83                        | -215          |
| Brackish Marsh           | 845                     | 353                                    | 0                                   | 685                          | 78                        | -607          |
| Open Water               | 1,638                   | 3,202                                  | 660                                 | 2,594                        | 790                       | -1,804        |
| Wooded Swamp             | 141                     | 1                                      | 0                                   | 32                           | 20                        | -12           |
| Bottomland Hardwoods     | 881                     | 165                                    | 23                                  | 456                          | 242                       | -214          |
| Levee                    | 0                       | 0                                      | 794                                 | 0                            | 758                       | +758          |
| Agriculture              | 0                       | 720                                    | 2,623                               | 448                          | 2,207                     | +1,759        |
| Residential/Commercial   | 0                       | 137                                    | 498                                 | 86                           | 420                       | +334          |

<sup>1/</sup> The total area evaluated is 4,598 acres.

at over \$13,000; 930 man-days of sport hunting valued at nearly \$9,000; over \$2,600 in fur harvest; and over \$1,900 in wildlife-oriented recreation. These impacts can be assigned a dollar value, but the marshes, forests, and open-water areas within the study area have other functions such as acting as habitat for fish and shellfish breeding and nursery areas, furnishing cover and food for fish and wildlife, retaining floodwaters, reducing storm surges, and other functions that cannot be easily assigned a value.

#### ANALYSIS OF MITIGATION REQUIREMENTS

Two methods of analysis, a Habitat Evaluation Procedure (HEP) and a user-day/monetary analysis were used to evaluate mitigation requirements. 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 user-day/monetary analysis evaluates the project-induced losses or gains in user-day potential and then assigns monetary values to them.

##### HEP Analysis

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 (1976 version), a representative list of species is selected for the area, and these animals are used as evaluation elements in determining habitat quality. 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's Coordination Act in Appendix A. Results of the analysis can be found in Table 3. From this table, it can be seen that the project would have net annualized loss of -82,931 habitat units.

#### Recreational/Commercial Analysis

This type of analysis evaluates the project induced user-day and net potential monetary. It uses recreational and commercial value per acre, and then assesses monetary losses due habitat changes as a result of the project. The commercial values are derived from actual trapping and fishing records. The overall net changes between future with and future without the project can be used to determine mitigation needs. Table 4 summarizes the potential monetary losses of the without and with the hurricane protection project conditions. Based on 1985 net value per acre of annualized habitats available over the project life, a loss of \$43,442 worth of potential fish and wildlife resources could occur annually as a result of project implementation. Procedures used to determine these data can be found in Appendix B.

#### ANALYSIS OF MITIGATION FOR CLOVELLY FARM/LL&E

During the late 1970's, the South Lafourche Levee District requested the enclosure of the Clovelly Farms and Louisiana Land and Exploration Company (LL&E) property into the protected area. These farms currently are used for producing cattle, sugarcane, soybeans, and crawfish. An impact analysis was conducted specifically for these two farms, and can be found in the project Final Supplemental EIS. On Clovelly Farms, 217 acres would be impacted 110 of which are fresh marsh and 107 acres open water; on the LL&E lands, 319 acres would be affected 54 of which acres are brackish marsh, 105 acres open water, and 160 acres bottomland hardwoods. These



TABLE 3. The habitat suitability index and annualized habitat units for the existing, future without the project (FWOP), and future with the project (FWP) conditions for hurricane protection project.

| HABITAT                     | HABITAT SUITABILITY INDEX |                              |                           | HABITAT UNITS |  |   | Change<br>(FWOP-FWP) |
|-----------------------------|---------------------------|------------------------------|---------------------------|---------------|--|---|----------------------|
|                             | Existing                  | Future<br>Without<br>Project | Future<br>With<br>Project | Existing      | Annualized<br>Future<br>Without<br>Project | Annualized<br>Future<br>With<br>Project |                      |
| Fresh/Intermediate<br>Marsh | 60.25                     | 60.25                        | 60.25                     | 65,853        | 17,934                                     | 5,001                                   | -12,933              |
| Brackish Marsh              | 48.00                     | 48.00                        | 48.00                     | 40,560        | 32,857                                     | 3,735                                   | -29,122              |
| Open Water                  | 25.00                     | 25.00                        | 18.75 <sup>1/</sup>       | 40,950        | 64,846                                     | 16,097                                  | -48,749              |
| Forested Wetland            | 32.10                     | 32.10                        | 10.70 <sup>1/</sup>       | 32,806        | 15,695                                     | 4,962                                   | -11,003              |
| Levee                       | 7.50                      | 7.50                         | 7.50                      | 0             | 0  | 5,684                                   | + 5,684              |
| Pasture                     | <u>7.50</u>               | <u>7.50</u>                  | <u>7.50</u>               | <u>0</u>      | <u>3,362</u>                               | <u>16,554</u>                           | <u>+13,192</u>       |
| TOTAL                       | -                         | -                            | -                         | 180,169       | 134,694                                    | 51,763                                  | -82,931              |

<sup>1/</sup> The habitat value of open water was reduced because a portion of this habitat would be borrow pits and the value of forested wetlands reduced because the potential for increased grazing and development pressure. Additional information may be found in the Project Impacts Section of the USFWS Coordination Act Report (Appendix A).

TABLE 4. A summary of potential annual fish and wildlife losses and gains, in 1985 dollars, for the annualized acreage within the hurricane protection area for the with and without project conditions. The data is from Tables 2, and B-3, B-4 and B-7 of Appendix B.

| ACTIVITY              | VALUE <sup>1/</sup> |              | CHANGE         |
|-----------------------|---------------------|--------------|----------------|
|                       | Without Project     | With Project |                |
| Recreation            |                     |              |                |
| Hunting               | \$11,325            | \$4,261      | - \$7,064      |
| Fishing <sup>2/</sup> | -                   | -            | -              |
| Commercial            |                     |              |                |
| Fishing <sup>3/</sup> | 40,954              | 6,707        | - 34,247       |
| Trapping              | <u>2,905</u>        | <u>774</u>   | - <u>2,131</u> |
| TOTAL                 | \$55,184            | \$11,742     | -\$43,442      |

<sup>1/</sup> These values are the potential dollar productivity of the impacted habitats using 1985 dollars.

<sup>2/</sup> Recreational fishing has not been examined because of the difficulty in comparing fishing populations and recreational expenditure.

<sup>3/</sup> Includes shrimp, oysters, and crabs.

impacts would result in a net annualized habitat unit (HU) loss of -3,985 HU and -5,995 HU for each farm, respectively. Habitat Unit losses for Clovelly Farms account for five percent of the total HU loss and LL&E for seven percent of the total loss.

#### **PLAN FORMULATION FOR MITIGATION**

To mitigate for the hurricane protection project impacts, an array of alternatives was formulated based on criteria and measures provided by various Public Laws, Executive Orders, and Corps regulations and guidelines. The alternatives developed were evaluated for many factors, including environmental, social, economic, and engineering conditions.

#### **EVALUATIVE CRITERIA**

Criteria adopted for use in development and evaluation of alternative plans and in the selection of the recommended plan are as follows:

- o Losses of regionally significant habitat (e.g., marsh) which are unavoidable should be compensated in kind.
- o Project lands should be utilized for mitigation to the maximum extent practicable. If not practicable, the mitigative site should be in the project area vicinity, and within the governmental jurisdiction of the local sponsoring agency.
- o Management of existing public lands is preferable to acquisition of privately-owned lands.
- o Any tracts of land acquired as separable lands for wildlife mitigation should be of sufficient size to assure reasonable and efficient manageability for wildlife, and should be justified based on consideration of overall project costs and benefits.

## GENERAL MEASURES CONSIDERED

Mitigation, as defined by the President's Council on Environmental Quality (in the National Environmental Policy Act), includes efforts that serve to avoid, minimize, rectify, reduce, or eliminate impacts, as well as those that serve to compensate for unavoidable damages.

### Project Modifications Considered to Minimize Impacts

Since the 1974 Final Environmental Impact Statement was prepared, several modifications have taken place to reduce project impacts. As recommended by the U.S. Fish and Wildlife Service and National Marine Fisheries Service, borrow material has been obtained on the protected side of the levees, and Section A East was realigned to exclude 1,500 acres of wetlands.

The purchase and preservation/management of remaining marsh segments within the protected area were evaluated. Because drainage and development of wetlands would occur as a result of project implementation, their preservation and management are not practicable. Pumping stations would keep water in the protected area at 5 feet below NGVD. Additionally, the segmentation and isolation of the remaining marsh parcels would make management difficult.

### Management/Preservation of Existing Public Lands

The possibility of providing funding to Federal, state, or local public agencies to manage existing public lands was considered. The management of wildlife populations to compensate for project-induced impacts was considered. However, to be effective, there should be a significant underdeveloped wildlife potential. The preservation of valuable habitats, such as marshes and bottomland hardwoods, was considered. Preservation is typically more ecologically sound than management of a select group of species because it preserves habitat diversity. The option of conducting

mitigative work on public lands was chosen as the recommended mitigation plan and will be described subsequently.

#### Acquisition of Separable Lands

Both fee simple and wildlife easement acquisition of separable lands are alternative mitigation measures. Although it is possible to provide mitigation by controlling land use through easements, the easements require such rigid controls that essentially all surface rights to the property are lost. Often the easement costs approach fee title costs. Fee title is generally the most advantageous because management may be conducted, cost effectiveness is assured, and administration is less cumbersome.

#### DEVELOPMENT AND SCREENING

Various alternative plans were initially evaluated to mitigate for project-associated fish and wildlife losses. These plans include:

- o Passive management of the Bully Camp Unit of the Pointe-au-Chien Wildlife Management Area (WMA).

- o Active management of the Bully Camp Unit of the Pointe-au-Chien WMA.

- o Passive management of a tract of land north of Grand Bayou in the Pointe-au-Chien WMA.

- o Passive management of an area within the Terrebonne Parish section of the Pointe-au-Chien WMA.

- o Introduction of fresh water into the Pointe-au-Chien WMA from the Gulf Intracoastal Waterway.

- o Purchase of a 1,500-acre in-holding within the Pointe-au-Chien WMA.

- o Acquisition of a long-term lease on the Lafourche Parish School Board section north of the WMA.

- o No action.

The use of the Bully Camp Unit for either passive or active management was found infeasible because of the unstable foundation materials for levees and weirs, presence of active oil wells, and lack of a freshwater source. The passive management of the Grand Bayou tracts was found feasible. The intensive management of the same area was neither cost effective nor necessary because passive management would adequately compensate for losses. The Terrebonne Parish Unit was not within the political boundary of the local project sponsor, Lafourche Parish. The introduction of fresh water was not cost effective. The purchase of a 1,500-acre in-holding within the Pointe-au-Chien WMA and acquisition of a long-term lease on the Lafourche Parish School Board section of land north of the refuge would not increase the wildlife productivity of these areas without additional management and costs. Because the Larose to Golden Meadow Hurricane Protection Project is an ongoing project, acquisition of separable lands for mitigation involves Congressional authorization and funding. The no action alternative was retained to compare impacts.

#### FINAL PLANS

Two alternatives, no-action and the management of a tract of land north of Grand Bayou on the Pointe-au-Chien WMA (Figure 2), were selected as the final plans for detailed evaluation. The management plan which is supported by the local interests and the state, would allow mitigation on publicly-owned lands, does not involve easements or purchase of lands, and can be approved by the Division Engineer. The plan was coordinated with the Louisiana Department of Wildlife and Fisheries, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service. The no-action alternative would not result in mitigation for significant project induced impacts.



## DESCRIPTION OF THE SELECTED PLAN

### DESCRIPTION

The selected mitigation alternative involves construction of an earthen-filled levee and a water-control structure (low-level weir), and future replacement of these facilities. In addition, the two recently constructed weirs on the Pointe-au-Chien Wildlife Management Area (WMA) would be maintained, and replaced as necessary. The proposed levee would be constructed along Cutoff Canal, Grand Bayou, and Grand Bayou Canal. To stabilize water levels within the mitigation area, low-level weirs were placed along two narrow drainage inlets and a third weir would be built across the natural headwater opening to Grand Bayou. The primary purpose of the weirs and levee is to retard the movement of salt water into the marshes north of Grand Bayou. The levees would reduce movement of saline water into the system, and the water-control structure would hold fresh water in the system. Because the crests would be set 0.6 to 0.8 feet below marsh level, some tidal flushing would be maintained.

The installation of two shell ramps against the weir was requested by the Louisiana Department of Wildlife and Fisheries (LDWF) to enhance movement of estuarine organisms, especially invertebrates, over the weirs. Although the use of ramps to assist the movement of estuarine organisms has not been studied, the LDWF has indicated the ramps would be monitored to determine their effectiveness. The information generated from this work could prove to be useful in evaluating future mitigation plans that utilize weirs.

### DESIGN

Specifically, the levee would begin near the intersection of Bayou Pointe-au-Chien and Cutoff Canal, then continue northeasterly along the west bank of the Cutoff Canal, Grand Bayou and Grand Bayou Canal, and then

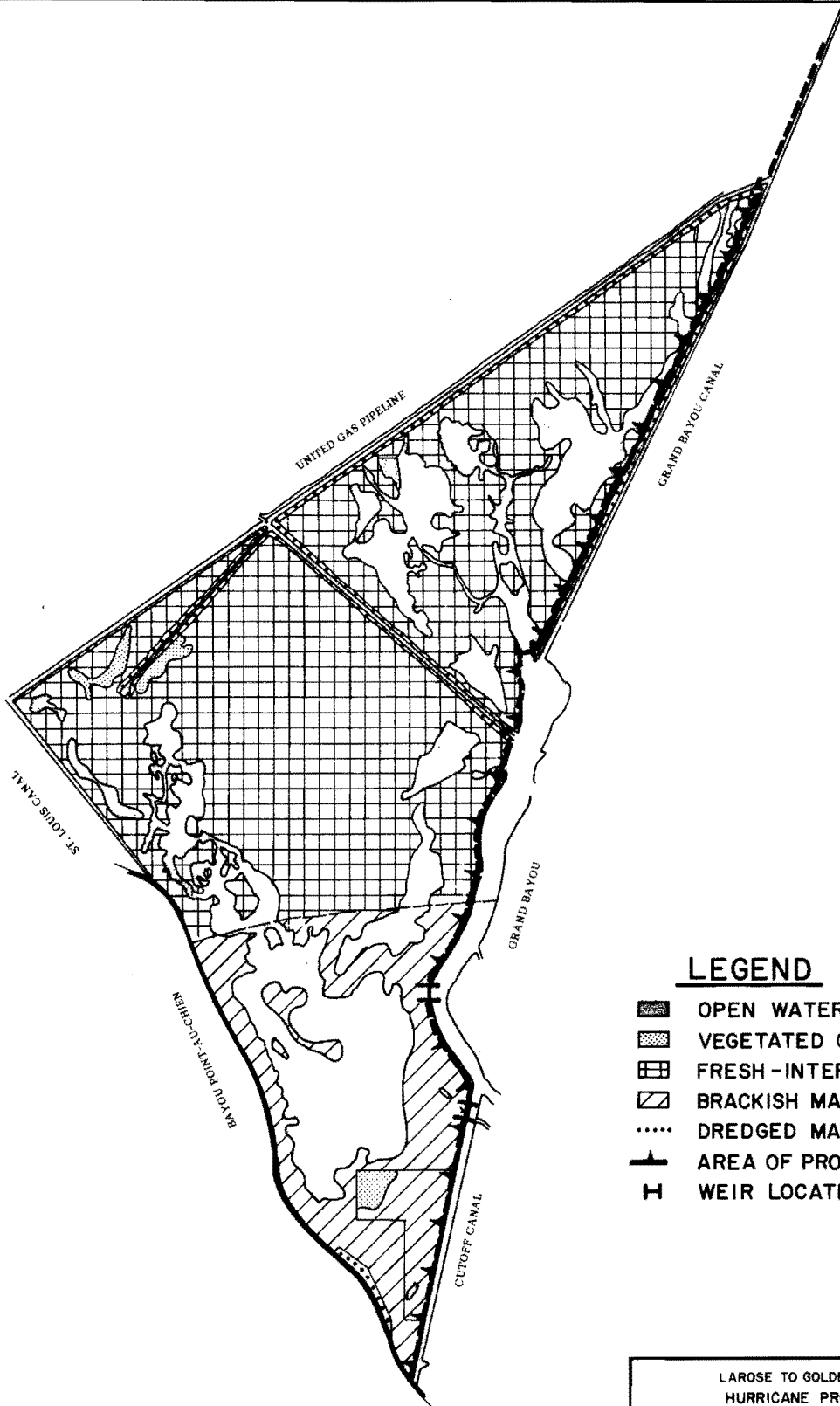


tie into an existing levee at United Gas Pipeline Canal (Figure 3). The embankment would be constructed by a floating plant, casting uncompacted fill from an adjacent parallel borrow area located in the canals. The design section for the protection levee would be built to a gross grade of +6.0 NGVD in order to obtain a project grade of +4.0 NGVD. After a period of several years, an estimated 2-foot settlement is anticipated in the fill height with a possibility of a 1-foot compaction in the base. With the addition of a second and third lift and continued maintenance, the levee could have a 100-year life. Soil strength properties for the preliminary levee design were based on the strength profile of a hurricane protection levee boring (61UE) which was assumed to be similar. The basic design of the earthen levee would consist of a 4-foot wide crown with a 1:4 side slope, stabilized by small lateral berms on each side (Figure 4). It should be noted that variations in the design sections may be required due to more refined design analysis. A review of 18 years of tidal gauge data at Leesville, Louisiana, shows that normal yearly high-water height did not exceed +3.2 NGVD and that a +4.0 NGVD levee would be of sufficient height to protect the mitigation area. Constant-level weirs (Figure 4) would maintain sufficient water levels inside the mitigation area and reduce the normal incoming flux of salt water from entering the area. These weirs would have no moving parts. The two existing 55-foot weirs would be maintained on Cutoff Canal, and a 105-foot weir would be constructed at the Grand Bayou inlet at Grand Bayou Canal. This plan would provide for future maintenance or replacement, as necessary.

#### ENVIRONMENTAL EFFECTS - MITIGATION AREA

##### Existing Conditions

The Pointe-au-Chien WMA encompasses about 28,244 acres of wetlands in Lafourche and Terrebonne Parishes of which 4,598 acres (1984 baseline) of marsh, open water and upland (dredged material) are in the immediate mitigation area. Of the marsh, about 2,102 acres are fresh/intermediate marsh and 899 acres brackish marsh. The vegetation of the fresh marsh type



### LEGEND

- OPEN WATER
- VEGETATED OPEN WATER
- FRESH-INTERMEDIATE MARSH
- BRACKISH MARSH
- DREDGED MATERIAL DISPOSAL
- AREA OF PROPOSED ACTION
- WEIR LOCATIONS

SCALE IN FEET  
2000 0 2000 4000 6000

LAROSE TO GOLDEN MEADOW, LOUISIANA  
HURRICANE PROTECTION PROJECT

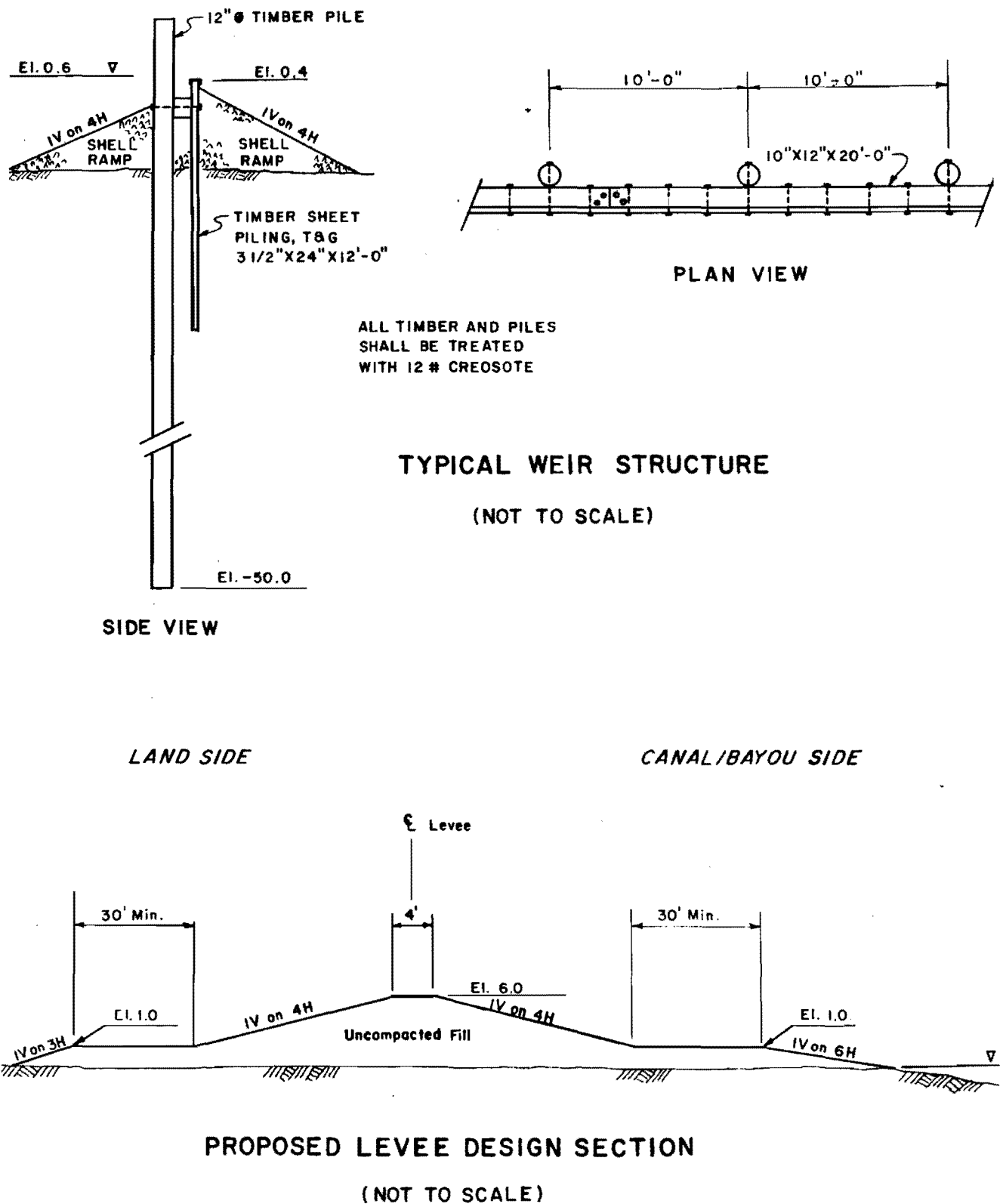
### PROPOSED MITIGATION PLAN STUDY AREA

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS

AUGUST 1982

FILE NO.

Figure 4. The basic levee and weir design for the Larose to Golden Meadow, Louisiana mitigation project.



includes bulltongue, Cyperus, wiregrass, Pluchea, dwarf spikerush, saltgrass, deerpea, saltmarsh mallow, and saltmarsh morning glory, and in the brackish marsh includes wiregrass and saltgrass. There are 1,494 acres of open water scattered throughout the mitigation area marsh. Where aquatic vegetation occurs (Figure 3), the dominant species are coontail, duckweed, water hyacinth, and alligator-weed. Other habitat available to wildlife is the 103 acres of dredged material along Grand Bayou Canal and the Tenneco Canals in the middle section of the area. The vegetation on these banks includes marsh elder, elephants ear, elderberry, black willow, hackberry, and waxmyrtle. The major wildlife species that utilize this marsh habitat include white-tailed deer, swamp rabbit, nutria, muskrat, river otter, raccoon, alligator, migratory and resident waterfowl, herons, egrets, and ibis. The fishery species include speckled seatrout, redfish, menhaden, shrimp, and blue crab in the more saline water bodies, and largemouth bass, crappie, catfish, and shad in the fresher water bodies. Extensive areas of marsh, wooded swamp, and bottomland hardwood forest exist north-northwest of the mitigation area. The marsh is predominantly fresh/intermediate immediately adjacent to the United Gas Pipeline Canal which serves as the northern boundary of the mitigation area. The marsh to the north is fresh. The wooded swamp and bottomland hardwood forest begin immediately north of the junction of the St. Louis Canal and United Gas Pipeline Canal and follow the St. Louis Canal north to Highway 24. Forest species would include red maple, green ash, live oak, American sycamore, hackberry, Chinese tallowtree, black willow, willow oak, bald cypress, and tupelogum.

#### Habitat Value

Where feasible, regionally significant habitats should be compensated in kind. In this mitigation plan, most of the benefits are attributed to the preservation of marsh by retarding saltwater intrusion. Impacts to other habitat types impacted by the hurricane protection project would be compensated with marsh. An area of concern has been the replacement of

bottomland hardwood losses with marsh preservation. However, the privately owned bottomland hardwoods north of the refuge would be indirectly benefited as future saltwater movement into this area would be restricted. Marsh is considered regionally significant because of the severe losses of this habitat along coastal Louisiana.

There is growing evidence that marshes are the most important factor in influencing the production of estuarine-dependent finfish and shellfish species. These marshes export vast amounts of organic detritus into adjacent estuarine waters where it serves as a food source for numerous invertebrate species. The productivity and, therefore, production, of commercially harvestable species is greatly enhanced. Turner (1979) reported that the Louisiana commercial inshore shrimp catch is directly proportional to the area of intertidal wetlands, and Cavit (1979) suggested that menhaden yields were greatest in those basins with the highest ratio of marsh to open water. These two species, shrimp and menhaden, account for most of the total volume of Louisiana's commercial landings. Harris (1973) has stated that total estuarine-dependent commercial fisheries production in coastal Louisiana has peaked and will decline in proportion to the acreage of marsh land loss. Louisiana's coastal marshes provide wintering waterfowl habitat for more than two-thirds of the Mississippi Flyway, and over one-fourth of the North American puddle duck population winters here. Louisiana has traditionally been the leading fur-producing area of North America, and accounts for nearly one-third of the U. S. fur take. Nongame species are also abundant, with the marshes supporting about 150 nesting colonies of seabirds, wading birds, and shorebirds representing approximately 800,000 individuals (Portnoy, 1977).

#### Future Without Mitigation Plan

Louisiana is experiencing an average loss of more than 40 square miles per year; the Deltaic Plain area of the state is losing coastal marsh at a rate of approximately 30 square miles per year; and the Barataria Bay Basin marsh loss is about one percent per year (Wicker, 1980). Wetland losses

have been primarily attributed to both natural and man-induced causes. Natural losses are a result of subsidence, compaction, and erosion, and man-induced losses have been attributed to channelization, leveeing of the Mississippi River, flood-control reservoirs, canal dredging, and development.

The fresh marshes of Louisiana are slowly declining, and much of this loss is due to the conversion of fresh to a more saline type. This change is primarily the result of saltwater intrusion caused by subsidence and erosion, and it is accelerated by numerous navigational, drainage, and mineral exploration canals. Based on work of Chabreck and Liscombe (1978), a 17 percent net increase (107 mi<sup>2</sup>) of more saline type vegetation occurred within the Barataria Bay Basin (Hydrologic Unit IV) from 1968 to 1978. From 1956 to 1978, there was a 364,000-acre (75 percent) loss of fresh/intermediate marsh in the delta area (Hydrologic Units II, III, and IV) (Wicker, 1980). Most of this fresh/intermediate marsh has been converted to estuarine open water due to the processes of subsidence and erosion; the temporary gain in the brackish/saline marsh is a result of saltwater intrusion into the fresher marshes.

The loss of land and encroachment of salinities is a problem in the mitigation area. Because of the extensive oil and sulphur exploration in the Lake Bully Camp Fields, land loss in this area is severe. Marshes within the mitigation area were calculated to be deteriorating at a rate in excess of 3 percent per year - a rate two to three times that of coastal Louisiana (Wicker, 1980). The mitigation area historically has been fresh marsh interspersed with floating fresh marshes. In recent years, the area has become much more saline.

Without the mitigation plan, the marsh in the area would continue undergoing further deterioration due to a number of factors, of which subsidence and saltwater intrusion are the most significant. Information developed by Wicker (1980) and habitat maps generated for the years 1956 and 1978 were used to predict future without mitigation changes in habitat

acreage within the mitigation area over the 100-year project life. At the calculated rate of habitat loss (greater than 3 percent), the future without mitigation (Table 5) shows extensive loss of fresh/intermediate marsh, and large gains in brackish marsh and open water.

Within the mitigation area, many of the natural and man-made levees would continue to deteriorate, allowing rapid marsh loss from saltwater intrusion. Extensive petroleum and related boat traffic within adjacent waterways will continue to contribute to bank erosion and rapid breakup of marsh, especially along the eastern border of the mitigation area. Adding to the problems of saltwater intrusion and wave wash-erosion would be the gradual loss of marsh due to subsidence.

The open-water areas would be utilized primarily by estuarine-dependent fish and shellfish species. Without the project, this habitat would become less attractive to hunters due to the loss of prime game habitat (i.e., freshwater bodies vegetated with aquatics and interspersed with fresh/intermediate marsh). Over the short term, this habitat could become more desirable to fishermen who could fish for estuarine and fish species. However, the loss of marsh in this detritus-based ecosystem would mean that there would eventually be fewer fish to catch.

#### Future With Mitigation Plan

To slow the trend of marsh loss, approximately 7 miles of levee and three water-control structures are proposed along the eastern boundary of the mitigation area. Direct construction impacts would eliminate approximately 46 acres of fresh/intermediate marsh, 27 acres of brackish marsh, and 9 acres of open water, exclusive of the water-control structure sites. Specific areas along the western boundary of the mitigation area had several major breaks in a man-made levee, and the mitigation plan as proposed would not achieve the desired effects if highly saline water was allowed to enter the area via Bayou Pointe-au-Chien/St. Louis Canal. The Louisiana Department of Wildlife and Fisheries has coordinated the repair

TABLE 5. A comparison of the existing conditions and annualized area for the mitigation area with and without management. The total area is 4,598 acres.

| HABITAT                     | CONDITION          |   |  | ANNUALIZED AREA                 |                              |               |
|-----------------------------|--------------------|---|--|---------------------------------|------------------------------|---------------|
|                             | Existing<br>(1984) | Future<br>Without<br>Management<br>(2085) | Future<br>With<br>Management<br>(2085) | Future<br>Without<br>Management | Future<br>With<br>Management | Net<br>Change |
| Fresh/Intermediate<br>Marsh | 2,186              | 84  | 2,634                                  | 684                             | 2,797                        | +2,113        |
| Brackish Marsh              | 953                | 1,384                                     | 0                                      | 1,526                           | 47                           | -1,479        |
| Open Water                  | 1,350              | 2,925                                     | 1,544                                  | 2,221                           | 1,446                        | -775          |
| Upland                      | 109                | 205                                       | 421                                    | 167                             | 307                          | +140          |



of these breaks, and with these repairs, the existing dredge material bank levee is adequate to keep out normal high tides and associated saline waters. With three water-control structures in place, water levels and salinities are expected to stabilize (Chabreck, Hoar, and Larrick 1978).

Previous studies monitoring marsh areas affected by water-control structures, specifically low-level weirs, showed that average water salinities were only slightly lower (about 10 percent) behind the weirs than in adjacent control areas (Chabreck and Hoffpauir 1962). However, the rate of exchange of water salinities behind the weirs was significantly reduced as tidal waters moved over the structures (Chabreck et al. 1978). The greatest and most significant effect on marsh areas affected by weirs concerns water-level stabilization. With the weirs set just below marsh levels, incoming tides easily move over the weir crest. However, as tides move out, water levels behind the weirs can recede only to a fixed level. Such water stabilization provides access for hunters and trappers during low water and is also inductive to growth of valuable wildlife foods, such as three-corner grass, widgeongrass, coontail, Eurasian watermilfoil, wild celery, southern naiad, and pondweed (O'Neil 1949, Larrick and Chabreck 1976, Chabreck et al. 1978). Spiller and Chabreck (1975) noted that water level stabilization behind weirs during low tidal periods increased the usage by ducks, coots, and nongame birds because the retention of water made more feeding and resting areas available.

The mitigation features would maintain a minimum water level inside the mitigation area and buffer saltwater intrusion from normal tidal exchange, while still allowing movement of most estuarine organisms into and out of the marsh area during normal tidal surges. Within the first growing season after construction, unvegetated open-water areas are expected to vegetate with fanwort, Eurasian watermilfoil, and widgeongrass. Utilization of marsh and open water within the mitigation area by fish and wildlife would increase. Stabilized water levels would improve habitat conditions for furbearers such as nutria, muskrat, river otter, and mink by maintaining a minimum water level during drought conditions and by promoting the growth

of desirable food plants. Alligators also would be benefited by stabilized water levels. Wintering waterfowl would greatly benefit from the stabilized water levels and increased submergent and emergent aquatic vegetation (Spiller and Chabreck 1975). Although weirs may hinder movement of certain estuarine species (croaker and penaeid shrimp) to and from marsh areas (Herke 1978), the benefit to accrue from the proposed water-control structures (weirs) in reducing marsh loss should outweigh such anticipated problems. Figure 5 presents a graphic display of the future with the mitigation project (FWP) and future without the project (FWOP).

The mitigation features would significantly reduce saltwater intrusion into the mitigation area which, in turn, would preserve the integrity of the marsh and forestlands north of the mitigation area. Although this report does not quantify benefits to the area north of the mitigation site, some positive benefits would occur as a result of the proposed mitigation features.

#### ADEQUACY OF MITIGATION

Corps guidance and regulations provide for the evaluation of fish and wildlife resources upon both monetary and nonmonetary values. Because these values arise primarily from the quantity and quality of the habitat in the impacted area, a habitat-based methodology, such as HEP, is utilized to assess mitigation needs. Typically, a user-day or other monetary method of evaluation is used for comparative purposes and to project gains and/or losses.

#### Habitat Evaluation Procedure (HEP) Analysis

Tables 6 and 7 illustrate how this proposed mitigation plan would compensate for the hurricane protection project habitat loss. The HEP conducted by FWS personnel shows that construction of the hurricane protection levee would have a total net annualized loss of -82,931 habitat

Figure 5. The future with project (FWP) and future without project (FWOP) conditions for the three major habitat types in the Larose to Golden Meadow mitigation area.

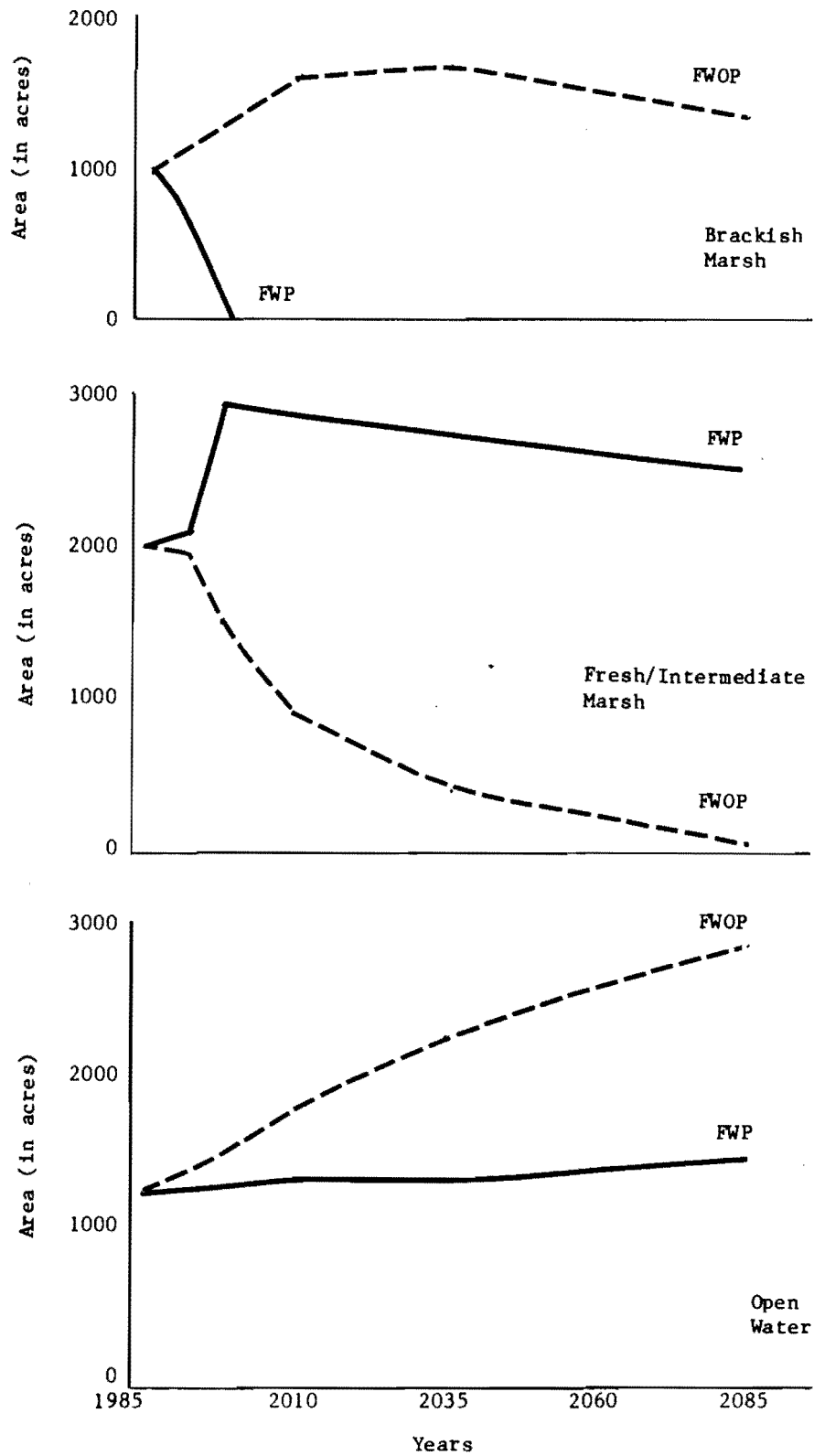


TABLE 6. The habitat suitability index for the existing, future without management, and future with management conditions on the Pointe-au-Chien Management Area.

| HABITAT                  | * HABITAT SUITABILITY INDEX |                |             |
|--------------------------|-----------------------------|----------------|-------------|
|                          | Existing                    | Future Without | Future With |
| Fresh/Intermediate Marsh | 57.25                       | 57.25          | 61.25       |
| Brackish Marsh           | 39.00                       | 39.00          | 39.00       |
| Open Water               | 25.00                       | 25.00          | 44.60       |
| Upland                   | 7.50                        | 7.50           | 7.50        |

TABLE 7. The annualized habitat units for the existing, future without, and future with mitigation plan conditions on the Pointe-au-Chien Management Area.

| HABITAT                  | * HABITAT UNITS |   |  |                      |
|--------------------------|-----------------|---|--|----------------------|
|                          | Existing        | Annualized<br>Future<br>Without<br>Management | Annualized<br>Future<br>With<br>Management | Change<br>(FWP-FWOP) |
| Fresh/Intermediate Marsh | 125,149         | 39,159  | 170,975                                    | +131,816             |
| Brackish Marsh           | 37,167          | 59,533  | 1,859                                      | -57,674              |
| Open Water               | 33,750          | 55,556  | 63,234                                     | +7,678               |
| Upland                   | 818             | 1,238   | 2,307                                      | +1,069               |
| TOTAL                    | 196,884         | 155,486                                       | 238,375                                    | +82,889              |

units (HU). The mitigation plan would have a total net annualized gain of +82,889 HU's. Based on this analysis, the mitigation plan would compensate for habitat losses incurred by the hurricane protection project. The reduction of salinities into the forested wetlands and marshes north of the management area was not evaluated because this land is in private ownership and its preservation is not assured; however, some benefits would accrue to this area as well. For a detailed explanation of the HEP methodology used to determine mitigation needs, refer to the Fish and Wildlife Coordination Act Report (Appendix A).

#### Recreational/Commercial Analysis

The values presented in Table 8 represent the potential net monetary losses or gains based on the productivity of habitats in the impacted area and proposed mitigation site. When used for determining mitigation needs, the dollar value is a relative figure that allows the various habitat types impact to be converted to a dollar value then back to replacement acreage of the same or different habitat types. Because construction of the hurricane protection levee and associated features would result in the potential net annual loss of about \$43,442 of commercial and recreational attributes (Table 4), and implementation of the mitigation plan a gain of \$48,608 (Table 8), an overall annual gain of \$5,166 per annualized area in 1985 dollars could be expected. Because the recreational/commercial analysis does not consider noncommercial species, it is Corps policy that habitat based analysis, such as the HEP procedure, should be selected to evaluate mitigation needs. Data for these tables was calculated from the information presented in Appendix B, and is in 1985 dollars.

TABLE 8. A summary of the potential fish and wildlife losses and gains for the annualized acreage of the proposed mitigation area for the with and without mitigation conditions, in 1985 dollars. Data from Tables B-4, B-10, B-11 of Appendix B.

| ACTIVITY              | VALUE <sup>1/</sup> |               | CHANGE         |
|-----------------------|---------------------|---------------|----------------|
|                       | Without Project     | With Project  |                |
| Recreation            |                     |               |                |
| Hunting               | \$20,795            | \$37,550      | + \$16,755     |
| Fishing <sup>2/</sup> | -                   | -             | -              |
| Commercial            |                     |               |                |
| Fishing <sup>3/</sup> | 92,069              | 118,481       | + 26,412       |
| Trapping              | <u>6,242</u>        | <u>11,683</u> | + <u>5,441</u> |
| TOTAL                 | \$119,106           | \$167,714     | +\$ 48,608     |

<sup>1/</sup> These values are potential dollar productivity of the impacted habitats using 1985 dollars.

<sup>2/</sup> Recreational fishing has not been examined because of the difficulty in comparing fishing populations and recreational expenditure.

<sup>3/</sup> Includes shrimp, oysters, and crabs.

## INCREMENTAL ANALYSIS

An incremental analysis of the water-control structures and levees is not practicable because they are functionally inseparable. The levee prevents intrusion of saline waters into the mitigation area over the banks of the waterways while the water-control structures reduce the influx of saline waters via the waterways that enter the interior. At the same time, they stabilize interior water levels.

An incremental analysis was conducted on two sections and four units within the management area (Figure 6), and the methods used are described in Appendix D - Incremental Analysis. A graph showing losses mitigated for each section and unit, and the percent of first costs, and first costs including operation and maintenance is shown in Figure 7. The recommended mitigation plan was most cost effective. The placement of two shell ramps at a cost of approximately \$40,000 has not been analyzed because insufficient research has been conducted to evaluate the enhanced benefits of their use. The ramps are basically experimental and will be monitored by the Louisiana Department of Wildlife and Fisheries (LDWF) and/or other agency to determine their effectiveness. The HEP analysis indicates a small deficiency of 42 habitat units (82,931 habitat units lost - 82,889 habitat units gained). Any type of management procedure utilized to gain these units would not be cost effective, and this increment of mitigation would be lost. Mitigation costs are about \$34 per habitat unit for the first costs, and about \$50 per habitat unit based on first costs plus capitalized operation and maintenance, and replacements.

## ECONOMIC EFFECTS

The estimated first cost of the Larose to Golden Meadow Hurricane Protection Project, exclusive of mitigation, is \$89.6 million with the local assuring agency responsible for \$26.9 million (October 1986 price level). The sum of the mitigation first costs and capitalized value of replacements, and operation and maintenance, is about \$4.2 million.



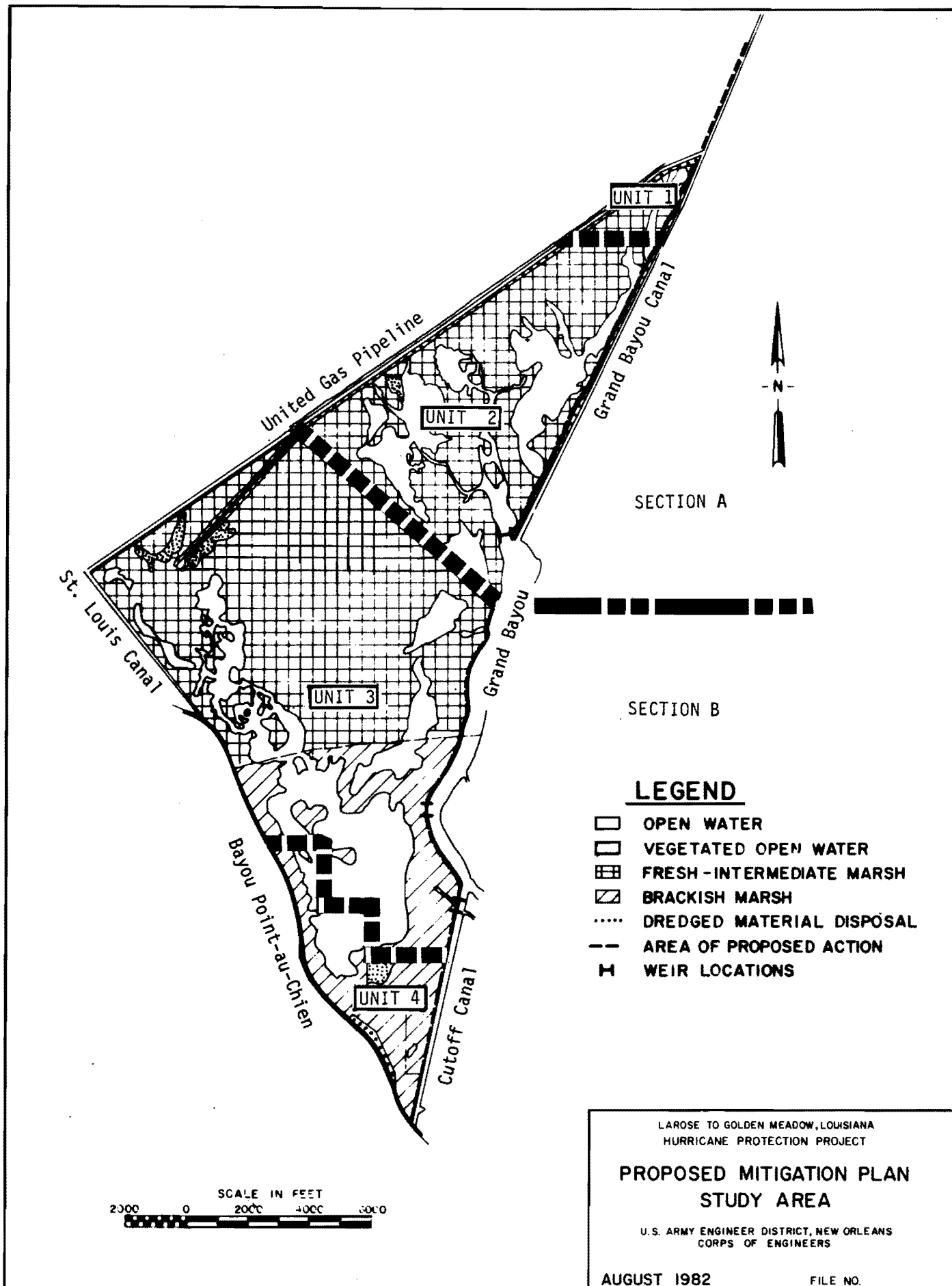
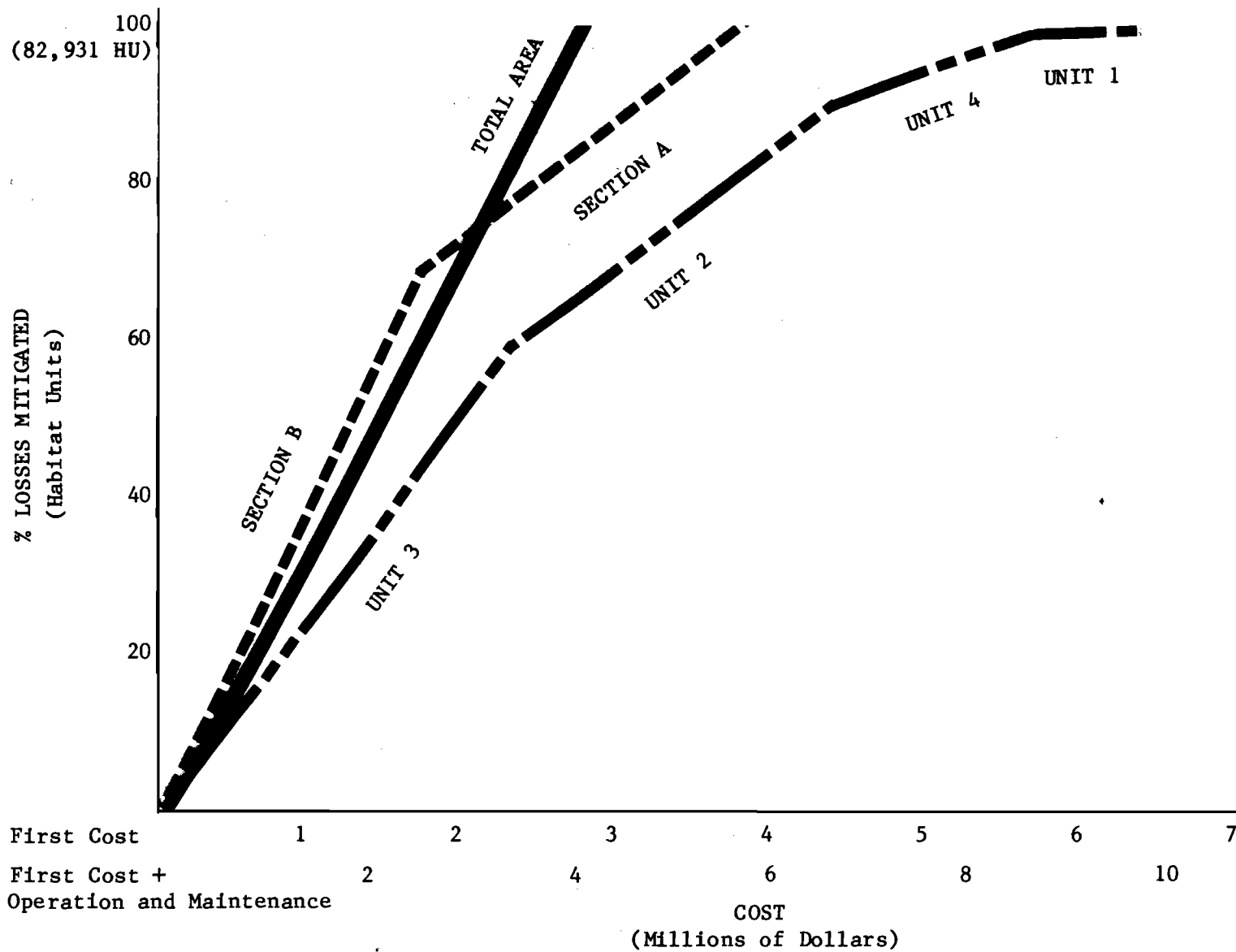


Figure 7. An incremental analysis of the Larose to Golden Meadow Mitigation plan.



38

Figure 7

The estimated first cost for this mitigation project is \$2.9 million, which includes engineering and design cost, supervision and administration of contracts, construction of the initial, second, and third levee lifts, and the construction and material cost of the water-control structures (weirs). The mitigation first cost has increased from the \$2.3 million presented in the draft mitigation report to the \$2.9 million cost estimate shown in Table 9. This increase is primarily due to increased construction costs since the original 1982 estimates were made. The total cost of replacements over the project life is estimated to be about \$102,000 with a capitalized (present worth) value of approximately \$29,600. No operational costs are required because the plan utilizes levees and fixed weirs. The annual maintenance costs have been estimated by the LDWF to be about \$45,000 per year, and over the 100-year project life, maintenance cost would equate to \$4.5 million with a capitalized value of approximately \$1.3 million. LDWF has verbally agreed to donate or obtain all lands, easements, and rights-of-way for construction of the levee and water-control structures.

The benefit/cost (B/C) ratio for the Larose to Golden Meadow Hurricane Protection Project at the authorized Federal discount rate of 3-1/4 percent is 10.1 to 1 excluding mitigation costs, and 9.0 to 1 with mitigation. The B/C ratio at the current Federal discount rate of 8-7/8 percent is 4.2 to 1 without mitigation, and 3.7 to 1 with mitigation. A summary of the B/C ratio is presented in Table 10.

### **Economic Analysis**

Fish and Wildlife losses and gains as shown in Table 10 attributable to the mitigation feature consist of two benefit categories: recreation and commercial fishing and trapping. All benefits and costs are based on October 1986 price levels and were evaluated over a 100 year project life. In addition, the present worth of project costs and benefits was computed to the base year (1991) at both the authorized Federal interest rate of 3-1/4% and the current interest rate of 8-7/8%.

TABLE 9. The 1986 cost estimates for the Larose to Golden Meadow Mitigation Plan.

| Work Item                                   | Estimated Cost (\$) |
|---|---------------------|
| <b>FIRST COST <u>a/</u></b>                 |                     |
| First Levee Lift                            | 1,436,750           |
| Second Levee Lift                           | 674,250             |
| Third Levee Lift                            | 363,500             |
| Water-Control Structure                     |                     |
| Timber Weirs                                | 21,375              |
| Shell Ramp                                  | 46,750              |
| Engineering & Design (E&D)                  | 162,728             |
| Supply & Administration (S&A)               | <u>203,410</u>      |
| <b>TOTAL FIRST COST</b>                     | <b>2,908,763</b>    |
| <b>REPLACEMENT COSTS</b>                    |                     |
| Total                                       | 102,000 <u>b/</u>   |
| Capitalized value (present worth) <u>c/</u> | <u>29,620</u>       |
| <b>MAINTENANCE</b>                          |                     |
| Annual                                      | 45,000/year         |
| Total over Project Life                     | 4,500,000           |
| Capitalized Value (present worth)           | <u>1,328,080</u>    |

a/ Costs include a 25% contingencies, except E&D and S&A.

b/ This total represents three replacements of \$34,000 (two 55-foot weirs at \$9,000 each and one 105-foot weir at \$16,000) in each of the years 2010, 2035, and 2060.

c/ At the authorized 3-1/4 percent interest rate.

TABLE 10. Remaining average annual cost to remaining average annual benefit ratio for the Larose to Golden Meadow, Louisiana, Hurricane Protection Project (1986 prices; 3-1/4, 8-7/8 percent interest (100-year project life)

|                                   | Existing Authorized Project    |                                | Existing Authorized Project<br>with Mitigation |                                |
|-----------------------------------|--------------------------------|--------------------------------|--|--------------------------------|
|                                   | 3-1/4% Interest<br>(x \$1,000) | 8-7/8% Interest<br>(x \$1,000) | 3-1/4% Interest<br>(x \$1,000)                 | 8-7/8% Interest<br>(x \$1,000) |
| <b>FIRST COSTS</b>                |                                |                                |  |                                |
| HURRICANE PROTECTION FEATURE      |                                |                                |  |                                |
| Construction Cost                 | 89,600                         | 89,600                         | 89,600   | 89,600                         |
| Remaining Construction Cost       | 25,000                         | 25,000                         | 25,000   | 25,000                         |
| Remaining Present Worth           | 23,775                         | 22,499                         | 23,775   | 22,499                         |
| MITIGATION FEATURE                |                                |                                |  |                                |
| Construction Cost                 | -                              | -                              | 2,909  | 2,909                          |
| Present Worth                     | -                              | -                              | 3,058  | 3,338                          |
| <b>AVERAGE ANNUAL COSTS</b>       |                                |                                |  |                                |
| HURRICANE PROTECTION FEATURE      |                                |                                |  |                                |
| Interest/Amortization             | 805                            | 1,997                          | 805  | 1,997                          |
| Operation/Maintenance             | 143                            | 143                            | 143  | 143                            |
| Replacements                      | 60                             | 29                             | 60   | 29                             |
| Fish and Wildlife Losses          | 41                             | 41                             | 41   | 41                             |
| MITIGATION FEATURE                |                                |                                |  |                                |
| Interest/Amortization             | -                              | -                              | 103  | 296                            |
| Operation/Maintenance             | -                              | -                              | 45   | 45                             |
| Replacements                      | -                              | -                              | 1  | 1                              |
| Fish and Wildlife Losses          | -                              | -                              | 3  | 5                              |
| REMAINING AVERAGE ANNUAL CHARGES  | 1,049                          | 2,210                          | 1,201  | 2,557                          |
| <b>AVERAGE ANNUAL BENEFITS</b>    |                                |                                |  |                                |
| HURRICANE PROTECTION FEATURE      |                                |                                |  |                                |
| Flood Control                     | 10,327                         | 8,820                          | 10,327   | 8,820                          |
| Area Redevelopment                | 217                            | 562                            | 217  | 562                            |
| MITIGATION FEATURE                |                                |                                |  |                                |
| Fish and Wildlife Gains           | -                              | -                              | 208  | 101                            |
| Area Redevelopment                | -                              | -                              | 26   | 74                             |
| REMAINING AVERAGE ANNUAL BENEFITS | 10,544                         | 9,382                          | 10,778   | 9,557                          |
| <b>BENEFIT / COST RATIO</b>       |                                |                                |  |                                |
| REMAINING<br>BENEFIT/COST RATIO   | 10.1                           | 4.2                            | 9.0  | 3.7                            |

Recreation benefits are based on 1986 Water Resources Council unit day values (UDV) for big game hunting (\$16.00), small game hunting (\$4.45) and waterfowl hunting (\$16.00). Projected acreages of various habitat types, along with the biological carrying capacities associated with each type, were used to generate estimates of man-days of supply for each hunting activity. The monetary values of man-days of supply were compared by multiplying the projected with-mitigation and without-mitigation supply of user days by unit day values for each activity.

Average yearly harvest (1963-1978) of commercial fish species, adjusted for unreported catch, multiplied by unit exvessel values in 1986 dollars were used to estimate gross dockside values. The values for all species, except oysters represents a running average of 1974-1978 exvessel prices brought to 1986 price levels using the CPI Food Index. For oysters, due to atypical data for the year 1975, the average price was calculated for the period 1976-1980. The fisherman's harvest costs, by species, were deducted from gross values to arrive at net values per species. This amount was divided by the number of acres within the area to arrive at the net dollar per acre amount. This amount was then multiplied by the projected acreage by decade for the with mitigation and without mitigation feature to arrive at without mitigation losses and with mitigation gains.

Impacts to trapping were addressed by measuring changes in output per acre by marsh type for alligators and furbearers for the with and without mitigation feature. Average catch in pelts per acre by marsh type and a per pelt normalized value from 1976-1981 expressed in 1986 dollars using the CPI Index for Hides, Skins, Leather, and Related Products were used to estimate gross returns. Cost of harvest was estimated at 25% of gross returns. Mitigation gains and without mitigation losses were determined by measuring differences in projected harvest values by decade for each condition.

## PLAN IMPLEMENTATION

### PROJECT AUTHORIZATION

Public Law 298 - 89th Congress, 1st Session approved 27 October 1965 authorized the project "Grand Isle, Louisiana, and Vicinity" to provide protection in accordance with the recommendations of the chief of Engineers in his report entitled, "Grand Isle and Vicinity, Louisiana," and contained in House Document No. 184, Eighty-ninth Congress, 1st Session.

### LOCAL COOPERATION

#### Original Local Cooperation Requirements

Local interests are required to furnish all lands, easements, rights-of-way; accomplish all necessary alterations and relocations; bear 30 percent of the total cost, inclusive of lands, damages, and relocations, and a cash contribution or equivalent work; hold and save the United States free from damages due to the construction works; maintain and operate all works after completion; prevent an encroachment on ponding areas unless equivalent storage or pumping capacity is provided, and comply with the provisions of Section 221 of Public Law 91-611 and Sections 210 and 305 of Public Law 91-646.

The conditions of Local cooperation specified in the authorizing document to the report of the Board of Engineers for Rivers and Harbors, and concurred in by the Chief of Engineers, are as follows:

" . . . that prior to construction local interests give assurances satisfactory to the Secretary of the Army that they will:

"a. Provide without cost to the United States all lands, easements, and rights-of-way, including borrow areas and spoil disposal

areas, and accomplish alterations to roads, pipelines, cables, wharves, oil wells, and any other facilities necessary for construction of the project, all at an estimated cost of \$1,534,000;

"b. Bear 30 percent of the total project cost, a sum presently estimated at \$2,357,000 to consist of the items listed in subparagraph a above and a cash contribution presently estimated at \$823,000, or equivalent work specifically undertaken as an integral part of the project after authorization and in accordance with construction schedules as required by the Chief of Engineers;

"c. Hold land save the United States free from damages due to the construction works;

"d. Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army; and

"e. Prevent any encroachment on ponding areas unless substitute storage capacity or equivalent pumping capacity is provided promptly without cost to the United States."

#### Local Cooperation Status and Modifications

The required Act of Assurance and authorization resolution, both executed by the Lafourche Parish Police Jury on 8 February 1967, were accepted for and on behalf of the United States on 15 March 1967. On 14 June 1967, the Police Jury amended its original Act of Assurance to correct the estimated cost of non-Federal lands and relocations. Since that time, the South Lafourche Levee District (formerly the South Louisiana Tidal Water Control Levee District) was created and supersedes the Lafourche Parish Police Jury



as the local cooperation agency. The levee district furnished an Act of Assurance covering all requirements of local cooperation on December 11, 1972, and was accepted on behalf of the United States on August 29, 1973.

By resolution dated October 11, 1982, the Board of Commissioners of the South Lafourche Levee District tentatively approved mitigation on a 70/30 cost-sharing basis, contingent on outside funding and maintenance. By resolution dated July 11, 1983, the levee district approved the proposed mitigation plan on a 70/30 cost-sharing basis (Appendix C). Assurances for the mitigation work have not been requested, but would be obtained prior to construction.

#### Principal Officers

The principal officer of the South Lafourche Levee District is:

Windell A. Curole  
Executive Secretary  
South Lafourche Levee District  
Post Office Box 426  
Galliano, LA 70354

#### REPLACEMENTS, OPERATION, and MAINTENANCE

Operation and Maintenance of the mitigation area would be conducted by the South Lafourche Levee District, the Louisiana Department of Wildlife and Fisheries, or other state agencies. Although maintenance responsibilities and procedures have not been developed at this time, specifics would be incorporated into the formal assurances coordinated prior to construction. Because the plan uses a levee and fixed crest weir, no operational functions are necessary. Normal maintenance would be minimal and would involve levee and weir repairs. The replacement and maintenance costs of the weirs and levees would be shared between the U.S Army Corps of Engineers and the assuring agency; however, the assuring agency would be

responsible for the work. In the event of a major storm or other condition resulting in significant damage to the system, repairs would be coordinated between the aforementioned agencies and the Corps.

#### LOCAL INTERESTS' VIEWS

The South Lafourche Levee District represents the local interests, and is in agreement with the hurricane protection plan and mitigation. The levee district is concerned about the non-Federal responsibility for maintenance and cost sharing. Maintenance agreements and procedures for mitigation have not been formulated or coordinated at this time, but would be a non-Federal responsibility. The levee district would prefer that maintenance of the mitigation levee not be their responsibility. The local interests' portion of the mitigation costs was to come from the State of Louisiana; however, Louisiana's recent financial difficulties could affect the funding availability.

#### REQUIRED NON-FEDERAL COST

Project authorization requires the non-Federal interest to provide 30 percent of the costs. The first cost of the project, exclusive of mitigation, is \$89.6 million of which the local assuring agency cost is estimated to be about \$26.9 million, which includes \$3.8 million for land and damages, \$9.7 million for relocations, and 13.3 million for a cash contribution and/or equivalent work. The inclusion of mitigation would increase the first cost, non-Federal contribution, by about \$873,000. However, the cash contribution required would be reduced by equivalent work and/or the cost of future operation and maintenance, and replacements (OM&R) as prescribed by Corps' Engineering Regulation 1105-2-50, 2-9(a)(1).

Both maintenance and replacement costs would be shared at the project's authorized 70/30 ratio and are a non-Federal responsibility. Because maintenance and replacement is the responsibility of the non-Federal entity, the capitalized value (present worth) of each is applicable toward assuring agencies 30 percent. The replacement of three wood weirs in or about the years 2010, 2035, and 2060 would result in a total cost of about \$102,000 in 1986 dollars and have a present worth of \$429,620 at the project's authorized 3-1/4 percent interest rate. The Louisiana Department of Wildlife and Fisheries estimated annual maintenance cost of \$45,000 would result in a total cost of about \$4,500,000 in 1986 dollars and have a present worth of about \$1,328,080.

#### RIGHTS OF WAY

With the exception of about 4,000 feet of rights-of-way, the proposed levee alignment is on land owned by the Louisiana Department of Wildlife and Fisheries. The 4,000 feet of privately owned land within the rights-of-way are owned by Louisiana Land and Exploration Company and Tenneco Oil Company (Tenneco Laterre Operations). Easements across this property would be obtained at no cost to the Federal government by the Louisiana Department of Wildlife and Fisheries.

#### ASSURANCES

Although regulations supporting mitigation have been received by the South Lafourche Levee District, and the preparation of this report coordinated with the Louisiana Department of Wildlife and Fisheries, assurances have not been obtained at this time. After project authorization and prior to construction, formal assurances would be obtained from both the afore mentioned public agencies addressing maintenance obligations, rights-of-way donations, cost apportionment, replacement procedures, and other appropriate provisions required for a 221 agreement of Public Law 91-611.

## COORDINATION AND PUBLIC VIEWS

On September 2, 1982, Corps personnel met with the South Lafourche Levee District, FWS, and LDWF to present an outline of the proposed mitigation plan. After the presentation, responses from the attending local, state, and Federal agencies were favorable, with the South Lafourche Levee District agreeing to present the proposed mitigation plan to the Board of Commissioners at its next monthly meeting. The National Marine Fisheries Service was advised of the meeting but elected not to attend. On October 11, 1982, the South Lafourche Levee District met and adopted a resolution (Appendix C) approving the proposed mitigation; however, this resolution did not contain specific language agreeing to a 70/30 cost-sharing arrangement. On July 11, 1983, a cost sharing resolution for mitigation was adopted on a 70/30 cost-sharing basis (Appendix C).

A draft of the mitigation report was included with the Draft Supplemental Environmental Impact Statement (DSEIS) for the Larose to Golden Meadow, Louisiana, Hurricane Protection project. This document was circulated with various Federal, state, and other interested agencies, organizations, and individuals. Notice of the DSEIS appeared in the Federal Register July 20, 1984. During coordination of the DSEIS and accompanying mitigation report, comments were received concerning the proposed mitigation plan. As a result, the revised mitigation plan presented in this document incorporates additional weir replacements, evaluates the effect of the state's initial construction of two 55-foot weirs, and includes two ramps to facilitate the movement of estuarine organisms.

The National Marine Fisheries Service supports mitigation but has expressed concern (see FWCAR; Appendix A) that the proposed plan does not adequately offset lost fishery production. The Corps acknowledges that implementation of the plan would initially result in an estuarine fisheries decrease; however, retarding saltwater intrusion and reducing marsh loss would ultimately enhance fisheries. Two shell/concrete ramps have been


incorporated into the weir design to assist the movement of estuarine organisms across the weir. Although this design is unproven, the Louisiana Department of Wildlife and Fisheries indicated that the ramps would be monitored to evaluate their effectiveness.

Because the proposed mitigation plan would compensate for both direct construction impacts and induced impacts to wetlands within the hurricane protection system, the Corps would consider the mitigation provided by this plan in the overall evaluation in regard to mitigation needs related to future individual Section 404 permit actions.

#### RECOMMENDATION

I have assessed the environmental impacts and potential benefits of adding fish and wildlife mitigation measures to the authorized Larose to Golden Meadow Hurricane Protection Project, Louisiana, in accordance with the selected plan described herein, and have determined that this addition would adequately compensate for significant habitat losses associated with project construction and subsequent operation and maintenance. I recommend that the selected mitigation plan described herein be approved for construction as a modification to the authorized Federal project.

18 September 1986  
Date

  
\_\_\_\_\_  
LLOYD R. BROWN  
Colonel, CE  
Commanding

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FINDING OF NO SIGNIFICANT IMPACT

and

ENVIRONMENTAL ASSESSMENT

LAROSE TO GOLDEN MEADOW, LOUISIANA

HURRICANE PROTECTION PROJECT

MITIGATION



Planning Division  
Environmental Analysis Branch

**FINDING OF NO SIGNIFICANT IMPACT  
(FONSI)**

**LAROSE TO GOLDEN MEADOW, LOUISIANA  
HURRICANE PROTECTION PROJECT**

**MITIGATION**


Description of Action. The U.S. Army Corps of Engineers (Corps), proposes to mitigate for impacts resulting from the construction of the Larose to Golden Meadow Hurricane Protection project by the passive management of about 4,600 acres on the State of Louisiana Pointe-au-Chien Wildlife Management Area. The proposed mitigation plan would improve habitat quality by retarding the movement of salt water into a tract of land north of Grand Bayou. The retention of fresh water would enhance the growth of higher quality emergent and submergent vegetation in the open-water areas. Fish and wildlife would, in turn, be attracted by the stable water levels, abundant food supply, and adequate nesting and nursery areas. About 75 acres of marsh and 10 acres of open water would be directly impacted by levee construction.

Factors Considered in Determination. Based on an Environmental Assessment (EA), the Corps determined there would be no adverse impacts by the proposed action.

Public Involvement. A draft of the mitigation report with a similar recommended alternative was included with the Draft Environmental Impact Statement for the Larose to Golden Meadow, Louisiana, Hurricane Protection project. This document was circulated with various interested parties in July of 1984. The final mitigation report, EA, and FONSI were mailed to interested parties on . These documents are on file at the New Orleans District, U.S. Army Corps of Engineers, and are available to the public upon request. Any inquiries should be directed to Mr. E. Scott Clark, telephone (504) 862-2521.

Conclusion. This office has assessed the environmental impacts of implementing a mitigation plan on the Pointe-au-Chien Wildlife Management area and has determined that the proposed plan would have no significant impact upon the human environment. No net environmental impacts would occur when the combined effects of hurricane protection project and mitigation plan are evaluated. Therefore, no environmental impact statement will be prepared.

18 September 1986  
Date

  
\_\_\_\_\_  
Lloyd K. Brown  
Colonel, Corps of Engineers  
District Engineer

## **INTRODUCTION**

This Environmental Assessment (EA) was prepared to evaluate the environmental impacts associated with a mitigation plan for the Larose to Golden Meadow, Louisiana, Hurricane Protection Project. A draft mitigation report and draft Supplemental Environmental Impact Statement (EIS) were issued in June of 1984 to examine both project and mitigation impacts. As mitigation for oil exploration-related impacts on the Pointe-au-Chien Wildlife Management Area (WMA), a portion of the mitigation package was constructed prior to implementation of the plan. As a result, reevaluation of the mitigation features was necessary and the revised mitigation report was separated from the final EIS.

## **NEED FOR ACTION**

### **PURPOSE**

The purpose of the mitigation plan is to mitigate for environmental losses caused by the Larose to Golden Meadow, Louisiana, Hurricane Protection Project.

### **PUBLIC CONCERNS**

The public is concerned about project-induced environmental impacts resulting from civil works projects and compensation for these impacts. This need to mitigate impacts has been expressed through legislation, such as the National Environmental Policy Act and Fish and Wildlife Coordination Act, interaction with Federal and state agencies, and the formation of public or special interest groups.

### **AUTHORITY**

The mitigation report and this EA were prepared to fulfill the U.S. Army Corps of Engineers' obligations as mandated by Corps policy, the Fish and

Wildlife Coordination Act of 1958 (Public Law 85-624), and the National Environmental Policy Act of 1969 (Public Law 91-190) by proposing means to mitigate for project-associated wetland losses. Public Law 298-89th Congress, 1st Session, approved October 27, 1965, authorized the project "Grand Isle, Louisiana and Vicinity" to provide hurricane protection in accordance with the recommendation of the Chief of Engineers in his report entitled "Grand Isle and Vicinity, La.," and contained in House Document No. 184, 89th Congress, 1st Session.

### **ALTERNATIVES CONSIDERED**

#### **ALTERNATIVES ELIMINATED**

Various alternative plans were initially evaluated to mitigate for project-associated fish and wildlife losses. These plans include:

- o Passive management of the Bully Camp Unit of the Pointe-au-Chien Wildlife Management Area (WMA).

- o Active management of the Bully Camp Unit of the Pointe-au-Chien WMA.

- o Passive management of an area within the Terrebonne Parish section of the Pointe-au-Chien WMA.

- o Introduction of fresh water into the Pointe-au-Chien WMA from the Gulf Intracoastal Waterway.

- o Purchase of a 1,500-acre in-holding within the Pointe-au-Chien WMA.

- o Obtain a long-term lease on the Lafourche Parish School Board section north of the WMA.

The use of the Bully Camp Unit for either passive or active management was found infeasible because of the unstable foundation materials for levees

and weirs, presence of active oil wells, and lack of a freshwater source. The Terrebonne Parish Unit was not within the political boundary of the local project sponsor, Lafourche Parish. The introduction of fresh water was not cost effective. The purchase of a 1,500-acre in-holding within the Pointe-au-Chien WMA and a long-term lease on the Lafourche Parish School Board section of land north of the refuge were evaluated. Problems associated with fee purchase or easements include land availability, condemnation procedures, authorization, and funding. Corps of Engineers' policy requires Congressional approval and funding for the acquisition for fish and wildlife mitigation lands - a lengthy process. In addition to the aforementioned problems, the acquisition of land by fee or easement would not increase the wildlife productivity of the areas without additional management.

#### FINAL ALTERNATIVES CONSIDERED

Two alternatives, no-action and the passive management of a tract of land north of Grand Bayou on the Pointe-au-Chien WMA, were selected as the final plans for detailed evaluation. The management plan, which is supported by the local interests and the state, would allow mitigation on publicly owned lands. This plan does not involve easements or purchase of lands and it can be approved by the Division Engineer. The plan was fully coordinated with the Louisiana Department of Wildlife and Fisheries, the U.S. Fish and Wildlife Service, and other state and Federal agencies. The no-action alternative would result in no replacement of project-induced losses.

#### PLAN DESCRIPTION

The selected mitigation alternative involves the construction of an earthen-filled levee and water-control structures (low-level weirs) on the WMA to retard the movement of saline water into the marshes north of Grand Bayou. The proposed levee would be constructed along Cutoff Canal, Grand Bayou, and Grand Bayou Canal. To stabilize water levels within the mitigation area, low-level weirs have been placed along two narrow drainage

inlets; the third would be built across the natural headwater opening to Grand Bayou. The levee would be constructed by a floating plant, casting uncompacted fill from an adjacent parallel borrow area located in the canals, and built to a gross grade of +6.0 NGVD in order to obtain a project grade of +4.0 NGVD. After several years of settlement, second and third lifts may be required. The earthen levee would consist of a 4-foot-wide crown with a 1:4 side slope and stabilized by small lateral berms on each side. Constant-level weirs with crests set 0.6 to 0.8 feet below marsh level would prevent the incoming flux of salt water from entering the area, yet allow some tidal flushing. The two existing 55-foot weirs would be maintained on Cutoff Canal, and a 105-foot weir would be constructed at the Grand Bayou inlet at Grand Bayou Canal.

#### ENVIRONMENTAL SETTING

The project area lies entirely within Lafourche Parish, Louisiana, and is situated in the Lafourche Delta, an ancient lobate delta of the Mississippi River. The area soils are typically river-deposited clays and silts with sands near the bayous. The surrounding marshes are of soft, highly organic deposits ranging from organic/clay to peat, and the organic content of fresh marshes is higher than that of the more saline marshes. The elevations in the area vary between 0.0 and 1.0 foot NGVD in the marshes to 3.0 and 8.0 feet NGVD at the crests of the natural levee ridges. The climate of the area is greatly influenced by the proximity of the Gulf of Mexico, and southeasterly winds from the gulf moderate the climate resulting in a humid, sub-tropical character. Air temperature varies with monthly averages of 57°F in January and February and 83°F in August. The tides are normally diurnal and range less than 1 foot, although hurricane tides have been recorded up to 5.5 feet NGVD at Larose, Louisiana. The habitat types presently in the study area include bottomland hardwood forest, fresh/intermediate marsh, brackish marsh, open water, and upland. The important animal species that inhabit the wetland habitats include freshwater fish, such as largemouth bass and catfish; estuarine fish, such as menhaden and croakers; birds, such as waterfowl and wading birds; and



mammals, such as deer, nutria, and muskrat. In the upland, rabbits, armadillos, rats, hawks, and owls can be found. The area provides quality recreational hunting and fishing, especially the Pointe-au-Chien WMA.

### **SIGNIFICANT RESOURCES AND IMPACTS**

The significant resources described in this section are those resources recognized as significant by laws, executive orders, regulations, or other standards of national, state, or regional agencies and organizations. The criteria used to evaluate significance are shown in Table 1, and a discussion of the resources presented in the sections below.

#### **MARSHES**

Louisiana has been losing marshlands at a dramatic rate. Estimates of losses greater than 40 square miles per year have been calculated with most of this loss occurring in the Mississippi Deltaic Plain (Wicker, 1980). Within the Barataria Basin, the losses are estimated to exceed 1 percent per year. These losses have been primarily attributed to channelization, leveeing of the Mississippi River, canal dredging, and saltwater intrusion. Marshes in the mitigation area are deteriorating at a rate in excess of 3 percent per year because of these factors, as well as the extensive oil and sulphur exploration in and near the management area. Marshes within the proposed mitigation area, ranging from fresh to brackish, and support a variety of plant and animal species. Both marsh types provide detritus, a vital part of the aquatic foodbase, and also commercial and recreational benefits. Within the proposed mitigation area, there are about 1,186 acres of fresh to intermediate marsh and 953 acres of brackish marsh. The fresh/intermediate marsh is characterized by vegetation such as bulltongue, Cyperus, wiregrass, saltgrass, and saltmarsh mallow. Animals found here include nutria, wading birds, ducks and geese, alligators, and numerous other reptiles and amphibians. The brackish marsh is dominated by wiregrass and saltgrass; animals seen here include the muskrat, waterfowl, wading birds, and a few reptiles and amphibians.

TABLE 1a. Environmental Quality attributes within the proposed Larose to Golden Meadow mitigation area.

| RESOURCE                              | ECOLOGICAL<br>ATTRIBUTES   | CULTURAL<br>ATTRIBUTES  | ESTHETIC<br>ATTRIBUTES  |
|---------------------------------------|--|---|---|
| MARSH                                 | Habitat for fish and wildlife, especially waterfowl, wading birds and furbearers. Prime nursery area for estuarine dependent fish and shellfish. | Supports the traditional extractive economy of the areas.                       | Typical Louisiana scenery includes ducks in a marsh and wading birds. |
| OPEN WATER                            | Major nursery area for estuarine dependent fish and shellfish.   | Supports the traditional extractive economy of the areas.                       | ---   |
| FISHERIES                             | Numerous species of fish utilize the project area.   | ---   | ---   |
| WILDLIFE                              | Numerous species of wildlife utilize project area.   | ---   | ---   |
| ENDANGERED SPECIES                    | No species breeding in study area. Some species are transients.  | ---   | ---   |
| BIRDS ON AUDUBON<br>SOCIETY BLUE LIST | Showing decline in numbers or decrease in range.   | ---   | ---   |
| CULTURAL RESOURCES                    | ---  | Indicators of previous residents.   | ---   |
| RECREATION                            | Potential for observing and interacting with nature, also conducive to recreational hunting and fishing.   | Extractive culture of coastal Louisiana includes extensive hunting and fishing. | ---   |

TABLE 1b. Environmental Quality recognition within the proposed Larose to Golden Meadow mitigation area.

| RESOURCE                           | INSTITUTIONAL<br>RECOGNITION   | TECHNICAL<br>RECOGNITION  | PUBLIC<br>RECOGNITION   |
|------------------------------------|--|---|---|
| MARSH                              | Coastal Zone Mgmt. Act of 1972, La. State and Local Coastal Resources Mgmt. Act of 1978, EO 11990, EO 11998, Estuary Protection Act. | Habitat for 14 Species of Special Emphasis (USFWS). Approximately 40 square miles being lost per year in coastal Louisiana. | Environmental groups and general public desire preservation of marsh.                 |
| OPEN WATER                         | Clean Water Act of 1977, La. Water Control Law, Estuary Protection Act.  | Major nursery area. Habitat for 5 species of Special Emphasis.  | Environmental groups and general public desire clean waters for multiple uses.        |
| FISHERIES                          | Fish and Wildlife Coordination Act.  | 1 Species of Special Emphasis in project area.  | Extensive recreational fishing occurs in project area.                                |
| WILDLIFE                           | Fish and Wildlife Coordination Act.  | 19 Species of Special Emphasis in project area.   | Some recreational hunting occurs in project area.                                     |
| ENDANGERED SPECIES                 | Endangered Species Act. Bald Eagle Act.  | ---   | ---   |
| BIRDS ON AUDUBON SOCIETY BLUE LIST | Audubon Society  | 14 Species on Blue List in study area.  | ---   |
| CULTURAL RESOURCES                 | National Historic Preservation Act E.O. 11593  | ---   | Use and development of historical and cultural sites is indicative of public support. |
| RECREATION                         | Land and Water Conservation Fund Act of 1965.  | Mitigation area is currently being used for recreation.   | Public desires expansion of recreational base.  |

With no action, the marshes would continue to deteriorate, primarily due to subsidence and saltwater intrusion. The current loss rate of over 3 percent per year is expected to continue. An annualized 684 acres of fresh/intermediate marsh, and 1,526 acres of brackish marsh would be present in the mitigation area over the project life.

With the mitigation plan, saltwater intrusion and land loss would be retarded. An annualized 2,797 acres of fresh to intermediate marsh and 47 acres of brackish marsh would be present in the area for a net annual change of +2,113 acres and -1,479 acres, respectively. Construction of the structural features of this project would convert about 46 acres of fresh to intermediate marsh and 27 acres of brackish marsh to a shrub-scrub type habitat.

#### OPEN WATER

The proposed mitigation area is interspersed with open-water areas, bayous, and canals. These areas range from fresh to brackish waters, and support a variety of recreationally and commercially important fish and wildlife species. Vegetation typical of freshwater areas is coontail, duckweed, water hyacinth and alligator-weed; widgeon grass is typical of the brackish waters. Planktonic organisms include minute crustaceans, such as cladocerans, copepods, and ostracods. In the bottom muds, chironomid larvae and tubifield worms reside in the fresh areas, and clams, mysids, isopods, amphipods, and decapods in the brackish areas. Currently, 1,350 acres of open water are within the mitigation area. The dissolved oxygen ranges from 7 to 10 mg/L; pH from 6.2 to 7.5; conductivity from 250 to 20,800 micromhs/cm; and salinity from 0.1 to 16.3 ppt. Concentrations of nickel and cadmium in the water may exceed EPA saltwater criterion for acute toxicity.

With no action, the area of open water within the mitigation area would continue to increase and also become more saline. Nutrient levels would be expected to increase as more lands are put into agricultural uses. An

average annual 2,221 acres of open water would be present over the project life.

With the mitigation plan, the expansion of open water would be retarded because of the stabilization of water levels and salinities. An annual average of 1,446 acres of open water would be found. This represents a reduction of 775 acres. Flow patterns could be altered by the placement of the levee and control structures. About nine acres of open water would be converted to upland. The growth of floating and rooted aquatic plants would be promoted. During levee construction, turbidity levels would temporarily increase and dissolved oxygen levels would decrease in the shallow waters adjacent to the discharge site. Concentrations of nitrogen, cadmium, copper, lead, and nickel would temporarily increase above ambient water levels.

#### FISHERIES

Both freshwater and estuarine fish are found in the mitigation area. Freshwater fish include large-mouth bass, threadfin and gizzard shad, channel catfish, longnose gar, sunfish, mosquito fish, and killifish. Saltwater fish include spotted and sand seatrout, sea catfish, striped mullet, tidewater silversides, sheepshead minnow, sailfin molly, bay anchovy, longnose killifish, Atlantic threadfin, bay whiff, and southern flounder. Certain stages within the life cycles of estuarine fishes occur within the intermediate to brackish ponds and bayous; these fish include the Gulf menhaden, spot, Atlantic croaker, white and brown shrimp, and blue crabs.

Without the mitigation project, the freshwater fish productivity would gradually diminish and the estuarine fishing increase. Over time, however, the estuarine dependent fisheries would decrease as the detritus-producing marshes eroded away.

With the mitigation plan, freshwater fisheries would be enhanced. The flow of detritus into surrounding estuarine areas would be reduced. Although

the movement of some estuarine organisms would be retarded by the structure, it is not an absolute barrier to migration. Weirs probably tend to restrict the movement of bottom species more so than upper water column organisms. The habitat changes promoted by weirs, such as reduced turbidity, decreased salinity, changed plant composition, and increased submerged vegetation, may reduce certain estuarine species utilizing the area. Species that may be sensitive to the weir include the anchovy, menhaden, seatrout, and white shrimp. Ramps leading to the weirs should facilitate movement of estuarine organisms.

#### WILDLIFE

Numerous wildlife species are found within the mitigation area, particularly the marshes. Fresh to intermediate marsh provides a high quality habitat. Waterfowl present includes the resident mottled duck and the migratory mallards, teal, gadwalls, widgeons, shovelers, pintails, ring-necked ducks, and scaup. Other water birds in the wetlands are the moorhen, coot, snipes, egrets, herons, ibis, bitterns, stilt, and rails. Game mammals and furbearers in these marshes include the deer, rabbit, nutria, otter, and mink. Brackish marsh supports many of the same animals found in the fresh marsh, but generally not as high a population. Clapper rails and muskrats are more characteristic of brackish marsh. Many of the animals found in the marshes also frequent the shallow water bodies, and include waterfowl, wading birds, and fur bearers. Along upland areas, the deer, cottontail, armadillo, opossum, and other terrestrial species can be found. About 197,000 habitat units are available in the mitigation area.

Without the mitigation plan, the wildlife utilization of the area could gradually diminish as the marshes erode and subside away. Over the project life, an annualized 155,000 habitat units would exist in the area.

With the mitigation plan, marsh losses would be reduced, and a higher animal population maintained. About 238,000 habitat units would be available annually, and this represents a net annual gain of about 83,000 habitat units.

## ENDANGERED AND THREATENED SPECIES/BLUE LIST SPECIES

There are no known endangered or threatened species that reside in the study area. Several endangered birds, such as the brown pelican, bald eagle, peregrine falcon, and Eskimo curlew, might be seen occasionally as transient visitors. The American alligator has been removed from the endangered species list in Louisiana, although it is still listed as threatened due to similarity of appearance. Although several species of plants from Louisiana are being reviewed for endangered or threatened species status, none of them occurs in the study area.

The National Audubon Society Blue List is an early warning system to indicate bird species undergoing noncyclical population changes and which might be declining in all or parts of their range in North America. About 14 species on this list may be found in the mitigation area. Without the project, suitable terrestrial habitat would decline. With the mitigation plan, fresh marsh would be preserved.

## CULTURAL RESOURCES

There are no recorded cultural resources in the study area. The stabilized water levels could enhance the protection of cultural resources, should they exist. The improvement of the existing levee and the proposed weir construction would have low potential for affecting presently unknown cultural resources.

## RECREATION

The natural resources within the proposed mitigation site provide wide and varied opportunities for outdoor recreational activities. The management area is used for fishing and big game, small game, and waterfowl hunting. Currently, there are an annual 2,156 potential man-days of recreation available. Without the mitigation plan, this would decline slightly to

2,026 man-days. With the mitigation plan, the potential man-days would increase to 3,358.

#### **COORDINATION**

In the coordination of the mitigation proposal, informal meetings were conducted with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Louisiana Department of Wildlife and Fisheries, and South Lafourche Levee District. A draft mitigation report with a similar recommended alternative was included with the Draft Supplemental Environmental Impact Statement (DSEIS) for the Larose to Golden Meadow, Louisiana, Hurricane Protection Project and was circulated among interested agencies, organization, and individuals. During coordination of the DSEIS and accompanying draft mitigation report, comments were received concerning the proposed mitigation plan and its impacts. As a result, the mitigation plan was revised to: incorporate additional weir replacements, evaluate the effect of the initial construction of two 55-foot weirs, and include two ramps to facilitate the movement of estuarine organisms.

#### **LIST OF PREPARERS**

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## CONCLUSION

The U.S. Army Corps of Engineers proposes to compensate for impacts associated with the Larose to Golden Meadow, Louisiana, Hurricane Protection Project by mitigation. The proposed mitigation alternative would result in the construction of a levee, one weir, and replacement of this weir and two existing weirs within Louisiana's Pointe-au-Chien Wildlife Management Area. The purpose of this system is to retain fresh water in a 4,600-acre area, and thus retard saltwater intrusion and marsh loss. Construction would directly impact 82 acres, yet benefit the remaining area. No net environmental impacts would occur when the combined effects of the hurricane protection project and mitigation plan are evaluated. Because this action, when taken in conjunction with completion of the hurricane protection project, would not have a significant impact on the human environment, no Environmental Impact Statement will be prepared.

Prepared by:

E. Scott Clark

26 Aug 86

Date

Reviewed by:

Suzanne R. Hare

26 Aug 86

Date

#### LITERATURE CITED

- Wicker, K.M. 1980. Mississippi Deltaic Plain Region ecological characterization: a habitat mapping study. A user's guide to the habitat maps. U.S. Fish and Wildlife Service, Office of Biological Services. FWS/OBS-79/07. 45 pp. .



**US Army Corps  
of Engineers**

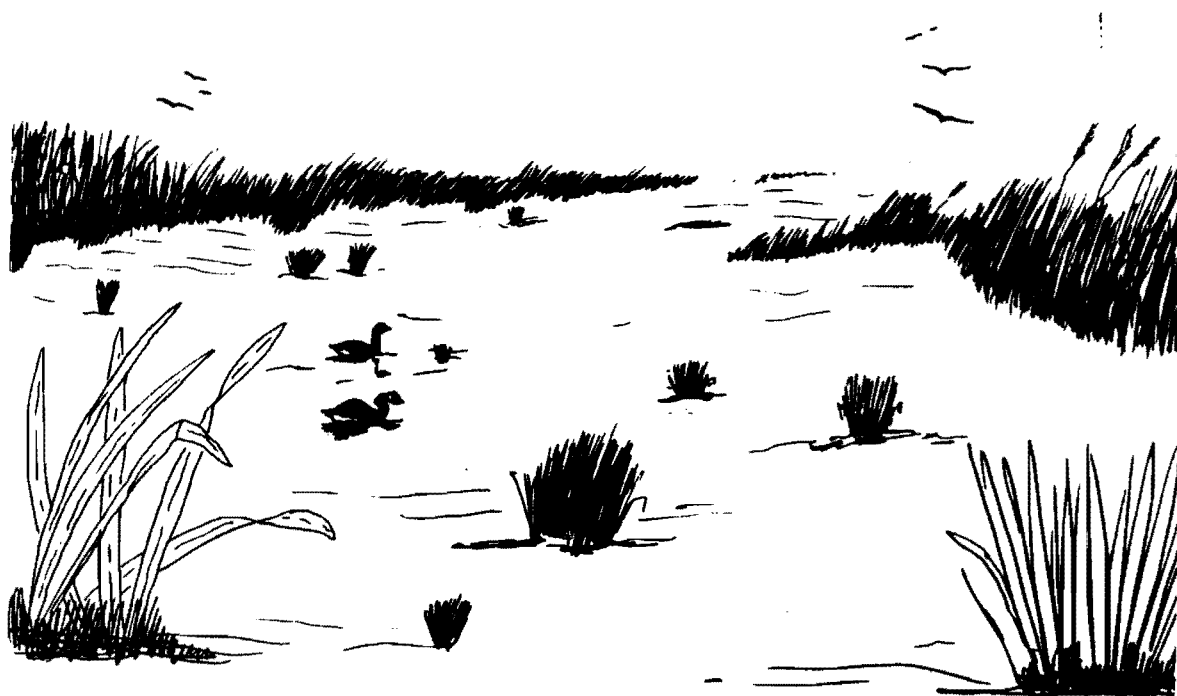
New Orleans District

**APRIL 1987**

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# **MITIGATION REPORT**

**APPENDIXES**



# **LAROSE TO GOLDEN MEADOW**

**LOUISIANA**

**HURRICANE PROTECTION PROJECT**



**APPENDIX A-1**

**U.S. FISH AND WILDLIFE SERVICE  
FISH AND WILDLIFE COORDINATION ACT REPORT**





# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

75 SPRING STREET, S.W.  
ATLANTA, GEORGIA 30303

May 20, 1985

Colonel Eugene S. Witherspoon  
District Engineer  
U.S. Army Corps of Engineers  
Post Office Box 60267  
New Orleans, Louisiana 70160

Dear Colonel Witherspoon:

Enclosed is the final Fish and Wildlife Coordination Act Report for the Larose to Golden Meadow, Louisiana, Hurricane Protection Project. Our report is transmitted to you 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. Copies of the letters of response from those agencies are enclosed. Your cooperation in this matter is appreciated.

Sincerely yours,

*James D. Brown*

ACTING Assistant Regional Director—  
Habitat Resources

Enclosures







**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
Southeast Regional Office  
9450 Koger Boulevard  
St. Petersburg, FL 33702

April 17, 1985 F/SER112/PK:gog  
409/766-3699

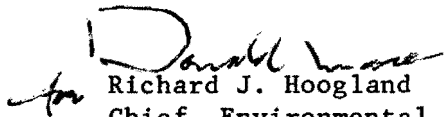
Mr. David W. Fruge'  
Field Supervisor  
Fish and Wildlife Service  
P. O. Box 4305  
Lafayette, LA 70502

Dear Mr. Fruge':

The National Marine Fisheries Service (NMFS) personnel have reviewed your April 2, 1985, proposed final Fish and Wildlife Coordination Act (FWCA) report for the Larose to Golden Meadow, Louisiana, Hurricane Protection Project. As stated in our April 22, 1983 review of your draft report, "The report adequately portrays the marine fishery resources and the anticipated project impacts to them." The proposed mitigation, however, would replace approximately 3/4 of the commercial fishery harvest and 5/7 of the man-days of sport fishing lost annually as a result of the project. In contrast, sport hunting potential and its attendant monetary value and the value of fur harvest would increase with implementation of the mitigation plan. The NMFS strongly disagrees with your indications in the cover letter, the EXECUTIVE SUMMARY and the CONCLUSIONS that the increase in values attributable to wildlife habitats would "reasonably compensate" or "adequately compensate" for the loss of values from fishery habitats. Therefore, we reemphasize from our previous letter that "implementation of additional mitigation discussed in the last paragraph of the CONCLUSIONS and proposed in RECOMMENDATION No. 6 will be necessary to adequately mitigate marine fishery project losses." The NMFS would be pleased to participate in the proposed cooperative development of a program to enhance additional wetlands in the Pointe-au-Chien Wildlife Management Area.

We appreciate the opportunity to review this report.

Sincerely yours,

  
for Richard J. Hoogland  
Chief, Environmental Assessment  
Branch







J. BURTON ANGELLE, SR.  
SECRETARY  
(504) 925-3617

DEPARTMENT OF WILDLIFE AND FISHERIES  
POST OFFICE BOX 15570  
BATON ROUGE, LA. 70895

EDWIN W. EDWARDS  
GOVERNOR

May 8, 1985

Mr. David W. Fruge'  
Field Supervisor  
U. S. Fish and Wildlife Service  
P. O. Box 4305  
Lafayette, Louisiana 70502

Re: FWCA Larose to Golden Meadow  
Hurricane Protection Project

Dear Mr. Fruge':

Personnel of the Louisiana Department of Wildlife and Fisheries have reviewed the above referenced document and have examined the conclusions and recommendations contained therein. We find that we agree with the conclusions and concur in the recommendations.

Sincerely yours,

*J. Burton Angelle*  
J. Burton Angelle  
Secretary

JBA:MBW:fsb



LAROSE TO GOLDEN MEADOW, LOUISIANA  
HURRICANE PROTECTION PROJECT

FINAL FISH AND WILDLIFE COORDINATION ACT REPORT

SUBMITTED TO

NEW ORLEANS DISTRICT  
U.S. ARMY CORPS OF ENGINEERS  
NEW ORLEANS, LOUISIANA

PREPARED BY

DAVID M. SOILEAU, SENIOR FIELD BIOLOGIST

UNDER THE SUPERVISION OF

DAVID W. FRUGE, FIELD SUPERVISOR  
DIVISION OF ECOLOGICAL SERVICES  
LAFAYETTE, LOUISIANA

MAY 1985



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- B. January 9, 1976, FWS supplemental letter report to NODCE
- C. August 7, 1980, FWS planning aid letter to NODCE
- D. March 26, 1982, FWS Habitat Evaluation Procedures planning aid report to NODCE
- E. June 30, 1982, FWS supplemental letter report to NODCE
- F. February 24, 1982, FWS planning aid letter to NODCE
- G. June 9, 1981, NODCE letter and July 1, 1981, FWS letter regarding endangered species coordination



## EXECUTIVE SUMMARY

The Larose to Golden Meadow, Louisiana, Hurricane Protection Project was authorized by Public Law 89-298, 89th Congress, on October 27, 1965. The present plan provides for enlargement of existing non-Federal levees and construction of 41 miles of new levees around the Bayou Lafourche ridge from Larose, Louisiana, to approximately 2 miles south of Golden Meadow, Louisiana. Nearly 4,600 acres of marsh, forested wetlands, and open water would be enclosed by the levee and subject to drainage and development.

A Habitat Evaluation Procedures (HEP) analysis of project impacts on fish and wildlife resources indicated a net annualized loss of 82,931 habitat units. Measured in conventional, monetary terms, the project would cause an average annual loss of 540,000 pounds of commercial fishery harvest valued at over \$144,000; 3,286 man-days of sport fishing valued at over \$13,000; 930 man-days of sport hunting valued at nearly \$9,000; over \$2,600 in fur harvest; and over \$1,900 in wildlife-oriented recreation.

Recommendations for project modifications which, if adopted, could virtually eliminate adverse impacts on fish and wildlife resources were identified in past Fish and Wildlife Service (FWS) reports and are listed at the end of this report. However, in recognition that project construction will follow the plan presently proposed, the FWS is recommending that unavoidable adverse impacts to fish and wildlife resources be fully mitigated concurrently with ongoing construction of the hurricane protection project via implementation of a water management plan on the State-owned Pointe-au-Chien Wildlife Management Area.

The Pointe-au-Chien Wildlife Management Area, located just west of the project area, is deteriorating rapidly from saltwater intrusion and subsidence which indicates a serious need for a water management program which would retard rapid wetland loss. Such a program, if properly designed, constructed, operated, and maintained, would increase and/or maintain the habitat value of the area to fish and wildlife resources above that which would be expected in the future if no management program were implemented. The benefit in increased habitat value could be used to offset the loss in habitat value resulting from the proposed hurricane protection levee.

The HEP analysis performed on the proposed mitigation area indicated that a comprehensive water management program (requiring a system of levees and water control structures) would produce an average annual net increase of 82,889 HU's. That increase would reasonably compensate for adverse project-induced impacts.

However, the management program would vary in its ability to compensate for the project-induced losses of human-use values (i.e., man-day/monetary). Approximately 420,000 pounds of the over 540,000-pound annual loss of commercial fishery harvest and only 2,500 of the nearly 3,300 man-days of sport fishing lost annually as a result of the project would be replaced via the mitigation plan. Even after implementation of the proposed management plan, then, a significant deficit in Coastal Louisiana's sport fishing potential and commercial fishery harvest would exist due to implementation of the hurricane protection project. Conversely, the sport hunting potential and attendant monetary value produced via the mitigation

plan would equal almost twice the sport hunting potential which would be lost with project implementation. Approximately four times the loss in fur harvest value associated with the project would be replaced by the mitigation plan, while increased wildlife-oriented recreation values produced under the mitigation plan would be slightly below that required to fully compensate for those values lost through project construction. Accordingly, the FWS believes that the proposed mitigation plan, if implemented simultaneously with continued project construction, would in most respects adequately compensate for project-induced losses of fish and wildlife related human-use values. However, in an April 22, 1983, letter of comment on the FWS's Draft Fish and Wildlife Coordination Act Report, the National Marine Fisheries Service noted that, based on the anticipated failure of the proposed mitigation program to fully mitigate commercial and recreational fishery resources, it "...will be necessary to adequately mitigate marine fishery project losses."

Finally, much of the Pointe-au-Chien Wildlife Management Area outside of the proposed mitigation area (approximately 23,000 acres) will continue to deteriorate and be lost to subsidence and erosion at an ever increasing rate. Continued marsh loss is a primary result of eliminating freshwater and sediment transport due to levee construction along the Lower Mississippi River and, in particular, elimination of Bayou Lafourche as a distributary of the Mississippi River. Therefore, it would seem appropriate to support, via project funding, enhancement of that portion of the Wildlife Management Area not proposed for inclusion under the mitigation proposal. Such enhancement is provided for via the Federal Water Project Recreation Act, Public Law 89-72, as amended (16 U.S.C. 460-1 (12), et seq.). In this case, the Act would provide that initial implementation costs of the enhancement program for sport fish and wildlife resources be cost-shared on a 75 percent Federal and 25 percent non-Federal basis. In addition, non-Federal interests would assume all costs for operation, maintenance, and replacement of structural enhancement features. The FWS would support development of such an enhancement plan on Pointe-au-Chien Wildlife Management Area.

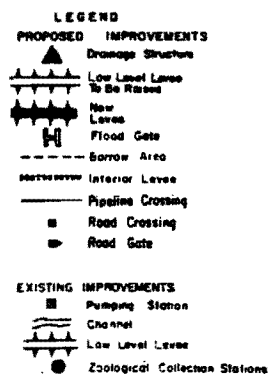
## PROJECT DESCRIPTION

The Larose to Golden Meadow, Louisiana, Hurricane Protection project (formerly Grand Isle, Louisiana, and Vicinity Hurricane Protection project) was authorized by Public Law 89-298, 89th Congress, on October 27, 1965. The authorized project, described in the General Design Memorandum (GDM) completed in May 1972 and in the Final Environmental Impact Statement completed in November 1973, involved the enlargement of existing non-Federal levees and/or the construction of new levees along the alignment indicated in Figure 1. The project area, to be enclosed by approximately 41 miles of perimeter levees, would extend along both banks of Bayou Lafourche from Larose, Louisiana, to approximately 2 miles south of Golden Meadow, Louisiana. The existing non-Federal levees would be enlarged by placing material along the new levee centerline in a series of lifts which would either straddle the existing levees or be located adjacent to them. In areas where levees were not present, material would be placed along the new levee centerline in a series of lifts. Throughout most of the project reach, the borrow areas would be located on the protected side of the levee; however, two sections would utilize borrow areas located outside the new levee. Navigation access into the protected area would be provided via two floodgates to be constructed across Bayou Lafourche, one at the north end and one at the south end of the protected area. Although the project would provide for gravity drainage of runoff from the protected area, local interests have indicated their intent to develop a pumping system for drainage of the enclosed area. Construction of certain segments of the authorized levee alignment began in 1975.

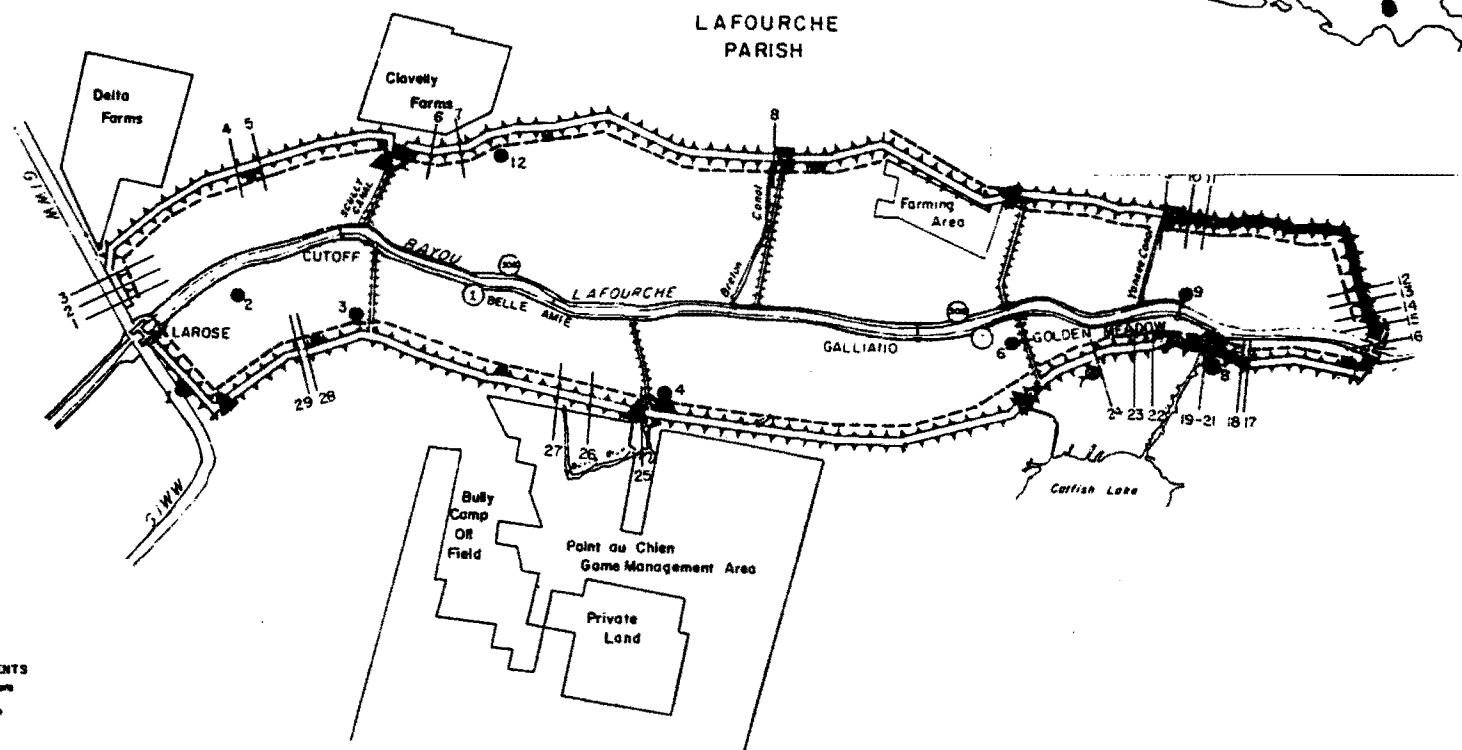
In a July 3, 1975, letter report (Appendix A), the FWS noted that approximately 3,550 acres of valuable wetland habitat would be lost via implementation of the authorized project and recommended the following project modifications to reduce anticipated fish and wildlife losses:

1. relocate the levee south of Yankee Canal and east of Bayou Lafourche to the natural levee along Bayou Lafourche or immediately adjacent to it, to exclude some 2,700 acres of brackish marsh;
2. relocate the levee near Belle Amie to exclude some 750 acres of fresh marsh and 100 acres of wooded swamp;
3. stockpile dredged material from construction of the floodgate south of Golden Meadow within the protected area, rather than within wetlands outside the protected area; and
4. obtain borrow material from within the protected area for all levee construction.

In an October 3, 1975, letter responding to FWS recommendations, the New Orleans District Corps of Engineers (NODCE) indicated its willingness to partially accommodate the request to relocate the levee south of Yankee Canal and east of Bayou Lafourche (Figure 2), thereby reducing wetland losses by approximately 800 acres. Further, NODCE agreed to stockpile dredged material from construction of the floodgate south of Golden Meadow



SCALE IN FEET  
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GRAND ISLE, LOUISIANA AND VICINITY  
HURRICANE PROTECTION  
(LAROSE TO VICINITY OF GOLDEN MEADOW)

Authorized Levee Alignment

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS

APRIL 1973

Figure 1

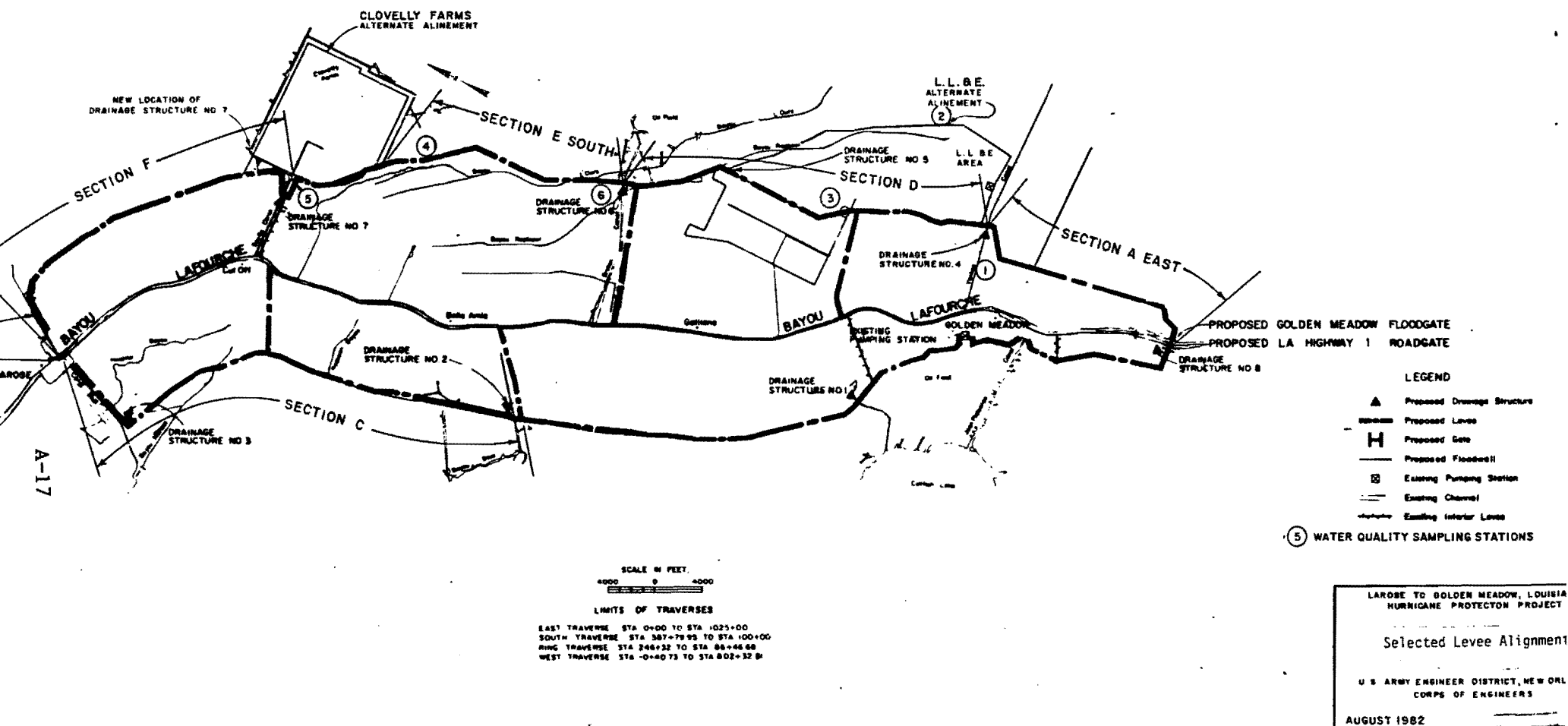


Figure 2

within the protected area and to remove borrow material from within the protected area for all levee construction. NODCE noted, however, that relocation of the levee near Belle Amie was not considered feasible due to greatly increased construction and maintenance costs and difficulties and delays associated with obtaining rights-of-way. In its January 9, 1976, letter discussing the project changes agreed to by NODCE (Appendix B), the FWS noted that some 2,750 acres of wetlands would still be eliminated by completion of the project as planned and generally addressed available options for mitigating that loss.

By letter dated April 28, 1980, NODCE requested FWS comments on a proposal to include within the levee system two additional areas, Clovelly Farms and lands owned by the Louisiana Land and Exploration Company (LL&E), both adjacent to the east levee alignment (Figure 2). In its August 7, 1980, letter of comment (Appendix C) on the proposal to amend the alignment, the FWS noted an increase in wetland loss of approximately 300 acres due to inclusion of the two new areas into the levee system. Of even greater significance was the FWS finding that, in addition to the original estimate of 2,750 acres of wetlands, 1,195 acres of fresh to intermediate marsh and 590 acres of forested wetlands would be destroyed with the authorized alignment.

In March 1982, the NODCE completed Supplement No. 1 to the GDM and included in the recommended plan the originally authorized levee alignment with the aforementioned modification in the levee south of Yankee Canal and east of Bayou Lafourche and with the addition of the Clovelly Farms and LL&E areas (Figure 2). According to the reanalyses of project-induced damages to fish and wildlife resources presented in planning aid reports dated March 26, 1982 (Appendix D) and June 30, 1982 (Appendix E), the FWS estimated that implementation of this plan would result in the loss of a total of 4,348 acres of wetland habitat.

On February 7, 1983, the NODCE project biologist furnished, via telecon, updated fish and wildlife habitat acreages (totalling 4,598 acres) that would be included within the project area. In March 1983, the FWS submitted to NODCE a Draft Fish and Wildlife Coordination Act Report containing conclusions and recommendations based on the selected plan and those updated acreage figures. That FWS report also contained an analysis of a management program, for a portion of the Louisiana Department of Wildlife and Fisheries' (LDWF) Pointe-au-Chien Wildlife Management Area, to be implemented by NODCE as mitigation for unavoidable project damages to fish and wildlife resources.

Since that time, the LDWF has implemented portions of that management program. Accordingly, this Final Fish and Wildlife Coordination Act Report reanalyses the anticipated benefit to accrue to NODCE for completing the management program.

## AREA SETTING

### General

The project area is located on an abandoned delta formed by Bayou Lafourche, a distributary of the Mississippi River between 1,800 and 1,000



years ago, and is within Hydrologic Unit IV according to Chabreck (1972). Principal physiographic features include the natural levee ridge adjacent to Bayou Lafourche, and forested wetlands and marshes which occupy areas of lower elevation adjacent to the ridge. The area is situated near the central portion of the axis of the Gulf Coast Geosyncline where downwarping and subsidence have been occurring concurrently since the end of the Tertiary period. The present rate of subsidence in this area is estimated to be slightly less than 1 foot per century (U.S. Army Corps of Engineers 1973).

Bayou Lafourche, formerly a distributary of the Mississippi River, was permanently separated from the Mississippi River by a closure at Donaldsonville, Louisiana, in 1904. The major source of inflow into the bayou is now rainfall runoff from about 300 square miles of adjoining land. There is also a pumping station at Donaldsonville that diverts water from the Mississippi River into the bayou at an average rate of 260 cubic feet per second.

Local interests have constructed low levees generally along the same alignment as that of the selected hurricane protection levee alignment. Those levees were constructed for the development of agricultural lands, however, and do not provide hurricane protection.

#### Description of Habitats

Major fish and wildlife habitat types identified in the project area include fresh/intermediate marsh, brackish/saline marsh, open water, and forested wetlands. According to the classification of Cowardin et al. (1979), fresh marsh is defined as palustrine emergent wetland; intermediate, brackish, and saline marshes are termed estuarine emergent wetlands; and shallow open waters are termed palustrine open waters where salinity is less than 0.5 parts per thousand (ppt) and estuarine open water where salinities average more than 0.5 ppt. Under that same classification system, forested wetlands are broadly categorized as palustrine forested wetlands. Detailed descriptions of these habitat types were included in FWS letter reports dated July 3, 1975; January 9, 1976; August 7, 1980; March 26, 1982; and June 30, 1982 (Appendices A, B, C, D, and E, respectively).

As previously mentioned, the natural levee ridge along Bayou Lafourche and the adjacent forested wetlands and marshes are a product of the deposition of sediments carried from the Mississippi River into Bayou Lafourche and deposited in shallow open waters. Levee construction along the Lower Mississippi River and, in particular, elimination of Bayou Lafourche as a distributary of the Mississippi River (reference "General" discussion) has virtually eliminated river-borne freshwater and sediment inflow to project area wetlands. Reduced freshwater inflow and extensive canal dredging has allowed saltwater intrusion, the net result of which has been accelerated subsidence and erosion of marshes and swamps and a conversion to more saline vegetation types. Additional fish and wildlife habitat loss has also occurred due to drainage projects and associated development for residential, commercial, and agricultural expansion. If these causes of habitat loss continue, the fish and wildlife habitat available in the future without-project condition will be considerably reduced. For analysis purposes, it has been assumed that those habitat losses will continue into the future. Based on the procedure identified in Appendix D,

habitat acreages were estimated for the future without-project condition at various target years (Table 1). Since project implementation began in the year 1975, that time was designated as the base year or existing condition. Other target years were selected based on their relative significance over the life of the proposed project (i.e., 1986 - the end of the first levee lift, 1991 - all of the enclosed area under pumped drainage, 1996 - completion of all 3 project lifts, 2026 - 30 years after completion of the project, and 2096 - end of project life).

### Fishery Resources

The wetlands of the project area, which include fresh to saline marshes and forested areas, provide suitable habitat for numerous juvenile and adult freshwater and estuarine-dependent fishes and shellfishes as discussed in detail in Appendices A, B, and C. The major contribution of these wetlands to fishery resources is in the form of organic detritus which is transported into adjacent estuarine waters where it forms the basis of a detritus-based food web. The contribution of vascular plant detritus to estuarine fisheries productivity is documented by Darnell (1961) and Odum et al. (1973). Recent studies by Daud (1979), Rogers (1979), Simoneaux (1979), and Chambers (1980) have substantiated the value of shallow marsh areas as nursery habitat for numerous estuarine-dependent species within the upper Barataria Basin (Hydrologic Unit IV).

There is growing evidence that the acreage of vegetated wetlands in Louisiana is the most important factor influencing the production of estuarine-dependent fishes and shellfishes of sport and commercial importance. Turner (1979) reported that Louisiana's commercial shrimp harvest is directly proportional to the area of intertidal wetlands. Harris (1973) stated that Louisiana's estuarine-dependent fishery production has reached the maximum sustainable yield and that any decline in wetlands will result in a corresponding reduction in that production. Based on these considerations, it was assumed that the magnitude of future declines in marsh acreages within the project area would result in a proportionate decline in future sport and commercial estuarine-dependent finfish and shellfish harvest within Hydrologic Units IV and V (Table 2). The figures in Table 2 indicate a 50 percent reduction in average annual man-days of sport fishing and commercial harvest resulting from marsh loss in the project area over the next 120 years.

### Wildlife Resources

The area of direct project impact supports a variety of wildlife species. A comprehensive listing of those species is contained in Appendices A and C. Estimates of population levels of certain recreationally important species in the project area for the future without-project condition is contained in Table 3. Just as with production and harvest of estuarine-dependent finfish and shellfish (Table 2), populations of recreationally important wildlife species (Table 3) are expected to decline proportionally to losses in wetland habitats. Certain species or species groups will support a level of sport hunting consistent with sustained annual harvest rates and hunter success rates for the various habitat types in the project area. A measure of sport hunting potentials and related monetary values within the project area is presented in Table 4. Similarly, a measure of fur catch and related monetary values from various habitats in the project area is presented in Table 5.

Table 1. Habitat acreage changes in the project area projected for the future without-project condition at various target years

| Target year      | Fresh/<br>Intermediate<br>Marsh | Brackish/<br>Saline<br>Marsh | Open<br>Water | Forested<br>Wetlands | Pasture | Developed | Total <sup>1</sup> |
|------------------|---------------------------------|------------------------------|---------------|----------------------|---------|-----------|--------------------|
| 1975 (base year) | 1,093                           | 845                          | 1,638         | 1,022                | 0       | 0         | 4,598              |
| 1986             | 763                             | 906                          | 1,907         | 866                  | 131     | 25        | 4,598              |
| 1991             | 648                             | 911                          | 2,017         | 803                  | 184     | 35        | 4,598              |
| 1996             | 550                             | 907                          | 2,119         | 745                  | 233     | 45        | 4,599              |
| 2026             | 206                             | 763                          | 2,607         | 475                  | 460     | 88        | 4,599              |
| 2096             | 21                              | 353                          | 3,202         | 166                  | 720     | 137       | 4,599              |
| Annualized       | 298                             | 685                          | 2,594         | 489                  | 448     | 86        | 4,599              |

1. Totals vary slightly due to rounding errors.

Table 2. Changes in sport fishing use and value and commercial harvest and value of major estuarine-dependent finfishes and shellfishes in the future without-project condition at various target years

| Target year      | Total Marsh <sup>1</sup><br>(acres) | Sport Fishing <sup>2</sup><br>Use<br>(man-days) | Sport Fishing <sup>3</sup><br>Value<br>(thousands of<br>dollars) | Commercial <sup>4</sup><br>Harvest<br>(millions of<br>pounds) | Commercial <sup>5</sup><br>Harvest Value<br>(thousands of<br>dollars) |
|------------------|-------------------------------------|---|--|---|---|
| 1975 (base year) | 1,938                               | 7,752   | 31.8   | 1.26  | 340   |
| 1986             | 1,669                               | 6,676   | 27.4   | 1.09  | 294   |
| 1991             | 1,559                               | 6,236   | 25.6   | 1.01  | 273   |
| 1996             | 1,457                               | 5,828   | 23.9   | 0.95  | 257   |
| 2026             | 969                                 | 3,876   | 15.9   | 0.63  | 170   |
| 2096             | 374                                 | 1,496   | 6.1  | 0.24  | 65  |
| Annualized       | 983                                 | 3,929   | 16.1   | 0.64  | 173   |

1. Sum of all marsh types in Table 1.
2. Value is the product of the estimated 4 man-day per acre usage figure (average for Hydrologic Units IV and V) from U.S. Army Corps of Engineers (1977) and the total marsh acreage.
3. Value is the product of man-days of sport fishing use and \$4.10 (value for general hunting and fishing from NODCE's June 1984 Feasibility Report on the Louisiana Coastal Area (Freshwater Diversion to Barataria and Breton Sound Basins)).
4. Adjusted Hydrologic Unit IV harvest data (302,950,000 pounds) from Table 5 of Final Fish and Wildlife Coordination Act Report on the Louisiana Coastal Area Study (September 1984) divided by the total acres of marsh habitat (465,797 acres) in Hydrologic Unit IV yielded an average commercial harvest value of 650.39 pounds of commercial harvest per acre of marsh. That value was multiplied by the total marsh acreage to determine commercial harvest in each target year.
5. Value (\$80,460,000) for commercial harvest from Hydrologic Unit IV divided by adjusted harvest data (302,950,000 pounds) for Hydrologic Unit IV (both figures from Table 5 of Final Fish and Wildlife Coordination Act Report cited above) yielded an average commercial harvest value of \$0.27 per pound. That value was multiplied by the pounds of commercial harvest to determine dollar value in each target year.

Table 3. Changes in total numbers of animals of selected species in the project area in the future without-project condition at various target years.

| Wildlife Resources        | 1975       | 1986       | 1991       | 1996       | 2026       | 2096       | Annualized |
|---------------------------|------------|------------|------------|------------|------------|------------|------------|
| Fresh/Intermediate Marsh  |            |            |            |            |            |            |            |
| Deer <sup>1</sup>         | 31         | 22         | 19         | 16         | 6          | 1          | 9          |
| Rabbit <sup>2</sup>       | 547        | 382        | 324        | 275        | 103        | 11         | 149        |
| Mottled Duck <sup>3</sup> | 16         | 11         | 10         | 8          | 3          | 0          | 4          |
| Brackish/Saline Marsh     |            |            |            |            |            |            |            |
| Deer                      | Negligible | Negligible | Negligible | Negligible | Negligible | Negligible | Negligible |
| Rabbit                    | 338        | 362        | 364        | 363        | 305        | 141        | 274        |
| Mottled Duck              | 4          | 4          | 4          | 4          | 4          | 2          | 3          |
| Forested Wetlands         |            |            |            |            |            |            |            |
| Deer                      | 17         | 14         | 13         | 12         | 88         | 3          | 8          |
| Rabbit                    | 511        | 433        | 402        | 373        | 238        | 83         | 245        |
| Squirrel <sup>4</sup>     | 511        | 433        | 402        | 373        | 238        | 83         | 245        |

1. Methodology for computing numbers of deer is discussed in Planning Aid Letter dated February 24, 1982 (Appendix F).
2. Methodology for computing numbers of rabbits is discussed in Planning Aid Letter dated February 24, 1982 (Appendix F).
3. Methodology for computing number of mottled ducks per acre after Hugh Bateman (personal communication), Louisiana Department of Wildlife and Fisheries.
4. Methodology for computing numbers of squirrels is discussed in Planning Aid Letter dated February 24, 1982 (Appendix F).
5. Not applicable.

Table 4. Sport hunting potential and value of project area

| Wildlife Resources              | Potential effort <sup>1</sup><br>(man-days/acre) | Value per man-day <sup>2</sup><br>(dollars) | Value per acre<br>(dollars) |
|---------------------------------|--|---|-----------------------------|
| <b>Fresh/Intermediate Marsh</b> |  |   |                             |
| Deer                            | 0.250  | 14.90                                       | 3.73                        |
| Rabbit                          | 0.176  | 4.10  | 0.72                        |
| Waterfowl                       | 0.488  | 14.90                                       | 7.27                        |
| Marsh birds                     | 0.254  | 4.10  | 1.04                        |
| TOTAL                           | 1.168  | -   | 12.76                       |
| <b>Brackish/Saline Marsh</b>    |  |   |                             |
| Deer                            | Negligible                                       | N/A <sup>3</sup>                            | N/A                         |
| Rabbit                          | 0.141  | 4.10  | 0.58                        |
| Waterfowl                       | 0.383  | 14.90                                       | 5.71                        |
| Marsh birds                     | 0.261  | 4.10  | 1.07                        |
| TOTAL                           | 0.785  | -   | 7.36                        |
| <b>Forested Wetlands</b>        |  |   |                             |
| Deer                            | 0.130  | 14.90                                       | 1.94                        |
| Rabbit                          | 0.176  | 4.10  | 0.72                        |
| Squirrel                        | 0.161  | 4.10  | 0.66                        |
| Waterfowl                       | 0.035  | 14.90                                       | 0.52                        |
| TOTAL                           | 0.502  | -   | 3.84                        |

1. Methodology for computing man-day per acre values is discussed in Planning Aid Letter dated February 24, 1982 (Appendix F).
2. Values from NODCE's June 1984 Feasibility Report on the Louisiana Coastal Area (Freshwater Diversion to Barataria and Breton Sound Basins).
3. Not Applicable.

Table 5. Estimated fur catch and value of project area

| Wildlife Resources       | Catch per acre <sup>1</sup><br>(average no. of pelts) | Value per pelt <sup>5</sup><br>(dollars) | Value per acre<br>(dollars) |
|--------------------------|---|--|-----------------------------|
| Fresh/Intermediate Marsh |   |  |                             |
| Muskrat                  | 0.0880  | 5.70                                     | 0.50                        |
| Nutria                   | 0.3988  | 7.76                                     | 3.09                        |
| Mink                     | 0.0015  | 14.36                                    | 0.02                        |
| Otter                    | 0.0005  | 46.80                                    | 0.02                        |
| Raccoon                  | 0.0093 <sup>2</sup>                                   | 12.03                                    | 0.11                        |
| Alligator                | 0.0080 <sup>2</sup>                                   | 215.21                                   | 1.72                        |
| TOTAL                    | -   | -  | 5.46                        |
| Brackish/Saline Marsh    |   |  |                             |
| Muskrat                  | 0.0527 <sup>3</sup>                                   | 5.70                                     | 0.30                        |
| Nutria                   | 0.0540 <sup>3</sup>                                   | 7.76                                     | 0.42                        |
| Mink                     | 0.0007 <sup>3</sup>                                   | 14.36                                    | 0.01                        |
| Otter                    | 0.0001 <sup>3</sup>                                   | 46.80                                    | Negligible                  |
| Raccoon                  | 0.0049 <sup>3</sup>                                   | 12.03                                    | 0.06                        |
| Alligator                | 0.0031 <sup>2</sup>                                   | 215.21                                   | 0.67                        |
| TOTAL                    | -   | -  | 1.46                        |
| Forested Wetlands        |   |  |                             |
| Muskrat                  | 0.0140 <sup>4</sup>                                   | 5.70                                     | 0.08                        |
| Nutria                   | 0.0620 <sup>4</sup>                                   | 7.76                                     | 0.48                        |
| Mink                     | 0.0160 <sup>4</sup>                                   | 14.36 <sup>6</sup>                       | 0.23                        |
| Otter                    | Negligible  | N/A <sup>6</sup>                         | Negligible                  |
| Raccoon                  | 0.0480 <sup>4</sup>                                   | 12.03 <sup>6</sup>                       | 0.58                        |
| Alligator                | Negligible  | N/A <sup>6</sup>                         | Negligible                  |
| TOTAL                    | -   | -  | 1.37                        |

1. Unless otherwise noted, average catch per acre is adapted from Palmisano (1973).
2. Average catch per acre value is based on tag allotments (Moody and Coreil 1980).
3. Value is average of brackish marsh value from Palmisano (1973) plus 25 percent of brackish marsh value (assumed to be value of saline marsh).
4. Average catch per acre value is adapted from Nichols and Chabreck (1973).
5. Based on 1976-81 running average of prices received by the trapper, expressed in 1983 dollars using the Consumer Price Index for hides, skins, leather and related products.
6. Not applicable.

A summary of the per-acre monetary value of the project area wetlands is available in Table 6. Those data indicate that marsh is, by far, the most valuable habitat when considering sport and commercial fish and wildlife production.

#### Endangered Species

Via letter dated July 1, 1981, to the NODCE (Appendix G), the FWS confirmed that there were no endangered or threatened species, or species proposed for such listing, likely to reside in the project area and that there was no designated critical habitat in the vicinity of the project area.

#### Wildlife Management Areas

The Pointe-au-Chien Wildlife Management Area lies just west of the project area and about halfway between the towns of Larose and Golden Meadow. That Management Area consists of approximately 28,000 acres of intermediate to brackish marsh and, like much of the remaining marshland of coastal Louisiana, is suffering from subsidence, salinity intrusion, and a lack of freshwater and nutrient inflow.

### **PROJECT IMPACT ASSESSMENT METHODOLOGY**

For this project, the FWS employed two basic analytical methods to qualify and quantify project impacts. One method, the Habitat Evaluation Procedures (HEP) analysis, involved qualification and quantification of the non-monetary impacts of the proposed action to terrestrial (wildlife) species. The second method, the man-day/monetary analysis, quantified impacts to commercial fishery and fur harvests and to sport fishing and hunting and wildlife-oriented recreation.

Using the FWS's HEP, habitat quality and quantity were established for baseline conditions and predicted for future with- and future without-project conditions. This standardized methodology allowed a numeric comparison of future with- and future without-project conditions at various times (target years) during the life of a project and, hence, provided a measure of project-induced impacts to fish and wildlife resources. In implementing the HEP, a representative list of species or species groups (including species of primary economic concern or high public interest) was selected for the project area. Various sample sites within each habitat type occurring in the project area were rated, on a scale of 0 to 100, according to their ability to support the selected species or species groups. Within the scale of 0 to 100, habitat rating 0 was considered the poorest and habitat rating 100 was considered the best. The average of those scores for all species over all sample sites within one habitat type yielded a relative measure of the value of that habitat type, termed a habitat unit value (HUV). When the HUV was multiplied by the acreage of a particular habitat type available, the result was a measure of both habitat quality and quantity, expressed as habitat units (HU). Comparison of the available HU's in the future without- and future with-project conditions afforded a measure of the anticipated impacts of the project.



Table 6. Summary of sport/commercial fish and wildlife value per acre of wetland habitats of project area

| Fish and Wildlife Use                     | Fresh/Intermediate Marsh (dollars) | Brackish/Saline Marsh (dollars) | Forested Wetlands (dollars) |
|---|------------------------------------|---------------------------------|-----------------------------|
| Commercial fishery harvest <sup>1</sup>   | 175.99                             | 175.99                          | N/A <sup>6</sup>            |
| Sport fishing <sup>2</sup>                | 16.38                              | 16.38                           | N/A                         |
| Sport hunting <sup>3</sup>                | 12.76                              | 7.36                            | 3.84                        |
| Commercial fur harvest <sup>4</sup>       | 5.46                               | 1.46                            | 1.37                        |
| Wildlife-oriented recreation <sup>5</sup> | 1.48                               | 1.48                            | 1.73                        |
| TOTAL                                     | 212.07                             | 202.67                          | 6.94                        |

1. This figure represents the annualized value per acre attributable to commercial fishery harvest, from Table 2.
2. This figure represents the annualized value per acre attributable to sport fishing, from Table 2.
3. Sum of value of all forms of sport hunting expected to occur in project area, from Table 4.
4. Sum of value of furbearer harvest, from Table 5.
5. Value is the product of the estimated man-day usage (average for Hydrologic Units IV and V) from U.S. Army Corps of Engineers (1977) and \$4.10 (the value of a man-day of general recreation from NODCE's June 1984 Feasibility Report on the Louisiana Coastal Area (Freshwater Diversion to Barataria and Breton Sound Basin).
6. Not applicable.

A man-day/monetary analysis was performed to measure tangible impacts upon human uses of fish, wildlife, and related recreational resources of the project area. In this analysis, the estimate of human use was based on past harvest records for commercial fishery and fur production, and on the potential of the habitat to support sport fishing, sport hunting, and wildlife-oriented recreation. An appropriate monetary value was applied to human uses of those resources, as previously indicated in Tables 2, 4, and 5. Subsequently, per-acre sport/commercial fish and wildlife monetary values for various wetland habitat types within the project area were computed (Table 6). Those values were applied to estimated future without- and future with-project habitat supply. The difference (either positive or negative) between these two conditions afforded a measure of fish and wildlife human use/monetary impacts from the project.

Of the two methods (described above) of identifying impacts, it is the policy of the FWS to use the HEP analysis as the basic analytical tool for evaluating impacts and formulating recommendations. The policy is not meant to exclude man-days as a valid measure of project impact. On the contrary, recreational use is important and highly pertinent. Efforts to fulfill the conservation purposes of the Fish and Wildlife Coordination Act, however, must be founded on protecting and maintaining the biological productivity and integrity of the resource base. Only in this manner can we protect and conserve the myriad values that fish and wildlife provide to the Nation. Any conservation measure not founded on the basis of biological productivity will, in the long run, adequately serve neither the resource nor the human use of that resource.

## PROJECT IMPACTS

### General

As previously discussed in the Project Description section of this report, substantial modifications in original project plans have been instituted which would reduce damages to fish and wildlife resources. However, these damages would still be quite severe under the presently selected plan.

The selected plan would have both direct and indirect adverse impacts on fish and wildlife resources. Direct impacts are primarily associated with levee construction and associated borrow material excavation in wetlands. The most serious indirect impacts involve inclusion of additional wetland areas in the hurricane levee system and subsequent elimination of these habitats by pump drainage.

Within five years of the start of construction, the levee system would have eliminated, via direct and indirect causes, 648 acres of fresh/intermediate marsh, 911 acres of brackish/saline marsh, 1,357 acres of open water habitat, and 261 acres of forested wetlands. However, as noted in the Description of Habitats section of this report, wetland habitats are already being converted, primarily to open water, via natural and man-induced processes at a very rapid rate. Under future without-project conditions, a loss of 627 acres of fresh/intermediate marsh, 558 acres of brackish/saline marsh, and 637 acres of forested wetlands is anticipated. The project would, nevertheless, greatly accelerate the rate of loss of these wetland habitats, causing a net annual loss of 215, 607, and 227

acres of fresh/intermediate marsh, brackish/saline marsh, and forested areas, respectively.

Conversely, levee and pasture habitat acreages would be significantly increased (758 and 1,759 acres, respectively, on an annualized basis). Their value to important fish and wildlife resources is, however, miniscule when compared to the value of marshes and forested wetlands which they would displace.

#### Habitat Evaluation Procedures Analysis

A detailed discussion of the HEP analysis completed for the selected plan is available in planning aid letters dated March 26 and June 30, 1982 (Appendices D and E). That analysis of future without- and future with-project habitat conditions showed a net annualized loss of 2,853 acres of marsh, open water, and forested wetlands and a net annualized gain of 2,517 acres of levee and pasture (Table 7). When the HUV's (Table 8), assigned by a team of biologists representing the NODCE, FWS, and LDWF were multiplied by the various habitat acreages (Table 7), the result was a measure of the number of HU's available by habitat type in the future with- and future without-project conditions (Table 9). In the analysis, it was assumed that baseline (existing) HUV's for all habitat types would remain constant in the future without-project condition. Similarly, future with-project HUV's for marsh habitats, levee, and pasture were assumed to be the same as future without-project HUV's. Developed areas were considered to have no wildlife resource value. All of the future with-project open water areas would be in the form of borrow pits, half of which would be enclosed by the levee and half of which would be contiguous with marshes outside the leveed area. It was assumed that the HUV of open water areas outside the leveed area would remain constant; whereas, the HUV of open water areas within the leveed area would be reduced by 50 percent. Accordingly, an average HUV of 18.75, i.e.,  $(25.00 + 12.50) \div 2$ , was applied to open water in the future with project condition. The HUV of forested wetlands remaining in the future with-project condition is expected to decline to one-third of the future without-project HUV due to increased grazing by domestic livestock, drainage, and destruction of adjacent marshes.

As indicated in Table 9, there would be a net annualized loss of 82,931 HU's in the future with-project condition, when compared to the future without-project condition. The extremely high loss of HU's associated with the project is a result of the direct and indirect destruction of wetlands, and the significant reduction in the wildlife value of the forested wetlands and open water habitat remaining within the levee system.

#### Man-Day/Monetary Analysis

As indicated in the Fishery Resources section of this report, it was assumed that any decline in marsh acreages within the project area would result in a proportionate decline in sport fishing and commercial estuarine-dependent finfish and shellfish harvest. Figures in Table 2 indicate a 50 percent reduction in average annual sport fishing and commercial harvest in the future without-project condition. Comparing future with-project marsh habitat conditions and annualized sport fishing and commercial harvest figures to future without-project figures indicated that the project would cause an annualized loss of 3,286 man-days of sport

Table 7. Comparison of future without-project (FWOP) and future with-project (FWP) habitat acreages

| Target year     | Fresh/<br>Intermediate<br>Marsh | Brackish/<br>Saline<br>Marsh | Open<br>Water | Forested | Levee | Pasture | Developed | Total <sup>1</sup> |
|-----------------|---------------------------------|------------------------------|---------------|----------|-------|---------|-----------|--------------------|
| 1975 FWOP       | 1,093                           | 845                          | 1,638         | 1,022    | 0     | 0       | 0         | 4,598              |
| FWP             | 1,093                           | 845                          | 1,638         | 1,022    | 0     | 0       | 0         | 4,598              |
| 1986 FWOP       | 763                             | 906                          | 1,907         | 866      | 0     | 131     | 25        | 4,598              |
| FWP             | 504                             | 596                          | 1,961         | 630      | 794   | 95      | 18        | 4,598              |
| 1991 FWOP       | 648                             | 911                          | 2,017         | 803      | 0     | 184     | 35        | 4,598              |
| FWP             | 0                               | 0                            | 660           | 542      | 794   | 2,186   | 416       | 4,598              |
| 1996 FWOP       | 550                             | 907                          | 2,119         | 745      | 0     | 233     | 45        | 4,599              |
| FWP             | 0                               | 0                            | 660           | 466      | 794   | 2,250   | 428       | 4,598              |
| 2026 FWOP       | 206                             | 763                          | 2,607         | 475      | 0     | 460     | 88        | 4,599              |
| FWP             | 0                               | 0                            | 660           | 188      | 794   | 2,484   | 472       | 4,598              |
| 2096 FWOP       | 21                              | 353                          | 3,202         | 166      | 0     | 720     | 137       | 4,599              |
| FWP             | 0                               | 0                            | 660           | 23       | 794   | 2,623   | 498       | 4,598              |
| Annualized FWOP | 298                             | 685                          | 2,594         | 489      | 0     | 448     | 86        | 4,599              |
| FWP             | 83                              | 78                           | 790           | 262      | 758   | 2,207   | 419       | 4,598              |
| Net Change      | -215                            | -607                         | -1,804        | -227     | +758  | +1,759  | +333      | -1                 |

1. Totals vary slightly due to rounding errors.

Table 8. Habitat unit values of project area for baseline (existing), future without-project (FWOP), and future with-project (FWP) conditions

| Habitat type             | Baseline | FWOP  | FWP   |
|--------------------------|----------|-------|-------|
| Fresh/Intermediate Marsh | 60.25    | 60.25 | 60.25 |
| Brackish/Saline Marsh    | 48.00    | 48.00 | 48.00 |
| Open Water               | 25.00    | 25.00 | 18.75 |
| Forested Wetlands        | 32.10    | 32.10 | 10.70 |
| Levee/Pasture            | 7.50     | 7.50  | 7.50  |
| Developed areas          | 0        | 0     | 0     |

Table 9. Comparison of future without-project (FWOP) and future with-project (FWP) habitat units

|              |                 | <u>Habitat Units by Habitat type</u> |                              |               |          |        |         |         |
|--------------|-----------------|--------------------------------------|------------------------------|---------------|----------|--------|---------|---------|
| Target year  |                 | Fresh/<br>Intermediate<br>Marsh      | Brackish/<br>Saline<br>Marsh | Open<br>Water | Forested | Levee  | Pasture | TOTAL   |
| A-32<br>-18- | 1975 FWOP       | 65,853                               | 40,560                       | 40,950        | 32,806   | 0      | 0       | -       |
|              | FWP             | 65,853                               | 40,560                       | 40,950        | 32,806   | 0      | 0       | -       |
|              | 1986 FWOP       | 45,971                               | 43,488                       | 47,675        | 27,799   | 0      | 983     | -       |
|              | FWP             | 30,366                               | 28,608                       | 49,025        | 20,223   | 5,955  | 713     | -       |
|              | 1991 FWOP       | 39,042                               | 43,728                       | 50,425        | 25,776   | 0      | 1,380   | -       |
|              | FWP             | 0                                    | 0                            | 12,375        | 5,799    | 5,955  | 16,395  | -       |
|              | 1996 FWOP       | 33,138                               | 43,536                       | 52,975        | 23,915   | 0      | 1,748   | -       |
|              | FWP             | 0                                    | 0                            | 12,375        | 4,986    | 5,955  | 16,875  | -       |
|              | 2026 FWOP       | 12,412                               | 36,624                       | 65,175        | 15,248   | 0      | 3,450   | -       |
|              | FWP             | 0                                    | 0                            | 12,375        | 2,012    | 5,955  | 18,630  | -       |
|              | 2096 FWOP       | 1,265                                | 16,944                       | 80,050        | 5,329    | 0      | 5,400   | -       |
|              | FWP             | 0                                    | 0                            | 12,375        | 246      | 5,955  | 19,673  | -       |
|              | Annualized FWOP | 17,934                               | 32,857                       | 64,846        | 15,695   | 0      | 3,362   | -       |
|              | FWP             | 5,001                                | 3,735                        | 16,097        | 4,692    | 5,684  | 16,554  | -       |
| Net Change   |                 | -12,933                              | -29,122                      | -48,749       | -11,003  | +5,684 | +13,192 | -82,931 |

fishing, valued at over \$13,000, and a 540,000-pound net average annual reduction in commercial harvest of estuarine-dependent finfishes and shellfishes, valued at over \$144,000 (Table 10).

As with sport fishing and commercial fishery harvest, it was assumed that project-induced changes in habitat acreages would result in directly proportionate changes in sport hunting potential, commercial fur harvest, and wildlife-oriented recreation. The data presented in Table 11 indicate that implementation of the selected plan would result in the net annual loss of 930 man-days of sport hunting, valued at nearly \$9,000. In addition, the project would cause the annual loss of over \$4,500 in fur harvest and wildlife-oriented recreation.

#### Endangered Species

In a June 9, 1981, letter (Appendix E) to the FWS, the Chief of the NODCE's Planning Division requested a list of endangered and/or threatened species, and species proposed for such listing, which might occur in the project area. In a July 1, 1981, letter (Appendix E) the FWS indicated that no endangered or threatened species, or species proposed for such listing, were likely to reside in the project area. Accordingly, no further endangered species coordination would be required for the project, as proposed. No significant project changes which might alter that opinion have occurred since that time.

### **DISCUSSION**

#### General

In comparison to future without-project conditions, project implementation would cause a net annualized loss of 1,049 acres of vegetated wetlands. Conversely, anticipated increases in levee and pasture habitat acreages would add little to the fish and wildlife value of the project area.

The non-monetary, habitat-based analysis (i.e., HEP analysis) of project impacts on fish and wildlife resources indicated a net annualized loss of 82,931 HU's. Measured in conventional, monetary terms, the project would cause an average annual reduction of 3,286 man-days of sport fishing (valued at over \$13,000), 540,000 pounds in commercial harvest of estuarine-dependent finfishes and shellfishes (valued at over \$144,000), 930 man-days of sport hunting (valued at nearly \$9,000), and over \$4,500 in fur harvest and wildlife-oriented recreation.

Inherent in the Fish and Wildlife Coordination Act is the concept that unavoidable impacts, resulting from a Federal project of this type, be offset via mitigation. Mitigation, as defined by the President's Council on Environmental Quality in the Regulations For Implementing the Procedural Provisions of the National Environmental Policy Act, can 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)

Table 10. Comparison of future without-project (FWOP) and future with-project (FWP) sport fishing use and value and commercial harvest and value of major estuarine-dependent finfishes and shellfishes

| Target year |      | Total marsh <sup>1</sup><br>(Acres) | Sport <sup>2</sup><br>Fishing<br>Use<br>(man-days) | Sport <sup>3</sup><br>Fishing<br>Value<br>(dollars) | Commercial <sup>4</sup><br>Harvest<br>(millions of<br>pounds) | Commercial <sup>5</sup><br>Harvest<br>Value<br>(dollars) |
|-------------|------|-------------------------------------|--|---|---|--|
| 1975        | FWOP | 1,938                               | 7,752  | 31,783  | 1.26  | 340,200  |
|             | FWP  | 1,938                               | 7,752  | 31,783  | 1.26  | 340,220  |
| 1986        | FWOP | 1,669                               | 6,676  | 27,372  | 1.09  | 294,300  |
|             | FWP  | 1,100                               | 4,400  | 18,040  | 0.72  | 194,400  |
| 1991        | FWOP | 1,559                               | 6,236  | 25,568  | 1.01  | 272,700  |
|             | FWP  | 0                                   | 0  | 0   | 0   | 0  |
| 1996        | FWOP | 1,457                               | 5,828  | 23,895  | 0.95  | 256,500  |
|             | FWP  | 0                                   | 0  | 0   | 0   | 0  |
| 2026        | FWOP | 969                                 | 3,876  | 15,892  | 0.63  | 170,100  |
|             | FWP  | 0                                   | 0  | 0   | 0   | 0  |
| 2096        | FWOP | 374                                 | 1,496  | 6,134   | 0.24  | 64,800   |
|             | FWP  | 0                                   | 0  | 0   | 0   | 0  |
| Annualized  | FWOP | 982                                 | 3,929  | 16,108  | 0.64  | 172,320  |
|             | FWP  | 161                                 | 643  | 2,636   | 0.10  | 28,317   |
| Net Change  |      | -821                                | -3,286   | -13,472   | -0.54   | -144,003   |

1. Sum of all marsh types in Table 7.
2. Product of 4 man-days per acre usage figure (from Table 2) and total marsh acreage available.
3. Product of \$4.10 (from Table 2) and man-days of sport fishing use.
4. Product of 650.39 pounds of commercial harvest per acre of marsh (generated in Table 2) and total marsh acreage available.
5. Product of \$0.27 per pound (generated in Table 2) and pounds of commercial harvest.



Table 11. Comparison of man-day/monetary values for future without-project (FWOP) and future with-project (FWP) habitat conditions for selected wildlife related parameters

| Habitat types            | Acres <sup>1</sup> | Sport hunting potential <sup>2</sup><br>(man-days) | Sport hunting value <sup>3</sup><br>(dollars) | Fur catch value <sup>4</sup><br>(dollars) | Wildlife-oriented recreation value <sup>5</sup><br>(dollars) |
|--------------------------|--------------------|--|---|---|--|
| Fresh/Intermediate Marsh |                    |  |   |   |  |
| FWOP(Annualized)         | 298                | 348  | 3,802   | 1,627                                     | 441  |
| FWP(Annualized)          | 83                 | 97   | 1,059   | 453                                       | 123  |
| Net change               | -215               | -251   | -2,743  | -1,174                                    | -318   |
| Brackish/Saline Marsh    |                    |  |   |   |  |
| FWOP(Annualized)         | 685                | 538  | 5,042   | 1,000                                     | 1,014  |
| FWP(Annualized)          | 78                 | 61   | 574   | 114                                       | 115  |
| Net change               | -607               | -477   | -4,468  | -886                                      | -899   |
| Forested Wetlands        |                    |  |   |   |  |
| FWOP(Annualized)         | 489                | 245  | 1,878   | 670                                       | 846  |
| FWP(Annualized)          | 262                | 43   | 332   | 118                                       | 150  |
| Net change               | -227               | -202   | -1,546  | -552                                      | -696   |
| Total Net Change         | -1,049             | -930   | -8,757  | -2,612                                    | -1,913   |

1. From Table 7.
2. Derived by multiplying total man-days per acre figure from Table 4 by annualized acreage; for FWP in forested wetlands the man-day per acre figure was reduced by 0.67, as per rationale presented in March 26, 1982, planning aid letter (Appendix D).
3. Derived by multiplying total value per acre figure from Table 4 by annualized acreage; for FWP in forested wetlands the value per acre figure was reduced by 0.67, as per rationale presented in March 26, 1982, planning aid letter (Appendix D).
4. Derived by multiplying total value per acre figure from Table 5 by annualized acreage; for FWP in forested wetlands the value per acre figure was reduced by 0.67, as per rationale presented in March 26, 1982, planning aid letter (Appendix D).
5. Derived by multiplying value per acre figure from Table 6 by annualized acreage; for FWP in forested wetlands the value per acre figure was reduced by 0.67, as per rationale presented in March 26, 1982, planning aid letter (Appendix 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.

Avoiding the adverse impacts totally, via the no action alternative, is apparently not acceptable to NODCE and local interests. Minimizing adverse impacts by excluding marsh and wooded wetlands from the area to be enclosed by the levee is also not acceptable to local interests. Since the wetlands to be enclosed would likely be drained and grazed, or converted to a higher land use, there is no opportunity to rehabilitate, restore, or preserve and manage the affected environment.

### Mitigation Options

After consideration of all of the various mitigation options listed above, only two appear viable and acceptable to NODCE and local interests. Those options, both involving offsite mitigation, include land acquisition and management, or management of existing publicly-owned fish and wildlife habitat.

The FWS considers the wetland habitats to be impacted in the project area to be of relatively high value for the evaluation species used in the HEP analysis. Further, those habitats are becoming scarce on both a national and regional basis. Such criteria place the wetland habitats of the project area within Resource Category 2, according to the FWS's Mitigation Policy published in the Federal Register on January 23, 1981. That category carries with it the mitigation goal of "No Net Loss of In-Kind Habitat Value." Accordingly, that goal would apply to whichever mitigation option were ultimately selected.

The FWS Mitigation Policy also lists measures for compensating for unavoidable impacts in the general order and priority in which they should be recommended. First on that list are management activities to increase habitat values of existing areas, with project lands and nearby public lands receiving priority.

The publicly-owned Pointe-au-Chien Wildlife Management Area lies just west of the project area and is deteriorating rapidly from saltwater intrusion and subsidence. The area is sorely in need of a water management program which would halt, or at least retard, the rapid rate of wetland loss. Such a program, if properly designed, constructed, operated, and maintained, could increase and/or maintain the habitat value of the area to fish and wildlife over that which would be expected in the future if no management program were implemented. The benefit in increased habitat value could be used to offset the loss in habitat value which would result from implementation of the proposed hurricane protection levee.

Management of such public lands is consistent with the FWS Mitigation Policy, is one of the two remaining viable mitigation options, and is critically needed for maintenance of valuable publicly-owned fish and wildlife habitat. Accordingly, the FWS supports this mitigation option; the specifics of managing this area to offset project-induced impacts is discussed in the following sections of the report.

## Mitigation Via Management of Pointe-au-Chien Wildlife Management Area Lands

### General

To evaluate the adequacy of the management program being proposed for the Pointe-au-Chien Wildlife Management area in mitigating the project-induced losses of fish and wildlife resources, a HEP analysis was performed on the area selected for management. The analysis initially involved rating the existing habitat quality of the area proposed for management, using the same evaluation species used in the HEP analysis of project impacts. Subsequently, the analysis was expanded to include an estimate of the most probable future without-management condition and an estimate of the future quality and quantity of habitat in the area under a proposed management program. Assuming the management program yielded some benefit to fish and wildlife habitat, the difference (measured in average annual habitat units) between the future without-management condition and the future with-management condition would represent benefits which could be used to offset project-induced damages.

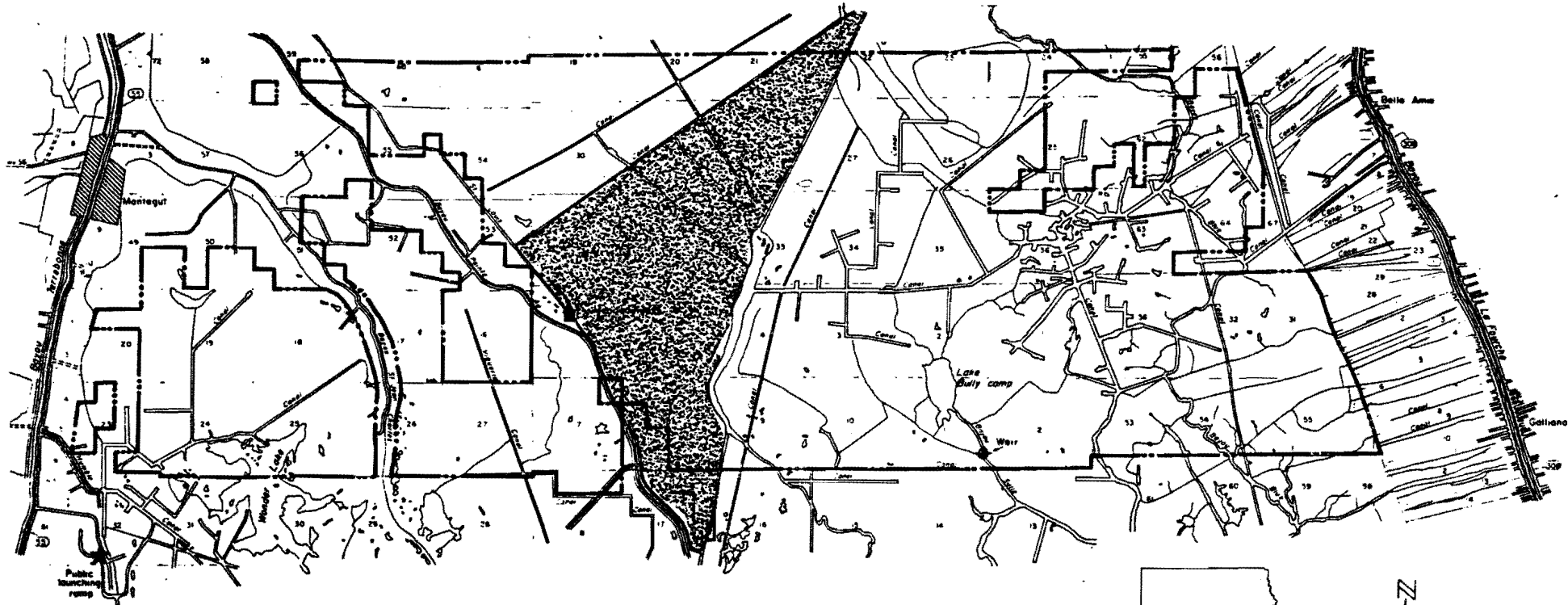
Similarly, a man-day/monetary analysis of human uses of fish and wildlife resources was performed to measure the difference between the future without- and future with-management plan for the mitigation area. Any human-use benefits (measured in man-days and/or dollars) generated from the mitigation plan could be used to mitigate losses in those values which resulted from implementation of the hurricane protection project.

In the March 1983 Draft Fish and Wildlife Coordination Act Report, the FWS assessed the anticipated success of the proposed mitigation plan over the entire 4,600-acre area being proposed for management. At that time, the FWS analysis assumed that NODCE would be implementing the entire management program (including the construction of 3 weirs and a levee system to reduce saltwater intrusion into the mitigation area). Subsequently, as a result of the urgent need to reduce habitat deterioration within the proposed mitigation area, the LDWF has had two of the weirs constructed by private interests as mitigation for Federally-permitted activities and has attempted to maintain a low-level levee system in critical areas along the perimeter of the mitigation area to attempt to minimize saltwater intrusion. Implementation of portions of the management plan by the LDWF has caused the need to reassess the number of benefits to be received by NODCE for completing and maintaining the program.

### Baseline and Future Without-Management Conditions of Mitigation Area

The area selected for management as mitigation is an approximately 4,600-acre portion of the Pointe-au-Chien Wildlife Management Area (Figure 3). The United Gas Pipeline borders the area on the northwest; the St. Louis Canal and Bayou Pointe-au-Chien form the southwestern border; and Grand Bayou Canal, Grand Bayou, and Cutoff Canal form the eastern border of the unit (Figure 4). To allow an accurate assessment of the credit to be received by NODCE for completing the management plan partially initiated by the LDWF, as indicated in the preceding paragraph, the mitigation area was divided into four management units as indicated in Figure 4.

Using the FWS's HEP (1976 version), habitat quality and quantity were established for baseline and future without-management conditions within



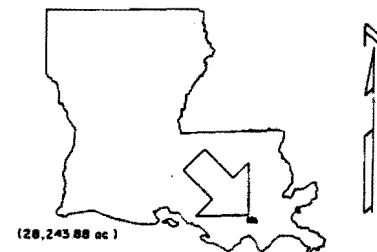
LEGEND

- |              |                       |
|--------------|-----------------------|
| --- Boundary | — Improved road       |
| ~ Streams    | - - - Unimproved road |
| — Canal      |                       |

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# POINTE AU CHIEN WILDLIFE MANAGEMENT AREA

Scale  
0 1 2  
Miles



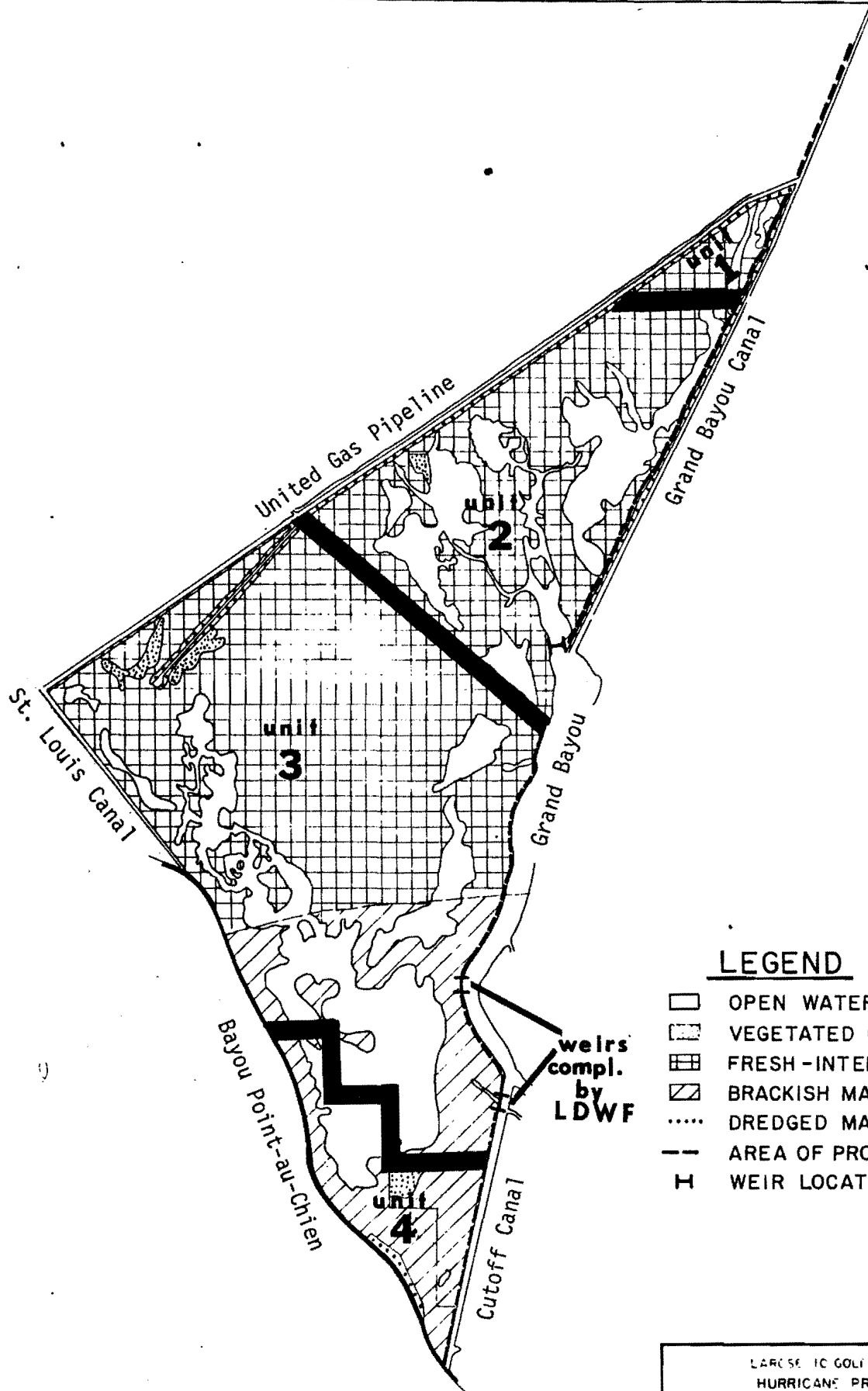
— mitigation area

LAROSE TO GOLDEN MEADOW, LOUISIANA  
HURRICANE PROTECTION PROJECT  
PROPOSED MITIGATION PLAN  
MANAGEMENT AREA

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS

AUGUST 1982

Figure 3



### LEGEND

- OPEN WATER
- ▨ VEGETATED OPEN WATER
- ▧ FRESH-INTERMEDIATE MARSH
- ▩ BRACKISH MARSH
- ..... DREDGED MATERIAL DISPOSAL
- AREA OF PROPOSED ACTION
- H WEIR LOCATIONS

SCALE IN FEET  
2000 0 2000 4000 6000

A-39

LAROSE TO GOLFEN MEADOW, LOUISIANA  
HURRICANE PROTECTION PROJECT

### PROPOSED MITIGATION PLAN STUDY AREA

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS

AUGUST 1982

the proposed mitigation area. The same evaluation species were used in this analysis as those used in evaluating fish and wildlife losses due to the project. Four habitat types (i.e., fresh/intermediate marsh, brackish/saline marsh, open water, and upland developed) were identified within the mitigation area.

Randomly selected points within these habitat types were chosen as sample sites. Biologists representing the NODCE, the LDWF, and the FWS visited the sites and rated the habitat suitability (habitat unit value) of the various habitats for the selected evaluation species. Field data sheets for specific sample sites and assigned baseline-habitat unit values are available for review at the Lafayette, Louisiana, field office of the FWS. The habitat unit values of similar habitat were assumed to be the same for all four units and to remain constant in the future without-management condition. Those values are listed in Table 12.

Table 12. Habitat unit values of all four units within the mitigation area for baseline and future without-management condition

| <u>Habitat type</u>      | <u>Habitat unit value</u> |
|--------------------------|---------------------------|
| Fresh/Intermediate Marsh | 57.25                     |
| Brackish/Saline Marsh    | 39.00                     |
| Open Water               | 25.00                     |
| Upland                   | 7.50                      |

As a result of many factors, of which subsidence and saltwater intrusion are the most significant, habitats in the mitigation area are changing at a rapid rate. Information developed by Wicker (1980) and habitat maps developed for the years 1956 and 1978 were used to predict future without-management habitat acreages within the mitigation area over the life of the project. It was assumed that future habitat changes within all units of the mitigation area would continue to occur at the rate that occurred during the period 1956 to 1978 within the entire area covered by the 1:24,000 scale Lake Bully Camp, Louisiana, topographic map (a majority of the mitigation area is contained within this map). Based on that assumption, future without-management habitat changes within each unit of the mitigation area were computed over the 100-year project life (Tables 13-16). Target years in units 1 and 2 differ slightly from those in units 3 and 4 due to complications in the analysis of future with-management conditions, brought about by partial implementation of the management program by the LDWF. This will be discussed in greater detail in subsequent paragraphs.

#### Management Program for Mitigation Area

The ultimate goal in managing the mitigation area is to increase fish and wildlife habitat quality and/or quantity above that which would result without management. Within the selected mitigation area, many of the

Table 13. Comparison of future without-management (FWOM) and future with-management (FWM) habitat acreages in Unit 1 of the Pointe-au-Chien mitigation area

| Target Yr/Condition |      | Fresh/<br>Intermediate<br>Marsh | Brackish/<br>Saline<br>Marsh | Open<br>Water | Upland | Total |
|---------------------|------|---------------------------------|------------------------------|---------------|--------|-------|
| 1984                | FWOM | 26                              | 4                            | 18            | 2      | 50    |
|                     | FWM  | 26                              | 4                            | 18            | 2      | 50    |
| 1985                | FWOM | 25                              | 5                            | 18            | 2      | 50    |
|                     | FWM  | 26                              | 4                            | 18            | 2      | 50    |
| 1990                | FWOM | 21                              | 7                            | 20            | 2      | 50    |
|                     | FWM  | 30                              | 0                            | 18            | 2      | 50    |
| 1995                | FWOM | 18                              | 9                            | 21            | 2      | 50    |
|                     | FWM  | 30                              | 0                            | 18            | 2      | 50    |
| 2010                | FWOM | 11                              | 13                           | 23            | 2      | 49    |
|                     | FWM  | 29                              | 0                            | 18            | 2      | 49    |
| 2035                | FWOM | 5                               | 15                           | 27            | 3      | 50    |
|                     | FWM  | 28                              | 0                            | 19            | 3      | 50    |
| 2085                | FWOM | 1                               | 13                           | 33            | 3      | 50    |
|                     | FWM  | 26                              | 0                            | 20            | 4      | 50    |
| Annual-<br>ized     | FWOM | 8                               | 13                           | 26            | 3      | 51    |
|                     | FWM  | 28                              | 0                            | 19            | 3      | 50    |
| Net change          |      | +20                             | -13                          | -7            | 0      |       |

Note: Totals vary slightly due to rounding errors.

Table 14. Comparison of future without-management (FWOM) and future with-management (FWM) habitat acreages in Unit 2 of the Pointe-au-Chien mitigation area

| Target Yr/Condition | Fresh/<br>Intermediate<br>Marsh | Brackish/<br>Saline<br>Marsh | Open<br>Water | Upland | Total |
|---------------------|---------------------------------|------------------------------|---------------|--------|-------|
| 1984 FWOM           | 783                             | 125                          | 525           | 60     | 1,493 |
| FWM                 | 783                             | 125                          | 525           | 60     | 1,493 |
| 1985 FWOM           | 758                             | 144                          | 531           | 61     | 1,494 |
| FWM                 | 761                             | 113                          | 522           | 98     | 1,494 |
| 1990 FWOM           | 645                             | 223                          | 562           | 63     | 1,493 |
| FWM                 | 867                             | 0                            | 525           | 101    | 1,493 |
| 1995 FWOM           | 548                             | 287                          | 593           | 65     | 1,493 |
| FWM                 | 861                             | 0                            | 528           | 105    | 1,494 |
| 2010 FWOM           | 338                             | 409                          | 677           | 70     | 1,494 |
| FWM                 | 842                             | 0                            | 537           | 115    | 1,494 |
| 2035 FWOM           | 151                             | 468                          | 797           | 77     | 1,493 |
| FWM                 | 811                             | 0                            | 552           | 131    | 1,494 |
| 2085 FWOM           | 30                              | 395                          | 980           | 88     | 1,493 |
| FWM                 | 752                             | 0                            | 579           | 163    | 1,494 |
| Annual- FWOM        | 243                             | 397                          | 777           | 76     | 1,493 |
| ized FWM            | 809                             | 4                            | 551           | 130    | 1,494 |
| Net Change          | +566                            | -393                         | -226          | +54    |       |

Note: Totals vary slightly due to rounding errors.



Table 15. Comparison of future without-management (FWOM) and future with-management (FWM) habitat acreages in Unit 3 of the Pointe-au-Chien mitigation area

| Target Yr/Condition | Fresh/<br>Intermediate<br>Marsh | Brackish/<br>Saline<br>Marsh | Open<br>Water | Upland | Total |
|---------------------|---------------------------------|------------------------------|---------------|--------|-------|
| 1984 FWOM           | 1,377                           | 490                          | 790           | 46     | 2,703 |
| 1984 FWM            | 1,377                           | 490                          | 790           | 46     | 2,703 |
| 1985 FWOM           | 1,358                           | 479                          | 789           | 78     | 2,704 |
| 1985 FWM            | 1,358                           | 479                          | 789           | 78     | 2,704 |
| 1987 FWOM           | 1,354                           | 478                          | 792           | 81     | 2,705 |
| 1987 FWM            | 1,354                           | 478                          | 792           | 81     | 2,705 |
| 1992 FWOM           | 1,064                           | 695                          | 893           | 52     | 2,704 |
| 1992 FWM            | 1,818                           | 0                            | 798           | 88     | 2,704 |
| 2010 FWOM           | 594                             | 941                          | 1,103         | 65     | 2,703 |
| 2010 FWM            | 1,769                           | 0                            | 821           | 114    | 2,704 |
| 2035 FWOM           | 265                             | 1,007                        | 1,352         | 80     | 2,704 |
| 2035 FWM            | 1,704                           | 0                            | 851           | 148    | 2,703 |
| 2085 FWOM           | 53                              | 820                          | 1,728         | 103    | 2,704 |
| 2085 FWM            | 1,581                           | 0                            | 909           | 214    | 2,704 |
| Annual- FWOM        | 433                             | 882                          | 1,309         | 79     | 2,703 |
| ized FWM            | 1,681                           | 26                           | 850           | 146    | 2,703 |
| Net Change          | +1,248                          | -856                         | -459          | +67    |       |

Note: Totals vary slightly due to rounding errors.

Table 16. Comparison of future without-management (FWOM) and future with-management (FWM) habitat acreages in Unit 4 of the Pointe-au-Chien mitigation area

| Target Yr/Condition |      | Fresh/<br>Intermediate<br>Marsh | Brackish/<br>Saline<br>Marsh | Open<br>Water | Upland | Total |
|---------------------|------|---------------------------------|------------------------------|---------------|--------|-------|
| 1984                | FWOM | 0                               | 334                          | 17            | 1      | 352   |
|                     | FWM  | 0                               | 334                          | 17            | 1      | 352   |
| 1985                | FWOM | 0                               | 320                          | 15            | 16     | 351   |
|                     | FWM  | 0                               | 320                          | 15            | 16     | 351   |
| 1987                | FWOM | 0                               | 319                          | 15            | 17     | 351   |
|                     | FWM  | 0                               | 319                          | 15            | 17     | 361   |
| 1992                | FWOM | 0                               | 314                          | 35            | 2      | 351   |
|                     | FWM  | 317                             | 0                            | 17            | 18     | 352   |
| 2010                | FWOM | 0                               | 274                          | 72            | 4      | 350   |
|                     | FWM  | 308                             | 0                            | 21            | 22     | 351   |
| 2035                | FWOM | 0                               | 227                          | 117           | 7      | 351   |
|                     | FWM  | 297                             | 0                            | 26            | 28     | 351   |
| 2085                | FWOM | 0                               | 156                          | 184           | 11     | 351   |
|                     | FWM  | 275                             | 0                            | 36            | 40     | 351   |
| Annual-<br>ized     | FWOM | 0                               | 234                          | 109           | 7      | 350   |
|                     | FWM  | 279                             | 17                           | 26            | 28     | 351   |
| Net Change          |      | +279                            | -217                         | -83           | +21    |       |

Note: Totals vary slightly due to rounding errors.

natural and man-made levees have deteriorated, allowing rapid marsh degradation from saltwater intrusion. Extensive petroleum and sulfur mining-related boat traffic within perimeter waterways has accelerated erosion of canal banks and rapid breakup of the marsh, especially on the eastern border of the mitigation area. Compounding the problem of saltwater intrusion is the gradual loss of marsh via subsidence, a problem which is generally plaguing all of coastal Louisiana.

In order to slow marsh loss and/or conversion to more saline marsh types (estimated to be occurring at an average rate of 3 percent per year in the proposed mitigation area), structural features are being proposed for the mitigation area. These features involve levee construction and the installation of water control structures at strategic locations around the perimeter of the mitigation area.

The first element of the mitigation plan involves the construction of a levee along Grand Bayou and Cutoff Canal and improvement of an existing levee along the Grand Bayou Canal, forming the eastern border of the unit (Figure 4). The levee would be set back 50 feet from the edge of the waterways. Initially, the levee would be built to a height of 6 feet mean sea level, with an expected subsidence of 2 feet. According to NODCE data, the 4 foot mean sea level elevation would be sufficient to protect against most incoming high tides. Additional lifts to be added to the levee, plus continued maintenance, would extend the functional life of the levee to 100 years.

The mitigation plan also involves the installation of three fixed-level weirs along the newly constructed levee. The weirs would have a crest elevation of 0.6 feet below marsh-floor elevation. These weirs would maintain a minimum water level in the mitigation area and buffer saltwater intrusion from normal tidal exchange, while still allowing movement of estuarine organisms into and out of the marsh during above-normal tidal surges. The northernmost weir would be located near the confluence of Grand Bayou and the Grand Bayou Canal across an opening 85 feet wide. The second (middle) weir would be along Grand Bayou, about midway along the levee, across an opening 25 feet wide. The southern-most weir would be along Cutoff Canal, approximately 4,000 feet south of the second weir, across an opening 35 feet wide. The middle and southern-most weirs have already been constructed by the LDWF.

With those features in place, water levels and salinities are expected to stabilize (Chabreck, Hoar, and Larrick 1978) and, over the long term, salinities are expected to decrease. Within the first growing season after construction, unvegetated open water areas would begin to support aquatic vegetation such as Eurasian watermilfoil, fanwort, and widgeongrass (personal communication, August 17, 1982, Allan Ensminger, formerly with the LDWF). As salinities in the marsh area decrease, and with improved water-level control, annual grasses (e.g., wild millet and fall panicum) and sedges (e.g., leafy threesquare) would begin to invade.

Utilization of marsh and open water in the mitigation area by fish and wildlife would increase. Stabilized water levels would improve habitat conditions for alligators and furbearers such as nutria, muskrat, and river otter by allowing water to remain in interior canals even during drought conditions and by increasing the production of desirable food plants (Chabreck and Hoffpauir 1965). Wintering waterfowl would greatly benefit

from the stabilized water levels and increased submergent and emergent aquatic vegetation (Spiller and Chabreck 1975). Although weirs may hinder the movement of certain estuarine species (e.g., croakers and penaeid shrimp) to and from marsh areas (Herke 1978), the benefits from the proposed weirs in reducing marsh loss should greatly outweigh such anticipated problems. Ultimately hunters, fishermen, and trappers would greatly benefit from increased usage of the mitigation area by fish and wildlife and by the maintenance of minimum water levels which would facilitate access within the area.

#### Future With-Management Condition of Mitigation Area

In order to estimate the benefit of the proposed mitigation plan, certain basic assumptions were made relative to anticipated changes in habitat quality and quantity that would result from the proposed management plan. It was assumed that only the portion of the habitat loss attributable to saltwater intrusion would be halted by implementation of the proposed management scheme. Habitat loss due to regional subsidence would continue, unaffected by the proposed management program. Accordingly, to project habitat losses due to subsidence within the mitigation area in the future with-management condition, the rate of habitat loss that occurred from 1956 to 1978 within an area located northwest of the mitigation area (included in the 1:24,000-scale Bourg, Louisiana, topographic map) was applied to the mitigation area. That area is believed to be experiencing land loss due to subsidence and mineral exploration, only. It was concluded that projecting habitat loss due to the exploration of petroleum products could be more accurately accomplished by using historic trends within the 1:24,000-scale Lake Bully Camp, Louisiana, topographic map (the map which contains the bulk of the mitigation area). By applying those loss rates, and estimates of habitat benefits to accrue from management (discussed below), anticipated changes in habitat acreages within the four units of the mitigation area for the future with-management condition were tabulated (Tables 13-16).

Based on a January 3, 1985, letter from the LDWF to NODCE, we have concluded that portions (i.e., the two southern-most weirs and intermittent levee maintenance) of the mitigation plan that the LDWF has already implemented will affect credits to be received by NODCE in units 3 and 4 (Figure 4). For those two units the following target years were used in the analysis (Tables 15 and 16):

1984 - baseline year

1985 - year of LDWF completion of the structural mitigation features affecting units 3 and 4

1987 - year through which the LDWF will receive all credit for benefits generated in units 3 and 4

1992 - year in which the LDWF ceases to receive credit for partial implementation of structural mitigation features in 1985

2010 and 2035 - increments included to allow comparison between FWOM and FWM conditions

2085 - year in which functional project life ends

It was also concluded that units 1 and 2 (Figure 4) will not benefit from those features of the mitigation plan that LDWF has already implemented. Accordingly, for those two units (Tables 13 and 14), the same target years used in the March 1983 Draft Fish and Wildlife Coordination Act Report were used in this reanalysis:

1984 - baseline year

1985 - anticipated year of completion of the structural mitigation features affecting units 1 and 2

1990 - year in which increases (defined in following paragraphs) in HUV's are anticipated for the fresh/intermediate marsh and open water habitats

1995, 2010, and 2035 - increments included to allow comparison between FWOM and FWM conditions

2085 - year in which functional project life ends

It was assumed (based on the previous discussion of anticipated habitat changes under management) that habitat quality (HUV) of the fresh/intermediate marsh and open water areas within units 1 and 2 would improve within five years (i.e., 1990) after completion of the structural mitigation features. Within units 3 and 4, the HUV of the fresh/intermediate marsh and open water areas was not assumed to improve until 1992, because the LDWF is not expected to be able to maintain the Grand Bayou/Cutoff Canal levee system in the proper condition to produce habitat quality improvements. It was assumed that the HUV for fresh/intermediate marsh would be 61.25 (the average HUV of intermediate marsh sites sampled--reference section titled Baseline and Future Without-Management Conditions of Mitigation Area) by 1990 in units 1 and 2 and by 1992 in units 3 and 4 (Table 17). Based on a description of anticipated increases in aquatic vegetation and reduced salinities in open water areas, provided by Allan Ensminger (personal communication, August 17, 1982), formerly with the LDWF, it was assumed that the HUV for open water would reach 44.60 by 1990 in units 1 and 2 and by 1992 in units 3 and 4 (Table 17). The HUV's of remaining habitats (i.e., brackish/saline marsh and upland) were assumed to remain constant over the life of the mitigation project. Finally it was assumed that, by 1990 in units 1 and 2 and by 1992 in units 3 and 4, all remaining brackish/saline marsh would convert to fresh/intermediate marsh (Tables 13-16.)

Table 17. Habitat unit values of mitigation area for baseline/future without-management (FWOM) and future with-management (FWM) conditions.

| <u>Habitat type</u>      | <u>Baseline/FWOM</u> | <u>FWM</u> |
|--------------------------|----------------------|------------|
| Fresh/Intermediate Marsh | 57.25                | 61.25      |
| Brackish/Saline Marsh    | 39.00                | 39.00      |
| Open Water               | 25.00                | 44.60      |
| Upland                   | 7.50                 | 7.50       |

The product of the HUV's (Table 17) and the habitat acreages (Tables 13 - 16) in the future without- and future with-management conditions, respectively, yielded a measure (HU's) of the habitat quality and quantity under either condition (Tables 18 - 21). Assuming that the future with-management condition produces HU's in excess of that available in the future without-management condition, the net annualized difference in HU's between these two conditions is attributable to the management program implemented. In this case, completion of the mitigation plan would yield a total net increase of 82,889 average annual habitat units (Table 22).

A man-day/monetary analysis of the future without- and future with-management scenario of the proposed mitigation area was also performed (Table 23). This analysis measured the tangible impacts upon human uses of fish, wildlife, and related recreational resources of the mitigation area. It was assumed that per/acre man-day/monetary estimates for various uses remained constant under the future without-management condition. Per/acre man-day estimates for the future with-management condition were assumed to follow the same trend as the HUV changes projected for that condition. In other words, since the brackish/saline marsh HUV did not increase with management, the per/acre man-day estimates were assumed to remain constant under that scenario over project life. Since the HUV of fresh/intermediate marsh was estimated to increase by 7 percent under the with-management scenario, the per/acre man-day estimate was also assumed to increase by that degree over project life. That same rationale was used in computing changes in fur harvest and wildlife-oriented recreation values for the future with- and future without-management conditions. In estimating the impact of management on sport fishing and commercial fishery harvest, it was assumed that harvest was directly related to the available marsh acreage (annualized) over project life.

Due to the proximity of the proposed mitigation area to the project area, baseline estimates of commercial fishery and fur harvest rates and sport fishing and hunting and wildlife-oriented recreation potentials for the project area (Tables 2, 3, 4, 5, and 6) were applied to the mitigation area. The unit monetary values of sport and commercial fish and wildlife harvests and recreational uses were assumed to remain constant over project life.

### CONCLUSIONS

Construction of the proposed hurricane protection levee would cause losses in wetland habitats substantially in excess of those expected to occur in the future without-project condition. The proposed project should not adversely impact endangered or threatened species. The project will cause a net annualized loss of 822 acres of marsh and 227 acres of forested wetlands and, thus, have a significant adverse impact on associated fish and wildlife. The HEP analysis of project impacts on those resources indicated a net annualized loss of 82,931 HU's. Measured in conventional, monetary terms, the project would cause an average annual loss of 540,000 pounds of commercial fishery harvest valued at over \$144,000; 3,286 man-days of sport fishing valued at over \$13,000; 930 man-days of sport hunting valued at nearly \$9,000; over \$2,600 in fur harvest; and over \$1,900 in wildlife-oriented recreation.

Table 18. Comparison of future without-management (FWOM) and future with-management (FWM) habitat units within Unit 1 of the Pointe-au-Chien mitigation area

| Target Yr/Condition |      | Fresh/<br>Intermediate<br>Marsh | Brackish/<br>Saline<br>Marsh | Open<br>Water | Upland | Total |
|---------------------|------|---------------------------------|------------------------------|---------------|--------|-------|
| 1984                | FWOM | 1,489                           | 156                          | 450           | 15     | 2,110 |
|                     | FWM  | 1,489                           | 156                          | 450           | 15     | 2,110 |
| 1985                | FWOM | 1,431                           | 195                          | 450           | 15     | 2,091 |
|                     | FWM  | 1,489                           | 156                          | 450           | 15     | 2,110 |
| 1990                | FWOM | 1,202                           | 273                          | 500           | 15     | 1,990 |
|                     | FWM  | 1,838                           | 0                            | 803           | 15     | 2,656 |
| 1995                | FWOM | 1,031                           | 351                          | 525           | 15     | 1,922 |
|                     | FWM  | 1,838                           | 0                            | 803           | 15     | 2,656 |
| 2010                | FWOM | 630                             | 507                          | 575           | 15     | 1,727 |
|                     | FWM  | 1,776                           | 0                            | 803           | 15     | 2,594 |
| 2035                | FWOM | 286                             | 585                          | 675           | 23     | 1,569 |
|                     | FWM  | 1,715                           | 0                            | 847           | 23     | 2,585 |
| 2085                | FWOM | 57                              | 507                          | 825           | 23     | 1,412 |
|                     | FWM  | 1,593                           | 0                            | 892           | 30     | 2,515 |
| Annual-<br>ized     | FWOM | 457                             | 498                          | 661           | 20     | 1,635 |
|                     | FWM  | 1,707                           | 5                            | 829           | 22     | 2,564 |
| Net Change          |      | +1,250                          | -493                         | +168          | +2     | +929  |

Table 19. Comparison of future without-management (FWOM) and future with-management (FWM) habitat units within Unit 2 of the Pointe-au-Chien mitigation area

| Target Yr/Condition |      | Fresh/<br>Intermediate<br>Marsh | Brackish/<br>Saline<br>Marsh | Open<br>Water | Upland | Total   |
|---------------------|------|---------------------------------|------------------------------|---------------|--------|---------|
| 1984                | FWOM | 44,827                          | 4,875                        | 13,125        | 450    | 63,277  |
|                     | FWM  | 44,827                          | 4,875                        | 13,125        | 450    | 63,277  |
| 1985                | FWOM | 43,396                          | 5,616                        | 13,275        | 458    | 62,745  |
|                     | FWM  | 43,567                          | 4,407                        | 13,050        | 735    | 61,759  |
| 1990                | FWOM | 36,926                          | 8,697                        | 14,050        | 473    | 60,146  |
|                     | FWM  | 53,104                          | 0                            | 23,415        | 758    | 77,277  |
| 1995                | FWOM | 31,373                          | 11,193                       | 14,825        | 488    | 57,879  |
|                     | FWM  | 52,736                          | 0                            | 23,549        | 788    | 77,073  |
| 2010                | FWOM | 19,351                          | 15,951                       | 16,925        | 525    | 52,752  |
|                     | FWM  | 51,573                          | 0                            | 23,950        | 863    | 76,386  |
| 2035                | FWOM | 8,645                           | 18,252                       | 19,925        | 578    | 47,400  |
|                     | FWM  | 49,674                          | 0                            | 24,619        | 983    | 75,276  |
| 2085                | FWOM | 1,718                           | 15,405                       | 24,500        | 660    | 42,283  |
|                     | FWM  | 46,060                          | 0                            | 25,823        | 1,223  | 73,106  |
| Annual-<br>ized     | FWOM | 13,912                          | 15,478                       | 19,436        | 569    | 49,396  |
|                     | FWM  | 49,423                          | 155                          | 24,219        | 978    | 74,775  |
| Net Change          |      | +35,511                         | -15,323                      | +4,783        | +409   | +25,379 |



Table 20. Comparison of future without-management (FWOM) and future with-management (FWM) habitat units within Unit 3 of the Pointe-au-Chien mitigation area

| Target Yr/Condition |      | Fresh/<br>Intermediate<br>Marsh | Brackish/<br>Saline<br>Marsh | Open<br>Water | Upland | Total   |
|---------------------|------|---------------------------------|------------------------------|---------------|--------|---------|
| 1984                | FWOM | 78,833                          | 19,110                       | 19,750        | 345    | 118,038 |
|                     | FWM  | 78,833                          | 19,101                       | 19,750        | 345    | 118,038 |
| 1985                | FWOM | 77,746                          | 18,681                       | 19,725        | 585    | 116,737 |
|                     | FWM  | 77,746                          | 18,681                       | 19,725        | 585    | 116,737 |
| 1987                | FWOM | 77,517                          | 18,642                       | 19,800        | 608    | 116,567 |
|                     | FWM  | 77,517                          | 18,642                       | 19,800        | 608    | 116,567 |
| 1992                | FWOM | 60,914                          | 27,105                       | 22,325        | 390    | 110,734 |
|                     | FWM  | 111,353                         | 0                            | 35,291        | 660    | 147,604 |
| 2010                | FWOM | 34,007                          | 36,699                       | 27,575        | 488    | 98,769  |
|                     | FWM  | 108,351                         | 0                            | 35,617        | 855    | 145,823 |
| 2035                | FWOM | 15,171                          | 39,273                       | 33,800        | 600    | 88,844  |
|                     | FWM  | 104,370                         | 0                            | 37,955        | 1,110  | 143,435 |
| 2085                | FWOM | 3,034                           | 31,980                       | 43,200        | 773    | 78,987  |
|                     | FWM  | 96,836                          | 0                            | 40,541        | 1,605  | 138,982 |
| Annual-<br>ized     | FWOM | 24,790                          | 34,414                       | 32,731        | 594    | 92,529  |
|                     | FWM  | 102,695                         | 1,018                        | 37,051        | 1,098  | 141,863 |
| Net Change          |      | +77,905                         | -33,396                      | +4,320        | +504   | +49,334 |

Table 21. Comparison of future without-management (FWOM) and future with-management (FWM) habitat units within Unit 4 of the Pointe-au-Chien mitigation area

| Target Yr/Condition |      | Fresh/<br>Intermediate<br>Marsh | Brackish/<br>Saline<br>Marsh | Open<br>Water | Upland | Total  |
|---------------------|------|---------------------------------|------------------------------|---------------|--------|--------|
| 1984                | FWOM | 0                               | 13,026                       | 425           | 8      | 13,459 |
|                     | FWM  | 0                               | 13,026                       | 425           | 8      | 13,459 |
| 1985                | FWOM | 0                               | 12,480                       | 375           | 120    | 12,975 |
|                     | FWM  | 0                               | 12,480                       | 375           | 120    | 12,975 |
| 1987                | FWOM | 0                               | 12,441                       | 375           | 128    | 12,944 |
|                     | FWM  | 0                               | 12,441                       | 375           | 128    | 12,944 |
| 1992                | FWOM | 0                               | 12,246                       | 875           | 15     | 13,136 |
|                     | FWM  | 19,416                          | 0                            | 758           | 135    | 20,309 |
| 2010                | FWOM | 0                               | 10,686                       | 1,800         | 30     | 12,516 |
|                     | FWM  | 18,865                          | 0                            | 937           | 165    | 19,967 |
| 2035                | FWOM | 0                               | 8,853                        | 2,925         | 53     | 11,831 |
|                     | FWM  | 18,191                          | 0                            | 1,160         | 210    | 19,561 |
| 2085                | FWOM | 0                               | 6,084                        | 4,600         | 83     | 10,767 |
|                     | FWM  | 16,844                          | 0                            | 1,606         | 300    | 18,750 |
| Annual-<br>ized     | FWOM | 0                               | 9,143                        | 2,728         | 55     | 11,926 |
|                     | FWM  | 17,150                          | 681                          | 1,135         | 209    | 19,175 |
| Net Change          |      | +17,150                         | -8,462                       | -1,593        | +154   | +7,249 |

Table 22. Comparison of future without-management (FWOM) and future with-management (FWM) average annual habitat units within the Pointe-au-Chien mitigation area

| Unit/Condition |      | Fresh/<br>Intermediate<br>Marsh | Brackish/<br>Saline<br>Marsh | Open<br>Water | Upland | Total   |
|----------------|------|---------------------------------|------------------------------|---------------|--------|---------|
| 1              | FWOM | 457                             | 498                          | 661           | 20     | 1,635   |
|                | FWM  | 1,707                           | 5                            | 829           | 22     | 2,563   |
| 2              | FWOM | 13,912                          | 15,478                       | 19,436        | 569    | 49,396  |
|                | FWM  | 49,423                          | 155                          | 24,219        | 978    | 74,775  |
| 3              | FWOM | 24,790                          | 34,414                       | 32,731        | 594    | 92,529  |
|                | FWM  | 102,695                         | 1,018                        | 37,051        | 1,098  | 141,862 |
| 4              | FWOM | 0                               | 9,143                        | 2,728         | 55     | 11,926  |
|                | FWM  | 7,150                           | 681                          | 1,135         | 209    | 19,175  |
| TOTAL          | FWOM | 39,159                          | 59,533                       | 55,556        | 1,238  | 155,486 |
|                | FWM  | 170,975                         | 1,859                        | 63,234        | 2,307  | 238,375 |
| Net Change     |      | +131,816                        | -57,674                      | +7,678        | +1,069 | +82,889 |

Table 23. Comparison of man-day/monetary values for future-without management (FWOM) and future-with management (FWM) habitat conditions within the selected mitigation area for selected fish and wildlife related parameters

| Habitat Types                                  | Acres <sup>1</sup> | Commercial <sup>2</sup><br>Fishery<br>Harvest<br>(millions of<br>pounds) | Commercial <sup>3</sup><br>Fishery<br>Value<br>(dollars) | Sport <sup>4</sup><br>Fishing<br>Use<br>(man-days) | Sport <sup>5</sup><br>Fishing<br>Value<br>(dollars) | Sport <sup>6</sup><br>Hunting<br>Potential<br>(man-days) | Sport <sup>7</sup><br>Hunting<br>Value<br>(dollars) | Fur Catch <sup>8</sup><br>Value<br>(dollars) | Wildlife <sup>9</sup><br>Oriented<br>Recreation<br>Value(dollars) |
|--|--------------------|--|--|--|---|--|---|--|---|
| Fresh/Intermediate Marsh                       |                    |  |  |  |   |  |   |  |   |
| FWOM(Annualized)                               | 684                | 0.44   | 118,800  | 2,736  | 11,218  | 799  | 8,728   | 3,735  | 1,012   |
| FWM  | 2,797              | 1.82   | 491,400  | 11,188   | 45,871  | 3,496  | 35,690  | 16,341                                       | 4,429   |
| Net change                                     | +2,133             | +1.38  | +372,600   | +8,452   | +34,653   | +2,697   | +26,926   | +12,606                                      | +3,417  |
| Brackish/Saline Marsh                          |                    |  |  |  |   |  |   |  |   |
| FWOM(Annualized)                               | 1,526              | 0.99   | 267,300  | 6,104  | 25,026  | 1,198  | 11,231  | 2,228  | 2,258   |
| FWM(Annualized)                                | 47                 | 0.03   | 8,100  | 188  | 771   | 37   | 346   | 69   | 70  |
| Net Change                                     | -1,479             | -0.96  | -259,200   | -5,916   | -24,255   | -1,161   | -10,885   | -2,159                                       | -2,188  |
| Upland   |                    |  |  |  |   |  |   |  |   |
| FWOM(Annualized)                               | 165                | -  | -  | -  | -   | 83   | 634   | 226  | 285   |
| FWM(Annualized)                                | 307                | -  | -  | -  | -   | 154  | 1,179   | 421  | 531   |
| Net change                                     | +142               | -  | -  | -  | -   | +71  | +545  | +195   | +246  |
| Total Net Annual<br>Change Under<br>Management | -                  | -0.42  | +113,400   | +2,536   | +10,398   | +1,607   | +16,622   | +10,642                                      | +1,475  |

1. From Tables 13 thru 16. It was assumed that commercial estuarine-dependent finfish and shellfish yields are more closely related to marsh acreage than open water. Accordingly, changes in open water acreage were not used to predict changes in estuarine-dependent fishery yields.
2. Product of 650.39 pounds of commercial harvest/acre of marsh (generated in Table 2) and annualized marsh acreage.
3. Product of \$0.27/pound (generated in Table 2) and pounds of commercial fishery harvest; based on assumptions in text, upland habitat would not contribute to commercial fishery harvest.
4. Product of 4 man-days per acre usage figure (from Table 2) and the marsh acreage available.
5. Product of \$4.10 (from Table 2) and man-days of sport fishing use.
6. Derived by multiplying total man-day per acre figure from Table 4 by annualized acres available; for FWM in fresh/intermediate marsh the man-day per acre figure was increased by 0.07 as per rationale in text; for upland habitat, man-day per acre figure was assumed to be equal to FWOP man-day value for forested wetlands.
7. Derived by multiplying value per acre figure from Table 6 by annualized acres available; for upland habitat, value per acre figure was assumed to be equal to forested wetlands value.
8. Derived by multiplying total value per acre figure from Table 5 by annualized acres available; for FWM in fresh/intermediate marsh, the total value per acre figure was increased by 0.07 as per rationale in text; for upland habitat, the total value per acre figure was assumed to be equal to forested wetlands value.
9. Derived by multiplying value per acre figure from Table 6 by annualized acres available; for FWM in fresh/intermediate marsh the value per acres figure was increased by 0.07 as per rationale in text; for upland habitat, the value per acre figure was assumed to be equal to forested wetlands value.

Project modifications to eliminate these adverse impacts to fish and wildlife resources have been deemed impractical or undesirable from the view point of the construction agency and/or the local sponsors. Therefore, the only acceptable alternative to ensure equal consideration of fish and wildlife resources would be to provide off-site mitigation for those unavoidable project-induced impacts. Consistent with the mitigation policy established by the FWS, a portion of the publicly-owned Pointe-au-Chien Wildlife Management Area has been selected for management to improve habitat quality and/or quantity above that which would occur in the future. If the management program were successful, this improved condition, measured in both HU's and in human-use values, would serve to compensate for unavoidable project damages to similar habitats.

The HEP analysis of the proposed mitigation area indicated that implementation, operation, and maintenance of a sound, structural management program could produce an average annual net increase of 82,889 average annual habitat units (Table 22). That excess would reasonably compensate for the project-induced annual loss of 82,931 HU's. Analysis of the impact of the management program on human-use values (i.e., man-day/monetary analysis) indicated that the program would vary in its ability to compensate for the project-induced losses of those values (Tables 10, 11, and 23). Approximately 420,000 pounds of the over 540,000-pound annual loss of commercial fishery harvest and only 2,500 of the nearly 3,300 man-days of sport fishing lost annually as a result of the project would be replaced via the mitigation plan. Even after implementation of the proposed management plan, then, a significant deficit in coastal Louisiana's sport fishing potential and commercial fishery harvest would exist due to implementation of the hurricane protection project. Conversely, sport hunting potential and its attendant monetary value, produced via the mitigation plan, would almost double that which would be lost with project implementation. Approximately four times the loss in fur harvest value associated with the hurricane protection project would be replaced by the mitigation plan, while increased wildlife-oriented recreation values produced under the mitigation plan would be slightly below that required to fully compensate for those values lost through project construction.

It is likely that since construction of the mitigation features would significantly reduce saltwater intrusion into the mitigation area, the marshes and forested lands north of the mitigation area would be indirectly benefitted by this reduction in saltwater intrusion. However, the extent to which the area north of the mitigation area would be benefitted has not been quantified.

The FWS believes that the proposed mitigation plan, if implemented simultaneously with continued project construction, would in most respects adequately compensate for project-induced losses to fish and wildlife resources. However, in an April 22, 1983, letter of comment on the FWS's Draft Fish and Wildlife Coordination Act Report, the National Marine Fisheries Service (NMFS) noted that, based on the anticipated failure of the proposed mitigation program to fully mitigate commercial and recreational fishery resources, it "...will be necessary to adequately mitigate marine fishery project losses."

Finally, much of the Point-au-Chien Wildlife Management Area outside of the proposed mitigation area (approximately 23,000 acres) will continue to deteriorate and be lost to subsidence and erosion at an ever increasing rate. This continued marsh loss is a primary result of eliminating freshwater and sediment transport due to levee construction along the Lower Mississippi River and, in particular, elimination of Bayou Lafourche as a distributary of the Mississippi River. Therefore, it would seem appropriate to support, via project funding, enhancement of that portion of the Wildlife Management Area not proposed for inclusion under the mitigation proposal. Such enhancement is provided for via the Federal Water Project Recreation Act, Public Law 89-72, as amended. In this case, the Act would provide that initial implementation costs of the enhancement program for sport fish and wildlife resources be cost-shared on a 75 percent Federal and 25 percent non-Federal basis. In addition, non-Federal interests would assume all costs for operation, maintenance, and replacement of structural enhancement features. The FWS would support development of such an enhancement plan on Pointe-au-Chien Wildlife Management Area.

### RECOMMENDATIONS

Based on a review of the currently selected plan for the Larose to Golden Meadow, Louisiana, Hurricane Protection Project, the FWS recommends that the following measures, many of which were contained in past letter reports dealing with this project, be implemented to ensure equal consideration of fish and wildlife resources:

1. The levee south of Yankee Canal and east of Bayou Lafourche should be realigned to, as nearly as possible, follow the natural levee along Bayou Lafourche (Appendix A, Figure 2).
2. In the Clovelly Farms area (Appendix C, Figure 1):
  - a. all borrow material should be obtained from upland sources or from existing borrow canals, and
  - b. the enclosure of the triangle of marsh near the northwest corner of Clovelly Farms should be deleted from project plans.
3. In the LL&E area (Appendix C, Figure 1):
  - a. no borrow material should be removed from intermediate marsh, brackish marsh, or forested wetlands,
  - b. the proposed levee segment located north of Centerline Station 224+00 should be moved west of its present alignment to avoid destruction of forested wetlands along the Bayou Raphael ridge.
4. The levee north of Breton Canal and east of Bayou Lafourche should be realigned to exclude the nearly 1,700 acres of wetlands in that area from levee protection. If such realignment is not feasible, water control structures, that

would remain open during normal water periods to allow for tidal exchange through the levee system, should be constructed in the proposed levee to preserve the integrity of those wetlands (Appendix D, plate 1, reference Potential Mitigation Area).

5. If the above recommendations cannot be implemented as an integral part of this hurricane protection project, the full extent of unavoidable adverse impacts to fish and wildlife resources should be mitigated via implementation of the water management plan for the Pointe-au-Chien Wildlife Management Area, as outlined in the text of this report, concurrently with continued construction of the hurricane protection project.
6. Because the remainder of the wetlands of the Pointe-au-Chien Wildlife Management Area not proposed for inclusion under the mitigation proposal will continue to deteriorate at an ever increasing rate, a program to enhance the fish and wildlife habitat of that area should be implemented, as provided for in the Federal Water Project Recreation Act, Public Law 89-72, as amended. That enhancement proposal should be developed cooperatively by the FWS, LDWF, NMFS, and the Corps of Engineers.

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## Appendix A





# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

17 EXECUTIVE PARK DRIVE, N. E.  
ATLANTA, GEORGIA 30329

July 3, 1975

District Engineer  
U.S. Army Corps of Engineers  
New Orleans, Louisiana

Dear Sir:

Reference is made to our letter dated December 10, 1974, prepared in response to public notice LMNED-DL (Levee Construction Larose to Golden Meadow Hurricane Protection project), dated November 1, 1974. In our letter, you were informed that prior Fish and Wildlife Service reports did not adequately assess the damages to fish and wildlife resources associated with the valuable coastal wetlands within the project area and that a revised report would be prepared with a view toward minimizing destruction of these resources. This revised report is submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

### PROJECT DESCRIPTION

The Larose to Golden Meadow, Louisiana, Hurricane Protection project (formerly Grand Isle, Louisiana, and vicinity Hurricane Protection project) was authorized by Public Law 89-298, 89th Congress, and approved October 27, 1965. The project area extends along both banks of Bayou Lafourche from Larose, Louisiana, to approximately 2 miles south of Golden Meadow, Louisiana, (figure 1). The project is divided into six sections. The dredging work within these units consists of construction of approximately 4 miles of new levees, enlargement of about 41 miles of existing non-Federal levees, and construction of 2 navigable flood-control structures in Bayou Lafourche near Larose and Golden Meadow, Louisiana. The existing non-Federal levee will be enlarged by placing material along the new levee centerline in a series of lifts which will either straddle the existing levee or be located adjacent to it. In areas where levees are not present, material will be placed in the marsh along the new levee centerline in a series of lifts. Throughout most of the project reach, the borrow areas will be located on the protected side of the new levee; however, two sections will utilize borrow areas located outside the new levee.



## RESOURCES WITHOUT THE PROJECT

Fish and wildlife values vary from section to section, therefore, these resources will be described separately.

### Section A

The western portion of this section contains some brackish marsh but has been extensively diked and drained. Construction of this portion is under way. Fish and wildlife resources in this segment are considered low to moderate.

The eastern portion of this section, which lies south of Yankee Canal and east of Bayou Lafourche, contains approximately 2,700 acres of brackish marsh and associated tidal ponds and streams (figure 1). Predominant vegetation in this marsh is saltmeadow cordgrass (Spartina patens), saltmarsh cordgrass (Spartina alterniflora), and saltgrass (Distichlis spicata). Decaying vegetation is transported by tidal action from the marsh to the ponds and tidal creeks of the area, thereby supplying detritus and nutrients valuable in the maintenance of a high level of biological productivity. The undrained wetlands in this project segment provide suitable habitat for numerous juvenile and adult fishes and shellfishes. Included among these are spotted seatrout, sand seatrout, Atlantic croaker, black drum, red drum, spot, southern kingfish, silver perch, sheepshead, spadefish, southern flounder, sea catfish, gafftopsail catfish, striped mullet, menhaden, blue crab, brown shrimp, and white shrimp. Other organisms used as food by sport and commercial fishes are also found in the project area including mud crabs, bay anchovy, grass shrimp, and killifishes. The marshes and open-water areas of this project segment are also capable of providing life support elements to herons, egrets, ibises, bitterns, rails, muskrats, river otter, nutria, raccoon, and mink. Migratory waterfowl found in and adjacent to the project area include American coot, pintail, mallard, American widgeon, mottled duck, blue-winged teal, green-winged teal, gadwall, lesser scaup, ring-necked duck, and northern shoveller. The Golden Meadow Floodgate spoil stockpile area, which comprises over 15 acres, is located immediately adjacent to this area and is also composed of brackish marsh.

### Section C

A large portion of the wetlands in this project segment have been extensively diked and drained. However, approximately 850 acres of

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1. Chabreck, R. H., "Vegetation, Water and Soil Characteristics of the Louisiana Coastal Zone." Louisiana Agricultural Experiment Station Bulletin No. 664. 1972.

coastal shallow and deep fresh marsh and wooded swamp<sup>2</sup> in the Belle Amie area remain relatively unaltered (figure 1). Dominant vegetation in the area consists of bulltongue (Sagittaria falcata), while other common perennials include cattail (Typha spp.) and southern bulrush (Scirpus californicus). Dwarf spikerush (Eleocharis parvula) and annual grasses and sedges, valuable as waterfowl food, are also abundant. This area supports numerous wildlife species including snowy egrets, great egrets, little blue herons, night herons, black-necked stilts, ibises, clapper rails, gallinules, Forster's terns, and lesser yellowlegs. Migratory waterfowl, seasonally abundant in this area, include mallard, pintail, American widgeon, gadwall, blue-winged teal, green-winged teal, mottled duck, and American coot. The American alligator, presently listed as an endangered species,<sup>3</sup> also inhabits this area. Suitable habitat is also provided for nutria, muskrat, raccoon, mink, and river otter. Through tidal action and surface runoff, nutrients and detritus are transported from these wetlands to adjacent estuarine waters. These wetlands therefore contribute to the production of important sport and commercial finfishes and shellfishes. Estuarine organisms tolerant of low salinities, such as blue crab and striped mullet, are also found in this area.

Local interests have applied for a Department of the Army permit, LMNOD-SP (Lafourche Parish Wetlands)<sup>20</sup>, to construct and maintain levees and a closure dam that would result in the reclamation of these wetlands. However, the Fish and Wildlife Service, in a letter dated January 16, 1975, recommended that the permit be denied. The permit has not been issued, and we have assumed, for purposes of our evaluation of the effects of the project, that it will not be issued.

#### Sections B, D, E, and F

Wetlands of these project segments have been extensively diked and drained. Relatively small undrained portions of these segments consist of coastal shallow and deep fresh marsh and wooded swamp (wetlands types 12, 13, and 7), and provide essential life support elements to wildlife species common to the Belle Amie area previously described.

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2. U.S. Department of the Interior, Fish and Wildlife Service, "Wetlands of the United States," Circular 39. Issued 1956. Reissued 1971.

3. U.S. Department of the Interior, Fish and Wildlife Service, "United States List of Endangered Fauna." May 1974.

## RESOURCES WITH THE PROJECT

### Section A

Construction of the project as currently planned will have a major adverse and irreversible impact on valuable fish and wildlife resources in the eastern portion of this project segment. Levee closure and subsequent drainage will destroy approximately 2,700 acres of valuable brackish marsh with a corresponding loss of attendant fish and wildlife.

### Section C

Accomplishment of the work as proposed in the Belle Amie area of this project segment would have severe adverse impacts on fish and wildlife resources. An estimated 750 acres of valuable freshwater marsh and 100 acres of wooded swamp would be segmented from the surrounding wetlands and would be eventually drained and converted to agricultural, residential, and commercial uses. The value of the enclosed area to wetland wildlife species would be virtually eliminated and its fishery resource value destroyed.

### Sections B, D, E, and F

Completion of these project segments will eventually lead to the drainage of the relatively small undrained wetland areas in these segments with a corresponding loss of their wildlife value. However, opportunities for project modifications which would greatly reduce these losses are negligible.

## DISCUSSION

Harris, in a study of Louisiana estuarine-dependent commercial fishery production,<sup>4</sup> stated his belief that high-priced fishes and shellfishes (seatrout, crabs, shrimp, and oysters) are presently undergoing maximum commercial exploitation. He also believes that total production has peaked and will decline in proportion to the acreage of marshland lost to forces such as subsidence, erosion, saltwater intrusion, drainage, hurricane protection projects, pollution, or industrial and housing

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4. Harris, A. H., "Louisiana Estuarine Dependent Commercial Fishery Production and Values," (Regional Summary and WRPA-9 and WRPA-10 Analysis of Production and Habitat Requirements). Unpublished report prepared for U.S. Department of Commerce, National Marine Fisheries Service, Water Resources Division, St. Petersburg, Florida.



developments. The results of other studies<sup>5</sup> of coastal Louisiana have shown that its wetlands are now being lost at the alarming rate of over 16.5 square miles per year. This loss is attributed to subsidence, compaction, erosion, and construction activities, and has been greatly accelerated by the construction of flood-control levees and reservoirs throughout the Mississippi River system. In view of this loss, it is imperative that all responsible agencies strive to preserve as much marshland as possible in order to mitigate the impact of this loss on activities such as commercial and sport fishing, hunting, and fur production.

Although the Fish and Wildlife Service is not opposed to the protection of developed areas from damaging floods, we cannot condone the unnecessary reclamation of thousands of acres of productive wetlands located adjacent to sparsely populated areas. Congress, as well as numerous Federal agencies, has placed a much higher priority on the preservation of estuarine and associated wetlands and on more careful planning for overall environmental quality. Construction of hurricane protection levees as proposed in the eastern portion of section A and in the Belle Amie portion of section C will provide flood protection to wetland areas which thrive on periodic inundation. In these two project segments, flood-protection levees could be constructed on or immediately adjacent to nonwetland sites for which flood protection is needed or in order to keep the overall protection plan intact. This alternative would provide adequate flood protection and would greatly reduce damages to fish and wildlife resources in the project area.

#### RECOMMENDATIONS

Thousands of acres of valuable fish and wildlife habitat have already been leveed and drained throughout the project area as a result of privately constructed and maintained protection levees. This Service therefore recommends that the following project modifications be adopted so that fish and wildlife losses may be reduced:

1. the levee south of Yankee Canal and east of Bayou Lafourche be relocated to the natural levee along Bayou Lafourche or immediately adjacent thereto (figure 2);

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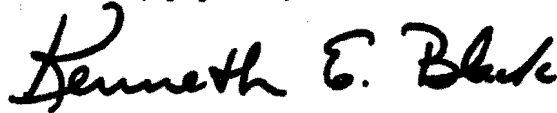
5. Chatry, F. M., and S. M. Galiano, "Shaping and Reshaping a Delta - Technology and Nature Collaborate." Reprinted, with minor modifications, from Fall 1970 issue of Water Spectrum magazine.

2. the portion of the section C levee associated with the undrained wetlands near Belle Amie be relocated as closely as possible to nonwetland areas adjacent to Belle Amie (figure 2) and such areas extend an approximate distance of 0.25 mile west of Louisiana Highway 1 at Belle Amie;
3. the floodgate stockpile to be located in section A be relocated to the west side of Bayou Lafourche within the area enclosed by the levee system (figure 2); and,
4. all borrow material utilized in construction of the realigned segments of sections A and C referenced above be obtained from the areas to be enclosed.

This report has been reviewed and concurred in by the National Marine Fisheries Service and the Louisiana Wild Life and Fisheries Commission. Copies of Regional Director Stevenson's and Director Angelle's letters of concurrence are attached.

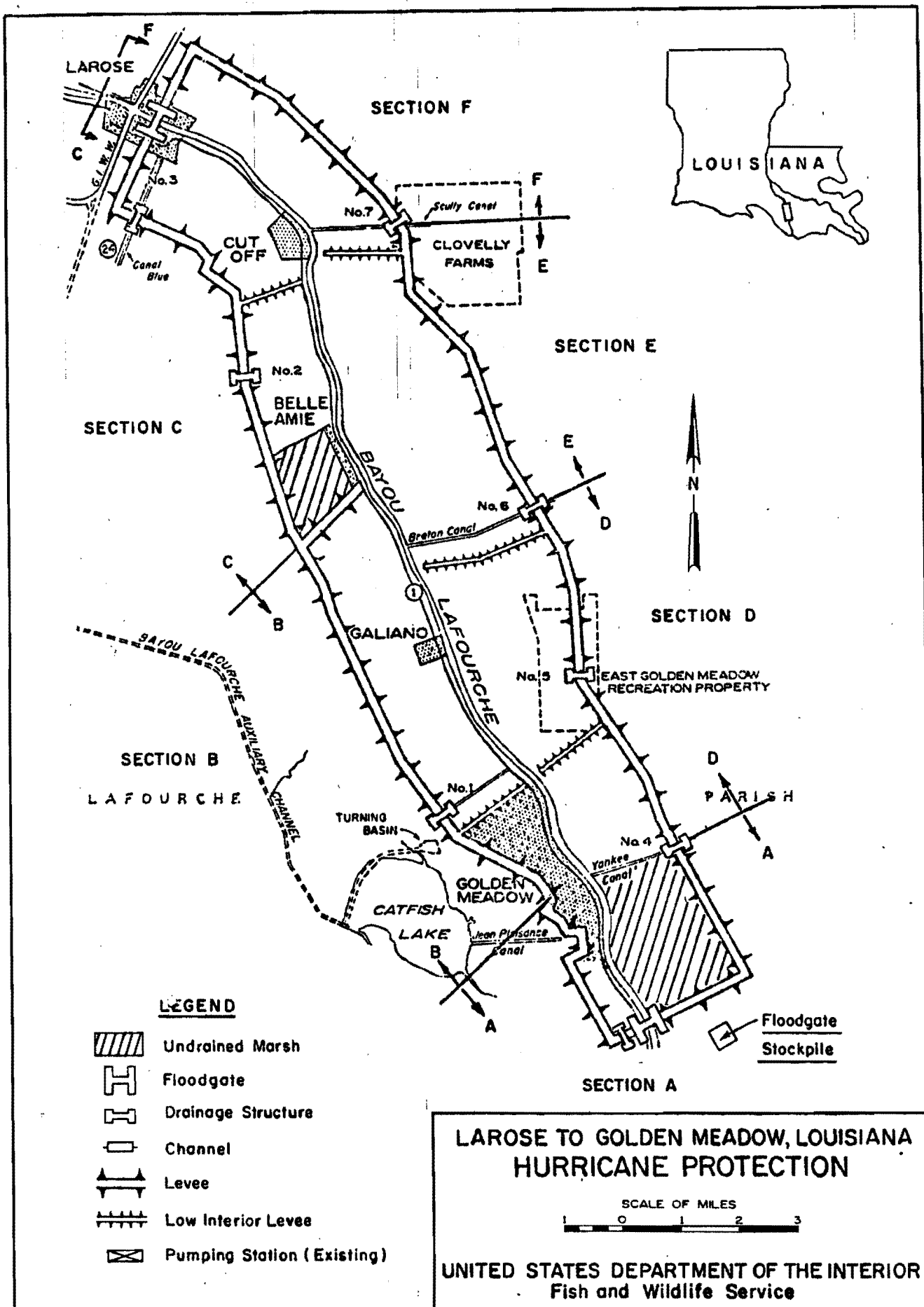
We would welcome the opportunity to meet with your staff to discuss our areas of concern. Please keep us advised of the status of this project.

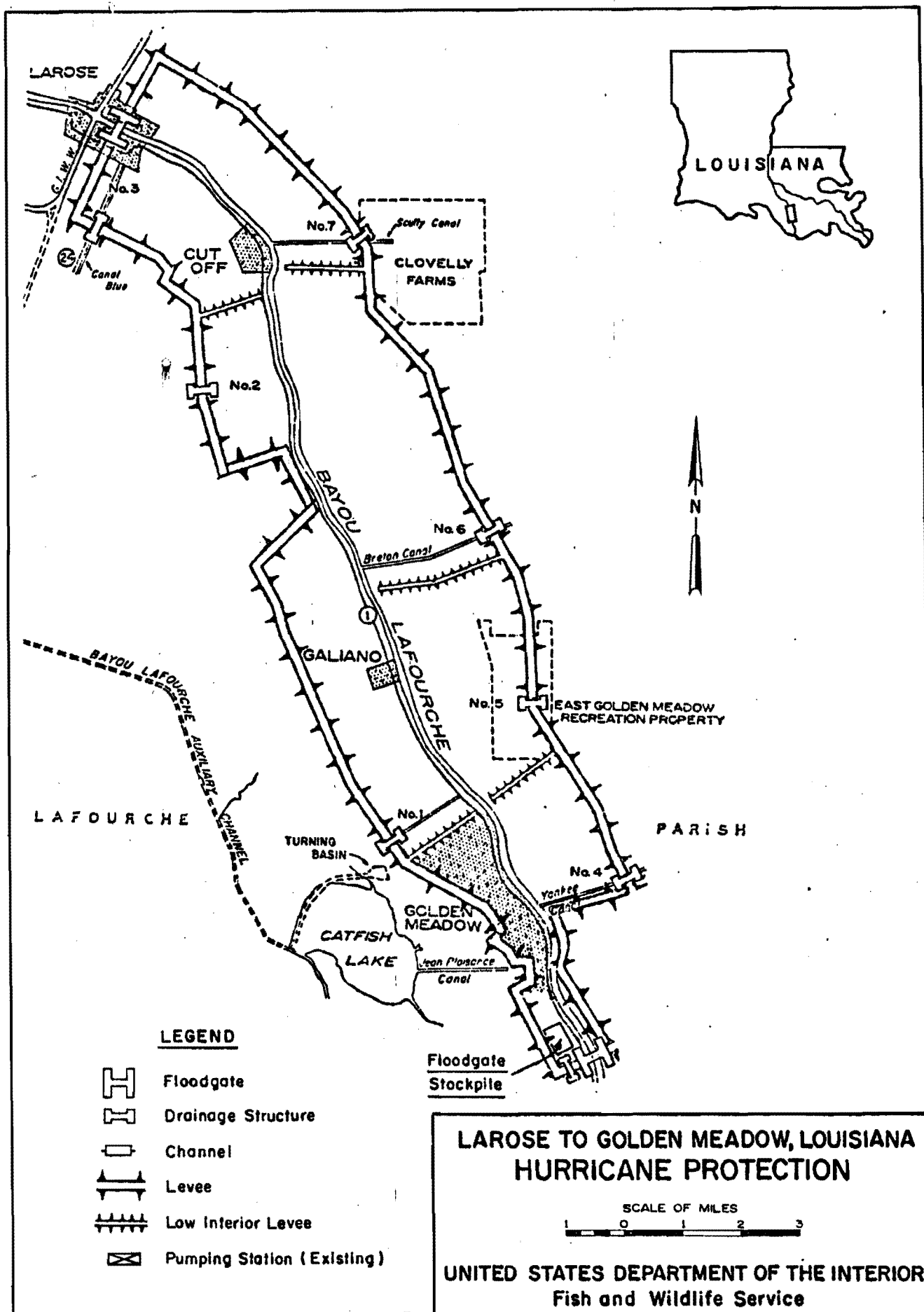
Sincerely yours,

A handwritten signature in black ink, reading "Kenneth E. Blake". The signature is written in a cursive style with a large initial "K".

Regional Director

Attachments 4







**U.S. DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
Duval Building  
9450 Gandy Boulevard  
St. Petersburg, FL 33702

May 7, 1975

FSE21/DM

Mr. Kenneth E. Black  
Fish and Wildlife Service  
17 Executive Park Drive, N.E.  
Atlanta, GA 30329

Dear Mr. Black:

Reference is made to Mr. John D. Green's letter dated April 22, 1975, concerning the review draft of your revised report on the authorized levee construction Larose to Golden Meadow, hurricane protection project, you are submitting in accordance with provisions of the Fish and Wildlife Coordination Act, as amended.

Your findings and recommendations support the concerns regarding this project we expressed to the District Engineer, New Orleans District, by letter dated December 13, 1974, in response to Public Notice LMNED-DL (Levee Construction Larose to Golden Meadow, Hurricane Protection Project) dated November 1, 1974. Therefore, we concur in your draft report.

Sincerely,

*E. L. Arnold, Jr.*

for William H. Stevenson  
Regional Director





WILD LIFE AND FISHERIES COMMISSION  
400 ROYAL STREET  
NEW ORLEANS 70130

J. BURTON ANGELLE  
DIRECTOR

EDWIN EDWARDS  
GOVERNOR

May 7, 1975

Mr. John D. Green  
Regional Supervisor  
Division of Ecological Services  
Fish and Wildlife Service  
17 Executive Park Drive, N. E.  
Atlanta, Georgia 30329

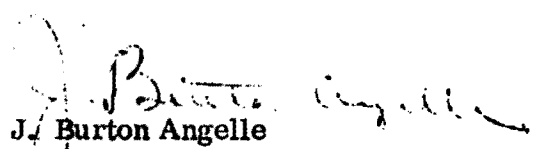
Dear Sir:

Personnel of the Louisiana Wildlife and Fisheries Commission have reviewed your proposed report on the Larose to Golden Meadow, La., Hurricane Protection Project. We believe the report adequately describes the adverse impacts on fish and wildlife resources which would result if the project, as currently planned, is implemented.

Our agency certainly is not opposed to flood protection for heavily populated areas. However, improved project planning could significantly reduce losses of productive wetlands supporting abundant fish and wildlife resources. We are, therefore, in concurrence with the project modifications as outlined in the proposed report.

We appreciate the opportunity to review and comment on the proposed report of the subject project.

Sincerely yours,

  
J. Burton Angelle  
Director

JBA:CK:tam





## Appendix B





# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

17 EXECUTIVE PARK DRIVE, N. E.  
ATLANTA, GEORGIA 30329

January 9, 1976

District Engineer  
U.S. Army Corps of Engineers  
New Orleans, Louisiana

Dear Sir:

Reference is made to your letter dated October 3, 1975, LMNED-DL, regarding the authorized project, "Larose to Golden Meadow Hurricane Protection Project, Louisiana." This supplemental report is submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). Your letter and an attached map were prepared in response to our July 3, 1975, revised report on this project which recommended changes in project plans in order to reduce damages to fish and wildlife resources. These recommendations are listed below and discussed in relation to comments contained in your October 3, 1975, letter.

Recommendation 1: The levee south of Yankee Canal and east of Bayou Lafourche be relocated to the natural levee along Bayou Lafourche or immediately adjacent thereto.

Remarks: According to your October 3, 1975, letter, the existence of a producing oil field, numerous pipelines and other oilfield facilities, and probable difficulties with acquisition of rights-of-way preclude adoption of this recommendation. However, you have initiated action to utilize an alternate alignment which would reduce wetland destruction by approximately 800 acres. We are pleased to note this alteration of project plans that will significantly reduce damages to wetland-associated fish and wildlife. However, an estimated 1,900 acres of valuable brackish marsh and associated ponds and streams will be destroyed by utilization of this alternate plan. A substantial loss of potential hunting opportunities will result from this action. This includes an estimated potential annual loss of 585 man-days of small-game hunting and 445 man-days of waterfowl hunting.



It is estimated that commercial fur production will incur an annual loss of 346 pelts per year. Commercial fishery losses resulting from the elimination of 1,900 acres of valuable estuarine wetlands in the Yankee Canal area will also be substantial. Approximately 578,000 pounds of commercial estuarine-dependent production will be lost annually.

Recommendation 2: That portion of the section C levee associated with the undrained wetlands near Belle Amie be relocated as closely as possible to nonwetland areas adjacent to Belle Amie, and such areas extend an approximate distance of 0.25 mile west of Louisiana Highway 1 at Belle Amie.

Remarks: It is noted in your October 3, 1975, letter that implementation of this alternative is not considered feasible because of greatly increased construction and maintenance costs and difficulties and delays associated with obtaining rights-of-way. This will necessitate implementation of the original plan, with an associated elimination of approximately 750 acres of fresh marsh and 100 acres of wooded swamp. Estimated annual losses of potential hunting opportunities associated with this destruction of wetland habitat are substantial and include 344 man-days of small-game hunting and 95 days of waterfowl hunting. Fur production in these wetlands will be reduced by an estimated 453 pelts annually. Commercial fishery losses will also be severe with the implementation of this project feature. An estimated 259,000 pounds of estuarine-dependent fishery production will be lost annually.

Recommendation 3: The floodgate stockpile to be located in section A be relocated to the west side of Bayou Lafourche within the area enclosed by the levee system.

Remarks: Since you will now relocate this feature to an area inside the protected area, damages will be reduced accordingly.

Recommendation 4: All borrow material utilized in the construction of the realigned segments of sections A and C be obtained from the areas to be enclosed.

Remarks: We are pleased to note that this recommendation will also be implemented. This action will reduce the impact of the project on adjacent marsh.

#### DISCUSSION

Substantial changes in project plans have been instituted to reduce damages to fish and wildlife resources. However, these damages will still be quite severe. Approximately 1,900 acres of brackish marsh, 750 acres of fresh marsh, and 100 acres of wooded swamp will be eliminated by completion of the project as now planned. It is therefore apparent that alterations in levee alignments will not be sufficient to adequately compensate for the severe damages to these valuable resources. The only project modification we are aware of that will eliminate this destruction of valuable wetlands is the incorporation of water-control structures into the Belle Amie and Yankee Canal levee segments. These structures would allow tidal exchange with adjacent waters under normal conditions, but would be closed preceding and during hurricanes. This system would be designed to provide hurricane flood protection to existing residential areas while preserving the character of the enclosed wetlands. If this alteration in project plans is not implemented, adequate compensation for project damages to fish and wildlife resources can only be provided by the purchase of marshlands for the purpose of intensive fish and wildlife management.

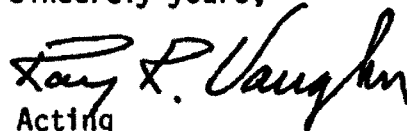
Section 663(c) of the Fish and Wildlife Coordination Act states: "When consistent with the purposes of sections 661 to 666c of this title and the reports and findings of the Secretary of the Interior ..., land, waters, and interests therein may be acquired by Federal construction agencies for the wildlife conservation and development purposes of sections 661 to 666c of this title as reasonably needed to preserve and assure for the public benefit the wildlife potentials of the particular project area ...." (emphasis added). It is therefore recommended that marshlands located adjacent to the nearby Pointe-au-Chien Wildlife Management

Area be purchased in a quantity similar to that to be eliminated by the project, and transferred to the Louisiana Wild Life and Fisheries Commission for management. The location of these lands is shown on the attached map. We wish to point out that acquisition and development costs and annual operation and maintenance costs for mitigation purposes are properly charged as a project cost. We realize that this acquisition must be authorized by Congress following a specific request for such authority by your agency. However, we are confident that you will recognize the need to mitigate the substantial losses of valuable coastal wetlands and their attendant fish, wildlife, and related resources associated with this project.

This report has been reviewed by the National Marine Fisheries Service and the Louisiana Wild Life and Fisheries Commission. Copies of Regional Director Stevenson's letter of comment and Director Angelle's letter of concurrence are attached.

Please advise us of your action on our recommendations.

Sincerely yours,

  
Acting  
Regional Director

Attachments - 3









**U.S. DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
Duval Building  
9450 Gandy Boulevard  
St. Petersburg, FL 33702

December 8, 1975

FSE21/GB

Mr. Kenneth E. Black  
Regional Director  
Fish and Wildlife Service  
17 Executive Park Drive, NE  
Atlanta, GA 30329

Dear Mr. Black:

The National Marine Fisheries Service (NMFS) has received and reviewed a copy of your proposed report to the District Engineer on the Larose to Golden Meadow, Louisiana, Hurricane Protection Project in response to the District Engineer's letter referenced LMNED-DL, dated October 3, 1975.

Please refer to our letter to the District Engineer dated November 19, 1975, by which we responded to his October 3, 1975, letter on the subject project. Our comments and recommendations addressed the protection of the wetlands to be enclosed by the Belle Amie and Yankee Canal levee segments.

In the first paragraph of the Discussion Section of your proposed report you discuss project modifications consisting of the incorporation and operation of water control structures which if implemented would preserve the character of the wetlands to be enclosed by the project levee. These modifications should be clearly stated as recommendations. To clarify the degree of tidal exchange through the levee, a wording such as - should allow unrestricted tidal exchange - should replace similar wording in the last sentence on page 4 of the report.


We note that you also recommended that if the above-mentioned recommendation is not implemented, then marshlands located adjacent to the nearby Pointe-au-Chien Wildlife Management Area be purchased for the purpose of intensive fish and wildlife management. Since we are unaware of any appropriate intensive management of marine fishes to recommend and these wetlands are already protected by Federal statute (Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Federal Water Pollution Control Act Amendments of 1972), their purchase apparently would not mitigate the losses to marine fisheries habitat. Furthermore, we have recommended to the Corps they not install appropriate water exchange structures, the levee south of Yankee



Canal be realigned to be closer to Bayou Lafourche than originally proposed. Therefore, we would concur with your recommendation if the second complete sentence on page 5 of your report was replaced by the following two sentences: If this alteration in project plans is not implemented, adequate compensation for project damages to wildlife resources can only be provided by the purchase of marshlands for the purpose of intensive wildlife management. Also, the project damage to marine fisheries habitat could be reduced by realigning the levee south of Yankee Canal to be located closer to Bayou Lafourche than suggested in your letter of October 3, 1975. Following these sentences the recommended alignment should be described, or our description in our letter of November 19, 1975, to the Corps should be referenced.

The NMFS would concur in your report provided the changes recommended above are incorporated in the report.

Sincerely,

  
William H. Stevenson  
Regional Director



J. BURTON ANGELLE  
DIRECTOR

WILD LIFE AND FISHERIES COMMISSION  
400 ROYAL STREET  
NEW ORLEANS 70130

EDWIN EDWARDS  
GOVERNOR

December 17, 1975

Mr. John D. Green  
Regional Supervisor  
Division of Ecological Services  
U. S. Department of the Interior  
Fish and Wildlife Service  
17 Executive Park Drive, N. E.  
Atlanta, Georgia 30329

Dear Mr. Green:

Personnel of the Louisiana Wildlife and Fisheries Commission have reviewed your proposed report on the LaRose to Golden Meadow, Louisiana, Hurricane Protection Project. We feel the report adequately describes alternatives for lessening the adverse impacts to the wildlife and fish resources in the project area.

Our agency agrees with the mitigation proposal which would enlarge the Pointe Au Chien wildlife management area and replace wetlands lost in the project. We support and agree with the modifications as outlined in the proposed report.

Thank you for the extra time allowed for reviewing and commenting on this project.

Sincerely,

J. Burton Angelle  
Director

JBA:FD:tam



## Appendix C





# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

POST OFFICE BOX 4306  
111 EAST MAIN STREET  
LAFAYETTE, LOUISIANA 70502

August 7, 1980

District Engineer  
U.S. Army Corps of Engineers  
P.O. Box 60267  
New Orleans, Louisiana 70160

Dear Sir:

Reference is made to your April 28, 1980, letter (LMNED-MP) regarding proposed modifications to the Larose to Golden Meadow, Louisiana, Hurricane Protection Project. According to your letter, local interests have requested that the New Orleans District Corps of Engineers (NODCE) revise the levee alignment in the area of Clovelly Farms and the land owned by Louisiana Land and Exploration Company (LL&E) near Golden Meadow. This letter is provided on a planning aid basis and does not fulfill our total responsibilities under provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

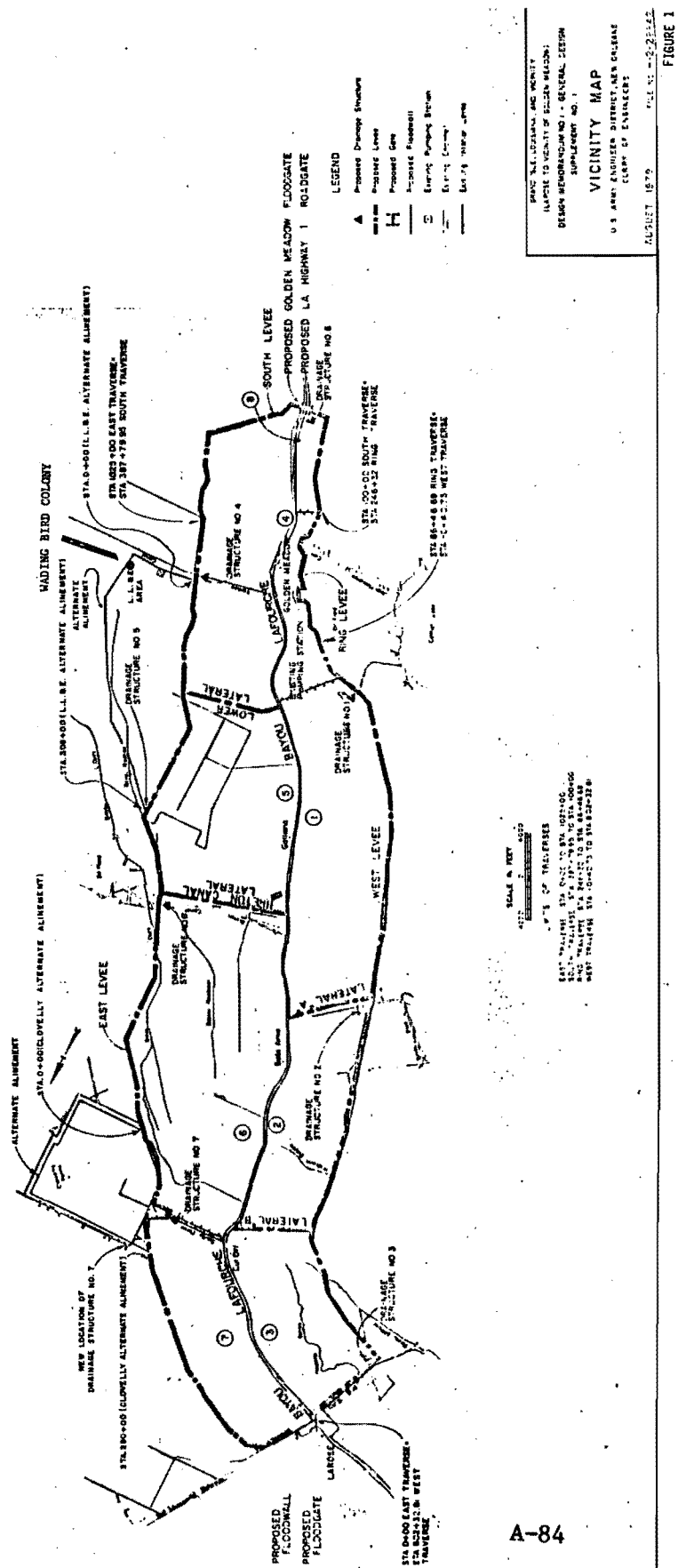
### PROJECT DESCRIPTION

The Larose to Golden Meadow, Louisiana, Hurricane Protection Project was authorized in 1965 by Public Law 298, 89th Congress, 1st Session. Portions of the project have been under construction since 1975. The proposed modifications in the Clovelly Farms and LL&E areas are shown on Figure 1. The work would essentially consist of raising the existing levees which presently enclose the two referenced areas to design grade. Design grade in the Clovelly Farms area is 8.5 feet National Geodetic Vertical Datum (NGVD), while the design grade in the LL&E area will range from 11.2 feet to 13.0 feet NGVD. Departure from the existing levee alignments would be required at designated locations. The proposed levees would be constructed in three lifts, with intervals of 3 years between lifts. Borrow material would be obtained from existing canals adjacent to the present levee system and from adjacent wetlands.

### FISH AND WILDLIFE RESOURCES

#### Clovelly Farms Area

Habitat types in the Clovelly Farms area consist of fresh to intermediate marshes (Chabreck 1972) and associated shallow ponds, existing levees and spoil banks, canals, and cultivated lands. Fresh marshes and intermediate marshes have been designated as Palustrine





Emergent Wetlands and Estuarine Emergent Wetlands, respectively, by Cowardin et al. (1979). Shallow ponds in the fresh marshes are termed Palustrine Open Water when unvegetated, and Palustrine Aquatic Bed when dominated by submergent and/or floating vegetation (Cowardin et al. 1979). Ponds in the intermediate marshes are called Estuarine Open Water or Estuarine Aquatic Bed (Cowardin et al. 1979), depending on whether or not they support extensive submergent or floating vegetation. Fresh marsh is found near the northwest corner of Clovelly Farms, while intermediate marsh borders the remainder of the alternate levee alignment. Common fresh marsh vegetation includes bulltongue, alligatorweed, cattail, and water hyacinth. Primary intermediate marsh vegetation consists of saltmeadow cordgrass, bulltongue, and bullwhip.

Existing levees and spoil banks support common reed, goldenrod, red maple, black willow, southern dewberry, and various terrestrial grasses. Canals consist of the perimeter Clovelly Farm borrow canal and those excavated for oil and gas exploration. Vegetation in these canals is sparse except for drifting mats of water hyacinth and scattered stands of Eurasian watermilfoil in the shallower waters. Cultivated lands in the area are primarily in sugarcane, with terrestrial grasses common along roads and drainage ditches.

Fishery resources in the Clovelly Farms area are primarily associated with canals and shallow marsh ponds. The canals are expected to support both freshwater and estuarine species. Common freshwater species include blue catfish, channel catfish, warmouth, black crappie, largemouth bass, threadfin shad, and alligator gar. Estuarine species believed to be found in the canals include Atlantic croaker, Gulf menhaden, bay anchovy, striped mullet, blue crab, brown shrimp, and white shrimp. The adjacent shallow marsh ponds provide feeding and nursery habitat for many of these species, especially during high tide periods. In addition, organic detritus produced by marsh vegetation is flushed into the ponds, canals, and adjacent estuarine waters where it contributes to a detritus-based food web largely responsible for the Barataria Bay estuary's high level of estuarine fish and shellfish production. According to National Marine Fisheries Service commercial fishery statistics compiled by the NODCE, the Barataria Bay estuary (Hydrologic Unit IV) accounted for an average annual estuarine-dependent fishery harvest of nearly 469 million pounds during 1963-1973, having a 1973 exvessel value of over \$40 million.

The wildlife value of the fresh to intermediate marshes and associated ponds is considered high. Migratory waterfowl believed to winter in these marshes include mallard, northern pintail, blue-winged teal, green-winged teal, gadwall, American wigeon, northern shoveler, ring-necked duck, lesser scaup, and American coot. Mottled ducks are also believed to utilize these wetlands for nesting and feeding purposes. Other birds present in these wetlands include king rail, sora, common gallinule, least bittern, green heron, yellow-crowned night heron, great blue heron, Louisiana heron, common egret, cattle egret, white ibis, black-necked stilt, red-winged blackbird, and boat-tailed grackle. Game mammals present include white-tailed deer and swamp rabbit.

Commercially important furbearers found in the fresh to intermediate marshes include nutria, muskrat, raccoon, mink, and river otter. The American alligator is common in the area marshes and associated ponds and canals. This species is presently listed as "threatened" by the U.S. Department of the Interior under the Similarity of Appearance clause of the Endangered Species Act of 1973. Amphibians in the area wetlands include the bullfrog, pig frog, cricket frog, and green treefrog.

Wildlife found on the existing levees and spoil banks include numerous songbirds, mourning dove, swamp rabbit, eastern cottontail, and possibly rice rat. Limited nesting by American alligator in these habitats is expected, as is usage by fur animals during flood periods. In addition to the American alligator, the shallow nearshore waters of the existing canals are believed to support limited use by American coot, common gallinule, and various wading birds. Wildlife expected to occur in the cultivated areas include eastern cottontail, cattle egret, mourning dove, and other seed-eating birds.

#### LL&E Area

Habitat types in the LL&E area include intermediate to brackish marshes and associated open water, forested wetlands, crawfish ponds, existing spoil banks and levees, pasture lands, and existing borrow canals. The vegetation of these habitat types is described below.

The marshes in the LL&E area are located outside of the existing forced drainage system serving the LL&E Farms area. Common intermediate marsh vegetation includes dwarf spikerush, coast bacopa, and saltmeadow cordgrass. The brackish marsh in the project area supports saltgrass, saltmeadow cordgrass, and saltmarsh cordgrass. Some areas of estuarine open water within the marsh support extensive stands of widgeongrass. Forested wetlands (Palustrine Forested Wetlands; Cowardin et al. 1979) along Bayou Raphael include wooded swamp and natural levee forest. Wooded swamp is present in areas experiencing prolonged flooding, and is characterized by tree species such as baldcypress and swamp red maple. Natural levee forest is less frequently flooded, and is found on the higher portions of the Bayou Raphael ridge. Overstory vegetation in this cover type includes hackberry, sweetgum, American elm, green ash, red maple, Nuttall oak, water oak, and live oak. Understory species include pokeweed, greenbriar, rattan vine, palmetto, and herbaceous groundcover.

Approximately 500 acres of crawfish ponds are present within the LL&E area. These ponds provide seasonal wetland habitat supporting plant species such as alligatorweed, cattail, and annual grasses and sedges.

Existing spoil banks and levees support common reed, terrestrial grasses, seaside goldenrod, giant ragweed, elderberry, southern dewberry, Eastern baccharis, marsh elder, verbena, and chinaberry. Pasture lands support a variety of native herbaceous vegetation, with scattered areas supporting wetland plants such as cattail, pickerelweed, and smartweed. The borrow canals, located outside

the existing LL&E levee, are generally unvegetated.

Fishery resources in the LL&E area are primarily estuarine-dependent. The intermediate to brackish marshes (Estuarine Emergent Wetlands; Cowardin et al. 1979) and associated shallow waters (Estuarine Open Water, Estuarine Aquatic Bed; Cowardin et al. 1979) found in the area constitute important nursery habitat for species such as Gulf menhaden, Atlantic croaker, sand seatrout, red drum, southern flounder, striped mullet, blue crab, white shrimp, and brown shrimp. The decaying vegetation flushed from the marshes and vegetated shallows also serves as a source of organic detritus for adjacent estuarine waters, contributing to fish and shellfish productivity. Limited fish populations are found in Bayou Raphael, and are believed to be dominated by species tolerant of low oxygen conditions. These include gars, bowfin, mosquitofish, and killifishes.

The intermediate to brackish marshes of the LL&E area support a variety of wildlife. These wetlands provide important feeding and resting habitat to migratory waterfowl including mallard, blue-winged teal, green-winged teal, gadwall, American wigeon, Northern pintail, Northern shoveler, lesser scaup, and American coot. Mottled ducks are believed to nest in the area. These marshes also provide nesting habitat to common gallinule, clapper rail, and king rail, and serve as important feeding areas to numerous species of wading birds such as Louisiana heron, yellow-crowned night heron, little blue heron, snowy egret, cattle egret, great egret, and white ibis. A large active wading bird nesting colony is located in a grove of Chinese tallow trees lying within the proposed LL&E levee right-of-way near Centerline Station 63+37.25. The general location of this colony is shown on Figure 1. A detailed population estimate of that colony was made during a survey conducted for the U.S. Fish and Wildlife Service in 1976 (Portnoy 1977). That survey revealed the following numbers of nesting adults: cattle egret (2,400); great egret (100); little blue heron (250); and white ibis (30). This colony was briefly inspected by a Fish and Wildlife Service biologist on July 16, 1980. This inspection revealed that the colony was still quite active, with all of the species observed in 1976 still present. Also noted was a large number of Louisiana heron adults and young. A detailed census of population numbers was not possible, due primarily to adverse weather conditions.

Commercially important furbearers expected to be common in the project area marshes include muskrat, river otter, nutria, raccoon, and mink. Other mammals present include swamp rabbit and possibly white-tailed deer. The American alligator is abundant in the canals and adjacent marshes.

The forested wetlands of the Bayou Raphael ridge are heavily grazed by cattle and possibly free-ranging hogs. Consequently, their value to white-tailed deer has been substantially reduced. Limited numbers of gray squirrels and fox squirrels are expected to be present. American woodcock and mourning dove are also expected to be associated with these woodlands. Habitat is also provide for a variety of non-

game birds such as warblers, cardinal, blue jay, Carolina wren, woodpeckers, common crow, fish crow, vultures, wading birds, hawks, and owls. Other non-game wildlife include numerous species of frogs, snakes, toads, lizards, turtles, and salamanders.

The crawfish ponds within the LL&E levee provide seasonal wetland habitat believed to be utilized extensively by wading birds, shorebirds, and migratory and resident waterfowl. The annual dewatering during the summer months enhances the production of annual grasses and sedges valuable to waterfowl as food.

The wildlife use of existing levees and spoil banks is similar to that described above for the Clovelly Farms area. Leveed pasture within the LL&E forced drainage system supports seed-eating and insectivorous birds such as mourning dove, common snipe, eastern meadowlark, and cattle egret. The Eastern cottontail and swamp rabbit are believed to be the only game mammals present in these areas. Other mammals expected to occur include nine-banded armadillo, rice rat, and opossum.

### IMPACT EVALUATION

The proposed alignment changes will have both direct and indirect adverse impacts on fish and wildlife resources. Direct impacts are primarily associated with levee construction and associated borrow material excavation in wetlands. The most serious indirect impacts will occur with inclusion of additional wetland areas in the hurricane levee system and subsequent elimination of these habitats by forced drainage. The impacts of the two alternative alignments are discussed below.

#### Clovelly Farms

Table 1 shows a comparison of the estimated wetland losses associated with the General Design Memorandum (GDM) alignment and the proposed Clovelly Farms Alternative.

As noted in Table 1, the Clovelly Farms Alternative will increase total marsh losses by 69.2 acres compared to the GDM Plan. The fishery value of the wetlands lost to levee construction or subsequently eliminated by inclusion in forced drainage systems will be totally eliminated. In addition, conversion of marsh to borrow canals is expected to reduce the value of the affected area to freshwater and estuarine-dependent fishes and shellfishes. This is attributed to a reduction in the amount of detritus produced and reduced shallow water nursery habitat. A recent study of the nekton of the Upper Barataria Basin (Chambers 1980) revealed greater standing crops of fishes in shallow marsh sites than those in neighboring open water areas.

Similar adverse impacts on wildlife populations will also occur with the Clovelly Farms Alternative. Marsh and shallow water areas converted to levee will be of minimal value to wildlife. Frequent mowing of the levee is anticipated, thus rendering it of low value even

Table 1. Comparison of Wetland Impacts Associated with Clovelly Farms Alternative and GDM Alinement, Larose to Golden Meadow, Louisiana, Hurricane Protection Project.

| Plan  | Fresh-Intermediate Marsh Acres Within Right-of-Way | Additional Fresh-Intermediate Marsh Acreage Enclosed | Total Fresh-Intermediate Marsh Acreage Affected |
|---|--|--|---|
| Clovelly Farms Alternative  | 87.2   | 56.9 <sup>a</sup>                                    | 144.1   |
| GDM Alinement   | 74.9 <sup>b</sup>                                  | N/A <sup>c</sup>                                     | 74.9  |
| Net Increase in Fresh-Intermediate Marsh Acreage Lost With Clovelly Farms Alternative | 12.3   | 56.9   | 69.2  |

a. Represents 76.3 acres of marsh endorsed by Clovelly Farms Alternative minus estimated 19.4 acres of marsh that would be eliminated by GDM levee in this reach.

b. Based on estimated length of 14,500 feet and average right-of-way width through marsh of 225 feet.

c. Only the increased acreage of enclosed wetlands associated with the Clovelly Farms Alternative is treated in this table.

to terrestrial wildlife. Elimination of marsh by inclusion in forced drainage systems will also severely reduce its value to most wildlife species, as will conversion of marsh to borrow canal.

#### LL&E Area

Damages to fish and wildlife resources with the LL&E Alternative Alinement are primarily associated with elimination of intermediate to brackish marsh and associated shallow waters, and of forested wetlands (wooded swamp and natural levee forest) found along Bayou Raphael. Table 2 summarizes net losses of these habitats that would occur with implementation of the LL&E Alternative Alinement. As the GDM levee alinement in this area would traverse lands dominated by pasture, no significant losses of wetlands are anticipated with that plan.

As with the Clovelly Farms Alternative, the fishery value of the wetlands lost to levee construction will be totally eliminated, and the area converted from marsh to borrow area substantially reduced. The contribution of organic detritus by the intermediate to brackish marsh in the project area will be lost.

The value of the project area marshes and shallow ponds as feeding habitat for waterfowl, wading birds, shorebirds, and fur animals will be virtually eliminated by levee construction. Some use of the enlarged borrow canals by American alligators is anticipated.

The conversion of forested wetlands to levee and borrow canal will virtually eliminate the value of this habitat to forest-associated wildlife such as white-tailed deer, fox squirrel, gray squirrel, and woodland songbirds. Wildlife use of the resultant borrow pit excavated in forested wetlands is expected to be limited primarily to shoreline areas, primarily by American alligator, wading birds, and possibly a few resident wood ducks and migratory waterfowl. Wildlife useage of the levee will be minimal.

Moderate freshwater fish populations can be expected to develop in the borrow pits located in forested wetlands. The value of these areas as fish habitat will depend on such factors as the degree of flooding of contiguous forested wetlands, the amount of agricultural runoff entering these pits, and water depth. Based on the inclusion of adjacent forested wetlands in the forced drainage system that will serve the leveed area, it is unlikely that flooding of these wetlands will allow use by fish populations for spawning and nursery purposes. In addition, the borrow canals will serve as catchment basins for nutrient-enriched runoff from the LL&E farms area. Such nutrient enrichment may lead to periodic oxygen depletion and resultant fish kills. The likelihood of such events will be increased if the depth of the borrow pits exceeds 6 to 8 feet and thus allows for development of an anoxic stratum (hypolimnion).

Levee construction in areas of existing crawfish ponds will reduce seasonal habitat for migratory waterfowl, wading birds, and shorebirds. Construction on existing levees and spoil banks is expected to reduce

Table 2. Wetlands Losses Attributable to LL&E Alternative Alinement<sup>a</sup>

| Habitat Type   | Acreage Within Right-of-Way |
|--|-----------------------------|
| Intermediate to Brackish Marsh<br>and Associated Shallow Water | 118.0                       |
| Forested Wetlands Inside Existing<br>LL&E Levee                | 17.9                        |
| Forested Wetlands North of<br>LL&E Levee                       | 96.2                        |
| Total Wetland Acreage  | 232.1                       |

a. Excludes seasonal wetlands created by flooding of LL&E of lands for crawfish production.

habitat for wildlife presently using such areas, as cover will be reduced by more frequent mowing.

Of particular concern is the proposed levee construction within a portion of the existing wading bird nesting colony near Centerline Station 63+37.25 of the LL&E Alternative Alinement. Such construction would eliminate a portion of the nesting cover in this colony, and could lead to complete abandonment of the colony by nesting wading birds. Additionally, there is no assurance that suitable alternative nesting cover would be available to permit relocation of this colony.

#### DISCUSSION AND RECOMMENDATIONS

As indicated above, the proposed Clovelly Farms and LL&E alternatives will substantially increase wetland impacts, as compared to the GDM alinement.

Most of the wetland damages associated with the Clovelly Farms Alternative would be eliminated if borrow material was obtained from the existing borrow canal and/or upland sources only, and the enclosure of the 76.3-acre triangle of marsh along the northwest-corner of Clovelly Farms was deleted from project plans.

Measures could also be taken to greatly reduce adverse impacts to fish and wildlife habitat associated with the LL&E Alternative. The loss of approximately 118 acres of intermediate to brackish marsh and associated open water could be greatly reduced by elimination of borrow material excavation in these habitats. Borrow material could be obtained from the existing borrow canals adjacent to the LL&E levee and from nearby drained lands. It is possible that the borrow pits created on the protected side of the LL&E levee could serve as a supplemental source of fresh water for the LL&E crawfish ponds. Water for flooding of those ponds is presently obtained from interior canals in that area.

Damages to forested wetlands along Bayou Raphael could be substantially reduced by realinement of the portion of the levee and borrow pits located north of Centerline Station 224+00 to the drained area just west of Bayou Raphael. This would require moving the levee centerline approximately 500 to 800 feet west of its present alinement between Centerline Stations 224+00 and 339+13.11.

Adverse impacts to the wading bird rookery in the southern portion of the LL&E area could be minimized by:

- 1) Realining of the levee to avoid destruction of nesting cover; and
- 2) Scheduling of construction to minimize disturbance during the nesting season.

In view of the foregoing, we would not oppose the proposed levee revisions if the following modifications were incorporated into



the final plans:

1. In the Clovelly Farms area:
  - a. all borrow material shall be obtained from upland sources or from existing borrow canals; and
  - b. the enclosure of the triangle of marsh near the northwest corner of Clovelly Farms shall be deleted from project plans.
2. In the LL&E area:
  - a. no borrow material shall be removed from intermediate marsh, brackish marsh, or forested wetlands;
  - b. the proposed levee segment located north of Centerline Station 224+00 shall be moved 500 to 800 feet west of its present alignment to avoid destruction of forested wetlands along the Bayou Raphael ridge;
  - c. the proposed levee segment located between Baseline Stations 66+63 and 77+38 shall be realigned approximately 170 feet to the east to avoid impacts on nesting cover at the wading bird nesting colony located in that segment; and
  - d. construction activity shall be prohibited between Baseline Stations 29+00 and 99+00 during the period of February 15 to August 15 of each year in order to minimize disturbance of the referenced wading bird rookery.

#### ADDITIONAL CONSIDERATIONS

Habitat maps of appropriate portions of the Mississippi Deltaic Plain Region prepared for the U.S. Bureau of Land Management (BLM) and the U.S. Fish and Wildlife Service (FWS) were utilized during our recent field inspection of the proposed levee realignment sections. These maps were prepared at a scale of 1:24,000 from color-infrared aerial photographs taken in 1978. Copies have been recently provided to your Planning Division. The habitat maps revealed that an acreage of wetlands far in excess of that originally documented in Corps of Engineers or Fish and Wildlife Service reports will be lost with construction of levee segments D, E, and F with the GDM alignment. Prior estimates of wetland losses have included only the Yankee Canal area (Section A East) and the Belle Amie area (Section C), involving a total of approximately 2,750 acres. However, preliminary estimates developed from the new BLM-FWS habitat maps and subsequent ground truthing indicate that an additional 1,195 acres of fresh to intermediate marsh and 590 acres of forested wetlands (natural levee forest and wooded swamp) will be destroyed or included in forced drainage systems with the GDM alignment in Sections D, E, and F alone.

Because of these findings, it is our opinion that the mitigation plan currently being developed for the unavoidable wetland losses associated with this project should be revised. This revision would include mitigation of all wetland losses, and not just the 2,750 acres referenced in the Supplemental Statement of Findings submitted by the NODCE on November 2, 1976, to the Environmental Protection Agency as required by Section 404 of the Federal Water Pollution Control Act Amendments of 1972. The Fish and Wildlife Service's Habitat Evaluation Procedures would be utilized to quantify non-monetary habitat losses and to assist in the evaluation of a mitigation plan. We also believe that a supplemental document should be prepared by the Corps of Engineers fully detailing all wetland types and acres to be affected by the entire project. This would include wetlands directly lost to construction, and wetlands enclosed by hurricane levees and subsequently eliminated by forced drainage systems. The proper vehicle for such an assessment might include the upcoming mitigation report or a supplement to the Environmental Impact Statement.

With regard to the mitigation issue, we are concerned that the unfavorable response to date by local interests to cost sharing for mitigation measures may prevent implementation of an adequate mitigation plan. If this is the case, efforts should be re-directed to include structural revisions on the project that will prevent losses of valuable wetland fish and wildlife habitat. Such measures could include substitution of floodgates for pumping stations in areas containing large wetland acreages. Such floodgates would remain open at all times except during periods immediately preceding and during extreme tidal flooding associated with tropical storms or hurricanes. This would allow the enclosed wetlands to remain in a natural state. It would also be consistent with prior Corps of Engineers and Environmental Protection Agency action on the Harvey Canal-Bayou Barataria, Louisiana, project, where floodgates were substituted for a pumping station to preserve approximately 2,700 acres of coastal wetlands. Another approach would be to realign levees to the wetland-nonwetland interface and obtain borrow material for levee construction from non-wetland sites. Because the Corps of Engineers is presently considering alignment changes recommended by local interests, alternative alignments and structural measures to reduce wetland losses should also be re-evaluated. Such action would be consistent with Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands). The objective of Executive Order 11988 is to "...avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative...". Executive Order 11990 was issued to "...avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid the direct or indirect support of new construction in wetlands wherever there is a practicable alternative...".

## Appendix D

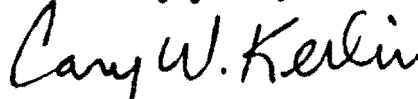


It is requested that we be advised of your final decision as to whether the alternative levee alignments requested by local interests will be incorporated into the project. In addition, your views on further consideration of project modifications to reduce wetland losses, as well as your plans to re-assess these losses, will also be appreciated.

Copies of this report have been provided to the Louisiana Department of Wildlife and Fisheries and the National Marine Fisheries Service for their review. Copies of any comments received from those agencies will be forwarded to you.

Please advise if we can be of further assistance in this matter.

Sincerely yours,



Cary W. Kerlin  
Field Supervisor

cc: EPA, Dallas, Texas  
NMFS, Galveston, Texas  
La. Dept. of Wildlife and Fisheries, New Orleans, La.  
La. Dept. of Wildlife and Fisheries, Baton Rouge, La.  
Area Office, FWS, Jackson, Mississippi

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# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

POST OFFICE BOX 400  
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March 26, 1982

District Engineer  
U.S. Army Corps of Engineers  
P.O. Box 60267  
New Orleans, Louisiana 70160

Dear Sir:

Reference is made to the authorized Larose to Golden Meadow, Louisiana, Hurricane Protection Project. The Fish and Wildlife Service (FWS) is working with members of your staff in the development of a mitigation plan and supplement to the environmental impact statement (EIS) for that project. The results of the FWS's Habitat Evaluation Procedures (HEP), as transmitted to you in this report, provide a quantitative, non-monetary evaluation of the project impacts to fish and wildlife resources, an evaluation that is essential to the development of an acceptable mitigation plan. These comments are submitted on a planning aid basis and do not fulfill our total responsibilities under provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

### PROJECT DESCRIPTION

The Larose to Golden Meadow, Louisiana, Hurricane Protection Project was authorized by Public Law 89-298, 89th Congress, in 1965. The project area extends along both sides of Bayou Lafourche from Larose to a point about 2 miles south of Golden Meadow, in southern Lafourche Parish, Louisiana (Plate 1). The project, as described in the General Design Memorandum (GDM) and in the Final EIS prepared by your District Office in 1973, involved the enlargement or construction of about 43 miles of perimeter levees and the construction of two navigable flood control structures to protect the project area from hurricane floods. Completion of this action was originally expected to destroy about 2,750 acres of productive wetlands.

Project modifications, updated wetland maps, and more accurate acreage measurements have led to significant changes in prior assessments of project impacts to fish and wildlife. As indicated in our August 7, 1980, letter report on this project, a large wetland area has been identified, within and adjacent to the Section E portion of the GDM alignment, in addition to that acreage originally identified as wetland.

The additional area to be destroyed by levee construction or to be included in the forced drainage system via the levee construction includes 1,098 acres <sup>1/</sup> of fresh/intermediate marsh and open water and 585 acres of forested wetlands (natural levee forest and wooded swamps). Conversely, a modification in the Yankee Canal portion (Section A East) of the original GDM alignment has significantly reduced the wetland loss anticipated with this project feature. However, the modified GDM alignment is, based on the recent analysis conducted by our staff and members of your Environmental Section, expected to destroy 4,025 acres of valuable marsh, forested wetlands, and shallow water bodies.

Two levee alignments that were originally considered as possible alternatives but are now being included as part of the Tentatively Selected Plan (TSP) are additions to the modified GDM alignment. One alignment would enclose the Louisiana Land and Exploration (LL&E) farm near Golden Meadow and the other would enclose Clovelly Farms near Cut Off. Both of these areas have existing, privately built levees that provide sufficient flood protection from normal storm surges but, reportedly, will not provide sufficient protection from hurricane floods. Significant construction will, therefore, be necessary to improve these levees to the desired grade. Completion of the LL&E levee alignment is expected to destroy an additional 218 acres of brackish/saline marsh, open water, and forested habitat. Completion of the proposed Clovelly Farms levee alignment is expected to destroy an additional 105 acres of fresh/intermediate marsh, open water, and forested habitat.

Implementation of the TSP, which includes the modified GDM alignment and the two new levee alignments, would cause the destruction of about 4,348 acres of fresh/intermediate and brackish/saline marsh, open water, and forested habitats. These losses are presented by habitat type in Table 1.

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<sup>1/</sup> All estimates of existing habitat acreages in the "Project Description" section of this report were made using 1978 habitat maps. As discussed in the "Methods" section, subsidence, saltwater intrusion, and other factors are causing habitat acreage changes in the project area. Therefore, estimates of future habitat acreages were based on 1978 acreages and projected rates of change from 1975 to 2096; these figures are presented in other sections of this report.



Table 1. Expected acreage losses, by habitat type, associated with completion of the Larose to Golden Meadow, Louisiana, Hurricane Protection Levee.

| Habitat type             | Acres to be impacted <u>1/</u> |                |                          |                           |
|--------------------------|--------------------------------|----------------|--------------------------|---------------------------|
|                          | GDM alignment                  | LL&E alignment | Clovelly Farms alignment | Tentatively Selected Plan |
| Fresh/intermediate marsh | 282/605                        | 0/0            | 44/51                    | 326/656                   |
| Brackish/saline marsh    | 244/570                        | 46/0           | 0/0                      | 290/570                   |
| Open water               | 319/1181                       | 42/0           | 8/2                      | 369/1183                  |
| Forested                 | 143/681                        | 100/30         | 0/0                      | 243/711                   |
| Total                    | 988/3037                       | 188/30         | 52/53                    | 1228/3120                 |

1/. Area destroyed by the project is listed as acres lost to levee construction/ acres enclosed by the levee as determined from 1978 habitat maps.

## METHODS

The Service's HEP was developed to be used to document the quality and quantity of available habitat for fish and/or wildlife species. Using HEP, habitat quality and quantity can be established for baseline conditions and predicted for future with- and without-project habitat conditions. This standardized methodology allows a numeric comparison of each future condition and hence provides an estimate of project-induced impacts on fish and wildlife resources.

Because the initial field portion of the HEP was completed in 1979, the 1976 version of the HEP analysis has been used in lieu of the updated 1980 version. In implementing the HEP analysis, habitat types within the project area were identified and a list of species that are economically important and/or represent various trophic levels of wildlife utilizing these habitat types were selected as evaluation elements. The four habitat types identified in the project area were fresh/intermediate marsh, brackish/saline marsh, open water, and forested. According to the classification of Cowardin et al. (1979), fresh marsh is defined as palustrine emergent wetland; intermediate, brackish, and saline marsh are termed estuarine emergent wetlands; and shallow open waters are termed palustrine open waters where salinity is less than 0.5 parts per thousand (ppt) and estuarine open water where salinities average more than 0.5 ppt. Under that same classification system, forested wetlands are broadly categorized as palustrine forested wetlands. Evaluation elements selected for the marsh and open water habitats were American alligator; puddle ducks; herons, egrets, and ibises; boat-tailed grackle; rails; North American mink; Neartic river otter; swamp rabbit; muskrat; and northern raccoon. For forested habitats the boat-tailed grackle and rails were dropped as evaluation elements and replaced by white-tailed deer and squirrels.

A number of randomly-selected points within each of these habitat types were chosen as sample sites. A team of biologists representing the Corps of Engineers, the Louisiana Department of Wildlife and Fisheries, and the FWS visited a total of 18 randomly-selected sites during October 23 and 24, 1979, and November 17 and 18, 1981 (Plate 1). At each site, the team rated the habitat suitability of each evaluation element on a scale of 0 to 10, with 0 being the poorest and 10 being the optimal score.

The average score for all evaluation elements over all sample sites within a particular habitat type is termed the habitat unit value (HUV). In those cases in which the HUV of each habitat type is based on the same set of evaluation elements, the HUV is assumed to be equivalent (i.e. HUV's can be compared among those habitat types). However, in cases in which the evaluation elements for two or more habitat types are different, it is necessary to convert all HUV's to an equivalent scale. This is accomplished by calculating a relative importance value (RIV)

for each habitat type based on its resource value, scarcity, vulnerability, and recreational value in comparison to the other habitat types in the study area. When RIV's are determined, the HUV for a particular habitat type is multiplied by the appropriate RIV to establish a comparable (equivalent) HUV for that habitat type.

The habitat unit (HU) is the basic unit utilized in the HEP for measuring project effects on wildlife. HU's are the product of the HUV and acreage of a particular habitat type at a given point in time (target year). Target years are set to depict significant changes in habitat quality or quantity that are expected to occur during the life of the project. HU's are established for baseline conditions using data collected by the team of biologists and actual measurements of existing habitat acreages. Future HU's change according to habitat changes in quality or quantity that are expected to occur at various target years during the life of the project, either without the project or with the project.

For this project, target years selected constitute significant points in project construction. The target years selected were 1975, beginning of construction; 1986, end of the first levee lift; 1991, 5-years after completion of the first lift (all of the enclosed area under pumped drainage); 1996, end of construction; 2006, 10-years after project completion; 2021, 25-years after project completion; 2046, 50-years after project completion; and 2096, 100-years after project completion (end of project life). As a result of many factors, of which subsidence and saltwater intrusion are the most significant, habitats in the project area are changing at a rapid rate. Accordingly, acreages at each target year were adjusted using habitat changes estimated from data generated by FWS personnel at the National Coastal Ecosystems Team in Slidell, Louisiana. The adjusted habitat acreages for each target year under future without-project (FWOP) conditions and future with-project (FWP) conditions for the TSP are presented in Table 2.

Descriptions of existing habitats in the project area have been provided in previous letter reports dated July 3, 1975 and August 7, 1980. Three habitats (i.e. levee, pasture, and developed) have not been previously described but would be created through implementation of this project. The levee that is to be constructed will be built in a series of "lifts". During each lift, spoil will be placed in the levee right-of-way, allowed to dry, shaped, and mowed. Once all lifts are completed, the levees will be mowed and/or grazed, and perennial grasses maintained as the dominant vegetation. It was determined that these areas would be of little or no value to the evaluation elements and were given an HUV of "0". The areas enclosed by the levees will be included in a pumped drainage system and are expected to be converted to pasture. It was determined that the habitat quality of the enclosed areas for all evaluation elements would be significantly reduced. It was assumed that the HUV of the enclosed marsh and shallow open water areas converted to pasture will become 7.5 within 5-years after completion of the first lift (1991).

Table 2. Comparison of future without-project (FWOP) and future with-project (FWP) habitat acreage for the Tentatively Selected Plan.

|                 |           | <u>Habitat types (acres)</u>  |                           |               |          |        |         |           |       |
|-----------------|-----------|-------------------------------|---------------------------|---------------|----------|--------|---------|-----------|-------|
| Target year     |           | Fresh/inter-<br>mediate marsh | Brackish/<br>saline marsh | Open<br>water | Forested | Levee  | Pasture | Developed | Total |
| A-102<br>-6-    | 1975 FWOP | 1,083                         | 836                       | 1,475         | 998      | 0      | 0       | 0         | 4,392 |
|                 | FWP       | 1,083                         | 836                       | 1,475         | 998      | 0      | 0       | 0         | 4,392 |
|                 | 1986 FWOP | 756                           | 896                       | 1,742         | 846      | 0      | 128     | 24        | 4,392 |
|                 | FWP       | 723                           | 554                       | 1,124         | 744      | 1,247  | 0       | 0         | 4,392 |
|                 | 1991 FWOP | 642                           | 902                       | 1,850         | 785      | 0      | 179     | 34        | 4,392 |
|                 | FWP       | 0                             | 0                         | 0             | 744      | 1,247  | 2,401   | 0         | 4,392 |
|                 | 1996 FWOP | 545                           | 898                       | 1,951         | 728      | 0      | 227     | 43        | 4,392 |
|                 | FWP       | 0                             | 0                         | 0             | 744      | 1,247  | 2,401   | 0         | 4,392 |
|                 | 2006 FWOP | 393                           | 866                       | 2,135         | 626      | 0      | 313     | 58        | 4,391 |
|                 | FWP       | 0                             | 0                         | 0             | 744      | 1,247  | 2,401   | 0         | 4,392 |
|                 | 2021 FWOP | 240                           | 787                       | 2,368         | 500      | 0      | 419     | 78        | 4,392 |
|                 | FWP       | 0                             | 0                         | 0             | 744      | 1,247  | 2,401   | 0         | 4,392 |
|                 | 2046 FWOP | 107                           | 625                       | 2,662         | 344      | 0      | 550     | 104       | 4,392 |
|                 | FWP       | 0                             | 0                         | 0             | 744      | 1,247  | 2,401   | 0         | 4,392 |
|                 | 2096 FWOP | 21                            | 349                       | 3,023         | 162      | 0      | 702     | 134       | 4,391 |
|                 | FWP       | 0                             | 0                         | 0             | 744      | 1,247  | 2,401   | 0         | 4,392 |
| Annualized FWOP |           | 277                           | 676                       | 2,441         | 466      | 0      | 447     | 84        | 4,391 |
| FWP             |           | 97                            | 75                        | 141           | 744      | 1,190  | 2,133   | 0         | 4,392 |
| Net change      |           | -180                          | -601                      | -2,300        | +290     | +1,190 | +1,666  | -84       | +1    |

The enclosed forested areas would also be drained and grazed by cattle, but not likely cleared. Because the baseline HUV of forested habitat was largely dependent upon the surrounding marsh, which will be leveed, pumped dry and grazed under future FWP conditions, the HUV of forested habitat was projected to decrease from 32.1 to 10.7 within 5-years after completion of the first lift (1991). The developed habitat type is indicative of those areas devoted to residential, commercial, or industrial development. Development under FWOP conditions is expected to occur along forested ridges; whereas, under FWP conditions development is expected to occur along existing agricultural areas which provide easy access to roads and Bayou Lafourche. Like levees, the developed areas were given an HUV of "0".

For each project feature, the change in HU's during the project life is annualized, or expressed on an average annual basis. The annualized change (increase or decrease) in HU's under FWP conditions, compared to FWOP conditions, provides a quantitative comparison of project impacts, which are expected to result from each project feature. An increase in HU's indicates that the project is beneficial to wildlife; a decrease in HU's indicates that the project is damaging to wildlife. If HU's are projected to be lost, steps must be taken to reduce and/or replace those HU's. Compensation for unavoidable project damages can, in this case, be accomplished through several vehicles, such as project modification, preservation of habitat that would otherwise be lost, and/or the addition of HU's through habitat improvement(s) that benefit the species used as evaluation elements.

## RESULTS

The average HUV for each habitat type under FWOP and FWP conditions is listed in Table 3. It was decided that the HUV for each habitat type would remain the same throughout the project life. Because the HUV's for all marsh types and open water were based on the same set of evaluation elements, these HUV's were assumed to be equivalent. Only 2 of the 10 evaluation elements used for marsh and open water habitats were changed for the forested habitat, and both marsh and forested habitats had identical RIV's of 1.0. Therefore, all habitat types in the project area were considered to have equivalent HUV's.

For determining impacts associated with the TSP, the adjusted habitat acreages in Table 2 were multiplied by the HUV values in Table 3 to determine HU's for each of the target years for the FWOP (presented in Table 4). The project-related habitat losses in Table 2 were used similarly to establish changes in HU's for FWP (presented in Table 4). As illustrated in Table 4, when FWOP conditions are compared to FWP conditions, there is a total net annualized loss of 89,413 HU's with implementation of the TSP.

**Table 3. Habitat unit values (HUV's) for baseline, future without-project (FWOP), and future with-project conditions (FWP).**

| Habitat type             | HUV's         |        |             |
|--------------------------|---------------|--------|-------------|
|                          | Baseline/FWOP | FWP    |             |
|                          |               | Row 1/ | enclosed 2/ |
| Fresh/intermediate marsh | 60.25         | 0.00   | 7.50        |
| Brackish/saline marsh    | 48.00         | 0.00   | 7.50        |
| Open water               | 25.00         | 0.00   | 7.50        |
| Forested                 | 32.10         | 0.00   | 10.70       |
| Levee                    | 0.00          | 0.00   | 0.00        |
| Developed                | 0.00          | 0.00   | 0.00'       |

1/ Row includes areas in the levee right of way.

2/ Includes those areas protected by the levee system and expected to be included in a forced drainage system.

Table 4. Comparison of future without-project (FWOP) and future with-project (FWP) habitat units for the Tentatively Selected Plan.

|                 |      | <u>Habitat units by habitat type 1/</u> |                          |            |          |         |
|-----------------|------|---|--------------------------|------------|----------|---------|
| Target year     |      | Fresh/inter-<br>mediate marsh           | Brackish<br>saline marsh | Open water | Forested | Pasture |
| 1975            | FWOP | 65,251                                  | 40,128                   | 36,875     | 32,036   | 0       |
|                 | FWP  | 65,251                                  | 40,128                   | 36,875     | 32,036   | 0       |
| 1986            | FWOP | 45,549                                  | 43,008                   | 43,550     | 27,157   | 960     |
|                 | FWP  | 43,561                                  | 26,592                   | 28,100     | 23,882   | 0       |
| 1991            | FWOP | 38,680                                  | 43,296                   | 46,250     | 25,198   | 1,342   |
|                 | FWP  | 0                                       | 0                        | 0          | 7,961    | 18,008  |
| 1996            | FWOP | 32,836                                  | 43,104                   | 48,775     | 23,369   | 1,702   |
|                 | FWP  | 0                                       | 0                        | 0          | 7,961    | 18,008  |
| 2006            | FWOP | 23,678                                  | 41,568                   | 53,375     | 20,095   | 2,348   |
|                 | FWP  | 0                                       | 0                        | 0          | 7,961    | 18,008  |
| 2021            | FWOP | 14,460                                  | 37,776                   | 59,200     | 16,050   | 3,142   |
|                 | FWP  | 0                                       | 0                        | 0          | 7,961    | 18,008  |
| 2046            | FWOP | 6,447                                   | 30,000                   | 66,550     | 11,042   | 4,125   |
|                 | FWP  | 0                                       | 0                        | 0          | 7,961    | 18,008  |
| 2096            | FWOP | 1,265                                   | 16,752                   | 75,575     | 5,200    | 5,265   |
|                 | FWP  | 0                                       | 0                        | 0          | 7,961    | 18,008  |
| Annualized FWOP |      | 16,707                                  | 32,425                   | 61,029     | 14,967   | 3,353   |
| FWP             |      | 5,846                                   | 3,582                    | 3,534      | 10,107   | 15,999  |
| Net change      |      | -10,861                                 | -28,843                  | -57,495    | -4,860   | +12,646 |

1/ Because levee and developed habitat types have an HUV of "0", no comparison of HU's was made under future conditions either without or with the project.

The tremendous HU loss associated with the project is a result of the annualized loss of 180 acres of fresh/intermediate marsh, 601 acres of brackish/saline marsh, 2,300 acres of open water, and a significant reduction in the wildlife value of the forested habitat in the project area (Table 2). Although there is a gain in forested habitat quantity under FWP conditions it must be remembered that the HUV drops from 32.1 to 10.7 and that there is an actual loss of nearly 5,000 HU's of forested habitat.

#### DISCUSSION

The HEP analysis indicates that completion of the TSP, including the modified GDM, LL&E, and Clovelly Farms alignments, would cause the annualized loss of nearly 2,800 acres of valuable fish and wildlife habitat and nearly 90,000 HU's. Most of this loss is the result of enclosing several large areas of marsh, namely Belle Amie (Section C), Yankee Canal (Section A east), and the somewhat recently identified marsh adjacent to Section E south. Enclosure of wetland areas and the expected conversion of marsh to habitats of greatly reduced wildlife value account for a large proportion of the adverse impacts associated with this project.

The FWS has been working with the Corps of Engineers on the Larose to Golden Meadow, Louisiana, Hurricane Protection Project for a number of years. In letter reports dated July 3, 1975, January 9, 1976, and August 7, 1980, the Service described fish and wildlife resources in the project area, quantified project effects on these resources, and recommended methods to reduce these impacts. Similar recommendations have also been made at a number of meetings attended by members of our respective staffs. More specifically, these recommendations have included:

- 1) levee realignment in the Belle Amie (Section C), Yankee Canal (Section A east), and Section E south portions of the project in an effort to reduce the amount of marsh enclosed by the levee system;
- 2) removal of borrow material from the area to be enclosed rather than from the flooded side of the proposed levee system in an effort to reduce habitat losses due to construction; and
- 3) installation of water control structures that would remain open during normal water periods to allow for tidal exchange through the levee system (thereby preserving the integrity of the marsh), but that would be closed during the threat of a hurricane.

These recommendations were intended to allow protection of existing residential and commercial developments, to allow additional development



of non-wetlands where feasible, and to preserve the character of existing wetlands. Some of these recommendations (i.e. modification of the Section A east levee alignment and removal of some borrow material from the enclosed side of the levee) were accepted and will certainly reduce project-related habitat losses. Nevertheless, far more could be done to further reduce project impacts and minimize fish and wildlife habitat losses, but still provide the same degree of protection to developed areas. Accordingly, FWS requests that the Corps adopt and implement these recommendations in their entirety. Should the Corps elect not to expand implementation of these recommendations, we request that the 89,413 HU's to be lost with construction of the TSP be replaced. This could be accomplished through either preservation of marsh habitat that would otherwise be lost without the project, management of existing publicly-owned marsh to increase its value to fish and wildlife, or a combination of these techniques. The FWS further requests that no additional project construction take place until a mitigation plan is developed and accepted by all involved federal and local agencies and, further, that implementation of mitigation features occur simultaneously with construction of other project features.

In the past, Corps of Engineers and FWS personnel have examined several alternative mitigative measures. The most promising of these involved the closure of gaps in specific spoil banks and the release of fresh water into the rapidly degrading marshes of the nearby, state-owned Pointe au Chien Wildlife Management Area. The Louisiana Department of Wildlife and Fisheries has indicated strong interest in these measures. Another mitigative measure discussed more recently is the preservation and management of the fresh/intermediate marsh immediately west of and adjacent to the Section E south levee segment (Plate 1). Preliminary estimates show that preservation of this marsh, via the purchase of real estate easements that prevent development and the installation of flap gates that allow for minimal water management, would totally mitigate for project losses to fish and wildlife. Providing public access to this area would also be strongly recommended to help offset recreational losses, associated with habitat losses, that are also anticipated with implementation of this project.

FWS personnel are looking forward to working with Corps personnel toward the development of an acceptable mitigation plan. The Louisiana Department of Wildlife and Fisheries has reviewed this report and a copy of their letter of concurrence is attached. Should you have any questions regarding this report, please contact Robert Strader of this office.

Sincerely yours,

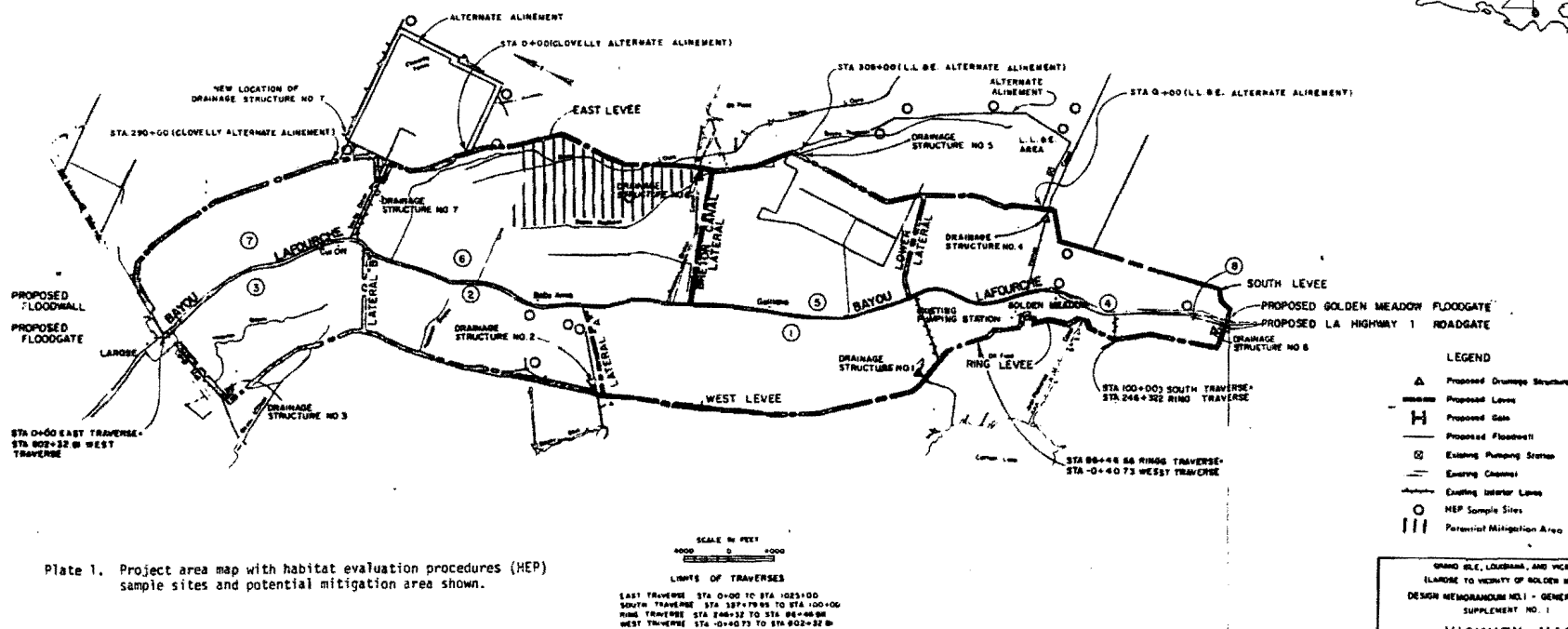
  
David W. Fruge  
Acting Field Supervisor

Attachment: As Stated

cc: EPA, Dallas, Texas  
NMFS, Galveston, Texas  
La. Dept. of Wildlife and Fisheries, Baton Rouge, Louisiana  
Area Office, FWS, Jackson, Mississippi  
Regional Office, FWS, Atlanta, Georgia

#### LITERATURE CITED

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979.  
Classification of wetlands and deepwater habitats of the United  
States. U.S. Fish and Wildlife Service, Office of Biological  
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GRAND BLE, LOUISIANA, AND VICINITY  
 (LARGE TO VICINITY OF GOLDEN MEADOWS)  
 DESIGN MEMORANDUM NO. 1 - GENERAL DESIGN -  
 SUPPLEMENT NO. 1  
 VICINITY MAP  
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
 CORPS OF ENGINEERS  
 AUGUST 1979 FILE NO. H-2-28415  
 PLATE 1

# State of Louisiana



JESSE J. GUIDRY  
SECRETARY

DEPARTMENT OF WILDLIFE AND FISHERIES  
400 ROYAL STREET  
NEW ORLEANS 70130  
504/342-5864

DAVID C. TREEN  
GOVERNOR

March 5, 1982

Mr. David Soileau  
US FWS  
P.O. Box 4305  
Lafayette, La. 70502

RE: Larose to Golden Meadow, La. Hurricane  
protection project - HEP Report

Dear Mr. Soileau:

Personnel of the Department of Wildlife and Fisheries have reviewed the  
above referenced document and we concur in its conclusions and recommendations.

Sincerely,

*Jesse J. Guidry*  
Jesse J. Guidry  
Secretary

JJG:MBW:cgd



## Appendix E







United States Department of the Interior  
FISH AND WILDLIFE SERVICE

POST OFFICE BOX 400  
101 EAST CYPRESS STREET  
LAFALETTE, LOUISIANA 70502

June 30, 1982

District Engineer  
U.S. Army Corps of Engineers  
P.O. Box 60267  
New Orleans, Louisiana 70160

Dear Sir:

Reference is made to the authorized Larose to Golden Meadow, Louisiana, Hurricane Protection Project. In order to assist your staff in the development of a draft supplement to the environmental impact statement (EIS) and mitigation report for that project, the Fish and Wildlife Service (FWS) provided the results of our Habitat Evaluation Procedures (HEP) to you in our March 26, 1982, report. Subsequent to review of that report by your Environmental Section, an informal meeting between members of our respective staffs was held, and several possible discrepancies in the information provided in our HEP report were called to our attention. In addition, another alternative has been more seriously considered by your staff. By virtue of this letter officially addressing each apparent discrepancy and the additional alternative, we are supplementing our March 26, 1982, report and request that you make the appropriate additions and deletions thereto.

Possible discrepancies in our report include:

- 1) the assignment of a habitat unit value (HUV) of "0" to levees;
- 2) the projected decrease in the HUV of forested habitat from 32.1 to 10.7 within 5 years after completion of the first lift;
- 3) the FWS assumption that the HUV for each habitat type will remain the same throughout the project life, despite the above-cited decrease in the HUV of forested habitat; and
- 4) the ability to implement and totally mitigate for all project damages by preventing development and managing water levels in the marsh immediately west of the Section E south levee segment of the tentatively selected plan (TSP).

In our original report, levee habitat was given an HUV of "0"; whereas, pasture was given an HUV of 7.5. Your staff has pointed out that levee and pasture would likely have the same HUV. We agree with this rationale and have raised the HUV of levee habitat to 7.5. The 1,247 acres of levee created by implementation of the TSP will, therefore, contribute an additional 8,927 habitat units (HU's) annually under future without-project (FWP) conditions. With this contribution, the net annualized loss of HU's will be reduced from 89,413 to 80,486 when future without-project (FWOP) conditions are compared to FWP conditions for the TSP alignment.

We have reviewed the rationale used by the HEP team to project a decrease in the HUV of forested habitat that is enclosed by the levees from 32.1 to 10.7 within 5 years after completion of the first levee lift. The forested habitat in the project area is currently of low value to wildlife species. Dominant vegetation includes live oak, bald cypress, sweetgum, red maple, sugarberry, and palmetto. The wildlife value of the forested areas is limited by the low value of the dominant vegetation and further reduced by cattle that currently graze most of the forested area and compete with forest-dwelling species for food. The principal use of this area is by individuals seeking escape, resting, and nesting cover; however, those individuals use the adjacent marshes as their primary feeding area. During the field portion of the HEP analysis, the interagency team discussed the value of the forested habitat and based its rating of 32.1 on the fact that, in general, there was moderate to high quality marsh adjacent to the forested areas. Under FWP conditions, it was assumed that both the forested habitat and adjacent marshes would be drained and grazed within 5 years after completion of first levee lift. Therefore, as adjacent marshes are converted to pasture, a significant decrease in the value of forested habitats could be anticipated under FWP conditions. In a telephone conversation on February 25, 1982, the HEP team agreed that a HUV of 10.7 for forested habitat under FWP conditions would be acceptable. Thus, the Service maintains its position regarding the decreased HUV of forested habitat in the project area from 32.1 to 10.7 under FWP conditions.

Obviously, the statement in the first paragraph of the "RESULTS" section of our March 26 report in which we stated, "It was decided that the HUV for each habitat type would remain the same throughout the project life," is not correct. This should be changed to read: "It was decided that the HUV of all habitat types, except forested habitat, will remain the same throughout the project life. Forested habitat, as previously discussed, will decrease from 32.1 to 10.7 within 5 years after completion of the first levee lift under FWP conditions."

A potential alternative to mitigate for project damages to productive wetlands was briefly discussed in our HEP report. This alternative involved the purchase of easements and installation of structures to

prevent development and to manage water levels in the fresh/intermediate marsh immediately west of and adjacent to the Section E south levee segment. As stated in that report, estimates of HU replacement associated with those mitigation measures were preliminary. Further refinement of marsh management measures and HU replacement calculations would be needed to fully evaluate the proposed mitigation plan.

Since submission of that report, we have been diligently working with members of your staff and the Louisiana Department of Wildlife and Fisheries in developing a mitigation plan that involves marsh management on Point au Chien Wildlife Management Area (WMA). Productive marsh within Point au Chien WMA is being lost at a rapid rate, primarily as a result of saltwater intrusion. Prompt measures must be taken to address this wetland deterioration problem before it becomes irreversible. Although the State of Louisiana is currently funding several projects to address coastal erosion, none of those projects involve Point au Chien WMA. It is, therefore, expected that marsh restoration on that publicly-owned management area will be a preferable mitigation approach to the plan proposed in our March 26, 1982 report. A description of that plan and its expected success regarding fulfillment of mitigation needs is forthcoming in a separate planning-aid report.

Subsequent to completion of our March 26, 1982, planning-aid report containing a HEP analysis of the TSP, your staff elected to more seriously consider an additional alternative, i.e., Plan 5. The levee alignment associated with Plan 5, as described by Corps personnel, is the same as the TSP alignment in every section except Section E south. The Plan 5 alignment proposed for that levee section generally follows an existing levee along the eastern edge of the Bayou Raphael ridge in a northerly direction from the Breton Canal for approximately 14,000 feet before extending eastward toward West Fork Bayou l'Ours and Clovelly Farms. Although this alignment is somewhat longer than the TSP alignment, which follows the West Fork Bayou l'Ours ridge from Breton Canal to Clovelly Farms, project impacts to fish and wildlife resources would be significantly reduced.

When compared to the TSP alignment, construction of the levee proposed in Plan 5 would destroy about 7 more acres of open water habitat and 53 more acres of forested habitat, but 95 fewer acres of the more valuable fresh/intermediate marsh habitat. More importantly, the Plan 5 levee would enclose nearly 1,325 fewer acres of fresh/intermediate marsh, open water, and forested habitats than the TSP alignment. A comparison of habitat acres impacted by the TSP and Plan 5 is presented in Table 1.

A HEP analysis of Plan 5 was completed using the same assumptions, target years, and HUV's as were used for the HEP analysis of the TSP presented in our March 26, 1982, report and supplemented in this letter. For comparison purposes, that portion of Section E south enclosed by the

Table 1. A comparison of expected acreage losses, by habitat type, associated with completion of the tentatively selected plan (TSP) and Plan 5 for the Larose to Golden Meadow, Louisiana, Hurricane Protection Project.

| Habitat Type             | Acres to be impacted <u>1/</u> |           | Difference |
|--------------------------|--------------------------------|-----------|------------|
|                          | TSP                            | Plan 5    |            |
| Fresh/intermediate marsh | 360/723                        | 265/137   | -95/-586   |
| Brackish/saline marsh    | 282/554                        | 282/554   | 0/0        |
| Open water               | 351/1124                       | 358/773   | +7/-351    |
| Forested                 | 254/744                        | 307/358   | +53/-386   |
| Total                    | 1247/3145                      | 1212/1822 | -35/-1323  |

1/ Area impacted by the project is listed as acres lost to levee construction/ acres enclosed by levee and based on 1975 adjusted acreages.

TSP but not affected by Plan 5 was included in the analysis, but no impacts to that area were attributed to this plan. That area has, however, been undergoing habitat changes due primarily to subsidence, and, as water in the neighboring marshes and water bodies becomes more saline, saltwater intrusion is also expected to play an important role in future habitat changes. Therefore, habitat acreages were adjusted accordingly. A comparison of annualized habitat acreages under FWOP and FWP conditions is presented in Table 2.

For determining impacts associated with Plan 5, the habitat acreages presented in Table 2 were multiplied by the appropriate HUV for each of the target years for both FWOP and FWP conditions (Table 3). The comparison of these two future conditions illustrates the total net annualized loss of 56,326 HU's associated with implementation of this plan. Using the same comparison to measure impacts associated with the TSP, it was determined that there would be a net annualized loss of 80,486 HU's.

Completion of the hurricane protection project using the Plan 5 levee alignment as opposed to the TSP alignment would reduce project impacts by over 24,000 HU's annually. Further comparison of the two plans indicates that implementation of Plan 5 would reduce the loss of valuable fish and wildlife habitat (i.e. fresh/intermediate marsh, brackish/saline marsh, open water, and forested habitats) by about 700 acres annually.

Based on these comparisons, the Service urges the Corps to adopt Plan 5 as the selected plan and to incorporate other recommendations, which were suggested in previous reports, into the selected plan in an effort to further reduce project impacts. Although the Service would favor the adoption of Plan 5 as the selected plan, we consider the loss of over 56,300 HU's to be significant and request that full mitigation for these losses be provided, should this plan be selected.

As stated previously, FWS personnel are presently working closely with Corps personnel in the development of an acceptable mitigation plan that will compensate for the HU's lost due to construction of the hurricane protection levee, regardless of the plan selected. Should you have any questions regarding this supplemental report, please contact Robert Strader of this office.

Sincerely,

*David W. Fruge*

David W. Fruge  
Acting Field Supervisor

cc: EPA, Dallas, Texas  
NMFS, Galveston, Texas  
La. Dept. of Wildlife and Fisheries, Baton Rouge, Louisiana  
Area Office, FWS, Jackson, Mississippi  
Regional Office, FWS, Atlanta, Georgia

Table 2. Comparison of future without-project (FWOP) and future with-project (FWP) habitat acreage for Plan 5.

| Target year     |      | Habitat types (acres)         |                           |               |          |                        |        |         | Total |           |
|-----------------|------|-------------------------------|---------------------------|---------------|----------|------------------------|--------|---------|-------|-----------|
|                 |      | Fresh/inter-<br>mediate marsh | Brackish/<br>saline marsh | Open<br>water | Forested | Forested<br>(enclosed) | Levee  | Pasture |       | Developed |
| 1975            | FWOP | 1,083                         | 836                       | 1,475         | 998      | 0                      | 0      | 0       | 0     | 4,392     |
|                 | FWP  | 1,083                         | 836                       | 1,475         | 998      | 0                      | 0      | 0       | 0     | 4,392     |
| 1986            | FWOP | 756                           | 896                       | 1,742         | 846      | 0                      | 0      | 128     | 24    | 4,392     |
|                 | FWP  | 612                           | 592                       | 1,285         | 640      | 0                      | 1,212  | 43      | 8     | 4,392     |
| 1991            | FWOP | 642                           | 902                       | 1,850         | 785      | 0                      | 0      | 179     | 34    | 4,392     |
|                 | FWP  | 403                           | 77                        | 545           | 262      | 358                    | 1,212  | 1,524   | 11    | 4,392     |
| 1996            | FWOP | 545                           | 898                       | 1,951         | 728      | 0                      | 0      | 227     | 43    | 4,392     |
|                 | FWP  | 342                           | 106                       | 577           | 243      | 358                    | 1,212  | 1,540   | 14    | 4,392     |
| 2006            | FWOP | 393                           | 866                       | 2,135         | 626      | 0                      | 0      | 313     | 58    | 4,391     |
|                 | FWP  | 247                           | 144                       | 633           | 209      | 358                    | 1,212  | 1,569   | 19    | 4,391     |
| 2021            | FWOP | 240                           | 787                       | 2,368         | 500      | 0                      | 0      | 419     | 78    | 4,392     |
|                 | FWP  | 151                           | 168                       | 707           | 167      | 358                    | 1,212  | 1,604   | 26    | 4,393     |
| 2046            | FWOP | 107                           | 625                       | 2,662         | 344      | 0                      | 0      | 550     | 104   | 4,392     |
|                 | FWP  | 67                            | 160                       | 799           | 116      | 358                    | 1,212  | 1,647   | 34    | 4,393     |
| 2096            | FWOP | 21                            | 349                       | 3,023         | 162      | 0                      | 0      | 702     | 134   | 4,391     |
|                 | FWP  | 14                            | 101                       | 911           | 55       | 358                    | 1,212  | 1,698   | 44    | 4,393     |
| Annualized FWOP |      | 277                           | 676                       | 2,441         | 466      | 0                      | 0      | 447     | 84    | 4,392     |
| FWP             |      | 202                           | 200                       | 828           | 210      | 318                    | 1,157  | 1,450   | 28    | 4,393     |
| Net Change      |      | -75                           | -476                      | -1,613        | -256     | +318                   | +1,157 | +1,003  | -56   | +1        |

Table 3. Comparison of future without-project (FWOP) and future with-project (FWP) habitat units for Plan 5.

| Target year     |      | Habitat units by habitat type 1/ |                           |               |          |                        |        |         |
|-----------------|------|----------------------------------|---------------------------|---------------|----------|------------------------|--------|---------|
|                 |      | Fresh/inter-<br>mediate marsh    | Brackish/<br>saline marsh | Open<br>water | Forested | Forested<br>(enclosed) | Levee  | Pasture |
| 1975            | FWOP | 65,251                           | 40,128                    | 36,875        | 32,036   | 0                      | 0      | 0       |
|                 | FWP  | 65,251                           | 40,128                    | 36,875        | 32,036   | 0                      | 0      | 0       |
| 1986            | FWOP | 45,549                           | 43,008                    | 43,550        | 27,157   | 0                      | 0      | 960     |
|                 | FWP  | 36,873                           | 28,416                    | 32,125        | 20,544   | 0                      | 9,090  | 322     |
| 1991            | FWOP | 38,680                           | 43,296                    | 46,250        | 25,198   | 0                      | 0      | 1,342   |
|                 | FWP  | 24,281                           | 3,696                     | 13,625        | 8,410    | 3,831                  | 9,090  | 11,430  |
| 1996            | FWOP | 32,836                           | 43,104                    | 48,775        | 23,369   | 0                      | 0      | 1,702   |
|                 | FWP  | 20,606                           | 5,088                     | 14,425        | 7,800    | 3,831                  | 9,090  | 11,550  |
| 2006            | FWOP | 23,678                           | 41,568                    | 53,375        | 20,095   | 0                      | 0      | 2,348   |
|                 | FWP  | 14,882                           | 6,912                     | 15,825        | 6,709    | 3,831                  | 9,090  | 11,768  |
| 2021            | FWOP | 14,460                           | 37,776                    | 59,200        | 16,050   | 0                      | 0      | 3,142   |
|                 | FWP  | 9,098                            | 8,064                     | 17,675        | 5,361    | 3,831                  | 9,090  | 12,030  |
| 2046            | FWOP | 6,447                            | 30,000                    | 66,550        | 11,042   | 0                      | 0      | 4,125   |
|                 | FWP  | 4,037                            | 7,680                     | 19,975        | 3,724    | 3,831                  | 9,090  | 12,352  |
| 2096            | FWOP | 1,265                            | 16,752                    | 75,575        | 5,200    | 0                      | 0      | 5,265   |
|                 | FWP  | 844                              | 4,848                     | 22,775        | 1,766    | 3,831                  | 9,090  | 12,735  |
| Annualized FWOP |      | 16,707                           | 32,425                    | 61,029        | 14,967   | 0                      | 0      | 3,353   |
| FWP             |      | 12,151                           | 9,600                     | 20,710        | 6,741    | 3,403                  | 8,677  | 10,873  |
| Net Change      |      | -4,556                           | -22,825                   | -40,319       | -8,226   | +3,403                 | +8,677 | +7,520  |

1/ Because developed habitat has a habitat unit value (HUV) of "0", no comparison of HU's was made under future conditions either without- or with-project.





## Appendix F



February 24, 1982

District Engineer  
U.S. Army Corps of Engineers  
P.O. Box 60267  
New Orleans, Louisiana 70160

Dear Sir:

Reference is made to the Larose to Golden Meadow, Louisiana, Hurricane Protection Project. The Fish and Wildlife Service is assisting your staff in the development of a mitigation plan and supplemental environmental impact statement (EIS) for that project. As part of this cooperative effort, your Recreation Planning Section has requested that we develop estimates of sport hunting potential (man-days) for the various habitat types within the study area. This letter, which is provided on a planning aid basis, provides the requested estimates of sport hunting potential and a synopsis of the methodology used in the development of those values.

Potential sport hunting (man-day) values per acre of habitat were computed using the following equations:

|                                      |   |  |   |   |
|--------------------------------------|---|--|---|---|
| Population density<br>(animals/acre) | X | Maximum sustainable annual<br>harvest rate             | = | Harvestable population<br>(animals/acre)                        |
| Harvestable population               | X | Hunter success rate (man-days effort/animal harvested) | = | Potential number of man-days of sport hunting per acre annually |

The species and man-day values used for this project are presented, by habitat type, in Table 1. A discussion of data used in obtaining these values follows that table.

Table 1. Potential sport hunting (man-day) value per acre for selected game species and habitats within the study area.

| Species     | Fresh/intermediate marsh | Brackish/saline marsh | Bottom-land hardwoods | Wooded swamp | Pasture |
|-------------|--------------------------|-----------------------|-----------------------|--------------|---------|
| Deer        | 0.250                    | Neg.                  | 0.130                 | 0.130        | Neg.    |
| Rabbit      | 0.176                    | 0.141                 | 0.176                 | 0.176        | 0.176   |
| Squirrel    | N/A                      | N/A                   | 0.161                 | 0.161        | N/A     |
| Waterfowl   | 0.488                    | 0.383                 | 0.016                 | 0.053        | Neg.    |
| Marsh birds | 0.254                    | 0.261                 | Neg.                  | Neg.         | Neg.    |

Deer Hunting - The value used for deer population density in fresh/intermediate marsh was 1 deer per 35-acres. This value was taken from Gosselink et al. (1979) and Joanen et al. (1981). The deer population density used for poor quality bottomland hardwoods (BLH), such as those found in the project area, and wooded swamp (WS) was 1 deer per 60-acres (U.S. Army Corps of Engineers, New Orleans District [1977] and the 1975 wildlife surveys for Lafourche Parish conducted by the Louisiana Department of Wildlife and Fisheries [LDWF]). The commonly accepted, maximum sustainable annual harvest rate is 33 percent. The hunter success rate (i.e., average number of days of hunting to kill 1 deer) used in this analysis was 26.5 for fresh/intermediate marsh and 23.7 for BLH and WS habitats. These values were taken from the LDWF 1980-81 deer kill survey. Deer populations in brackish/saline marsh and pasture are negligible.

Rabbit Hunting - Population density values for rabbits were 1 rabbit per 2-acres in fresh/intermediate marsh, BLH, WS, and pasture habitats, and 1 rabbit per 2.5-acres in brackish/saline marsh. These values were attained from the 1975 LDWF Lafourche Parish wildlife population survey. A sustained annual harvest rate of 60 percent is commonly accepted by wildlife biologists and was used for these estimates. A hunter success rate of 0.586, derived from the LDWF 1977-78 small game survey, was used for all habitat types.

Squirrel Hunting - Man-day use figures for squirrels were only determined for BLH and WS Habitats. A population density of 1 squirrel per 2-acres was used for both habitat types. This figure, which is a low estimate of potential squirrel populations, is thought to be realistic for the poor quality habitat that presently exists in the project area. A commonly accepted, sustained annual harvest rate of 60 percent was used. A hunter success rate of 0.537 was taken from the LDWF 1977-78 small game survey and used for the project area.

Waterfowl Hunting - Man-day values for migratory waterfowl hunting in fresh and intermediate marsh habitat were based on records for public waterfowl hunting on Lacassine and Sabine National Wildlife Refuges during the 1978-79 hunting season. Values of 0.454 man-days per acre for fresh marsh and 0.521 man-days per acre for intermediate marsh were averaged to establish the 0.488 man-day per acre value used for fresh/intermediate marsh. The man-day value for brackish/saline marsh was taken from the U.S. Fish and Wildlife Service Table A-3 (1980). For BLH, a population density of 1 duck per 10 acres, a sustained annual harvest rate of 40 percent, and a hunter success rate of 0.4 were used. These figures were taken from U.S. Fish and Wildlife Service (1980) and Kennedy (1977).

Marsh Bird Hunting - This included other game birds, including coots, rails, and snipe, that are commonly found in the marsh. Man-day values for these species for all marsh habitat were taken from Table 27 of the U.S. Army Corps of Engineers (1974). These values were averaged to obtain the man-day values for fresh/intermediate marsh and brackish/saline marsh habitat types. Populations, and therefore, man-day usage of these species in BLH, WS, and pasture is negligible.

If you have any questions regarding the above estimates and/or rationale, please contact Robert Strader with this office.

Sincerely,



David M. Soileau  
Acting Field Supervisor

## Literature Cited

- Gosselink, J.C., C.L. Cordes, and J.W. Parsons. 1979. An ecological characterization study of the Chenier Plain coastal ecosystem of Louisiana and Texas. Volume I: narrative report. U.S. Fish and Wildlife Service, Office of Biological Services. FWS/OBS - 78/9. 302 pp.
- Joanen, T., L. McNease, and J. Robinette. 1981. Estimate of coastal deer population from an aerial survey conducted on 7 April 1981, Cameron Parish, Louisiana. Louisiana Department of Wildlife and Fisheries. Grand Chenier, Louisiana. 4 pp.
- Kennedy, R.S. 1977. Ecological analysis and population estimates of the birds of the Atchafalaya River Basin in Louisiana. Ph.D. dissertation, Louisiana State University, Baton Rouge. 201 pp.
- U.S. Army Corps of Engineers, New Orleans District. 1974. Louisiana coastal area study: fish and wildlife study of the Louisiana coastal area and Atchafalaya Basin Floodway. Appendix D-2: Methodology for estimating the fish and wildlife sport harvest. New Orleans, Louisiana. Pages D-7 to D-52.
- U.S. Army Corps of Engineers. 1977. Value of wetlands and bottomland hardwoods. Mimeograph report, Environmental Quality Section, New Orleans District. 30 pp.
- U.S. Fish and Wildlife Service. 1980. A planning aid report on the Mississippi and Louisiana estuarine areas study. Lafayette, Louisiana. 86 pp + appendix.

## Appendix G





July 1, 1981

IN REPLY REFER TO:  
Log no. 4-3-81-147

Mr. James F. Roy  
Chief, Planning Division  
Department of the Army  
New Orleans District, Corps of Engineers  
LMNPD-RE  
P.O. Box 60267  
New Orleans, Louisiana 70160

Dear Mr. Roy:

This refers to your letter of June 9, 1981, in which you requested endangered species information for the area of the Larose to Golden Meadow Hurricane Protection Project located in Lafourche Parish, Louisiana.

Our data indicate that there are no endangered, threatened, or proposed species likely to reside in the project area, and there is no designated Critical Habitat in the vicinity of this project. Therefore, no further endangered species coordination will be required for this project, as described. If you anticipate any changes in project location or activities, however, please contact our office for further coordination.

If you have any questions concerning this project, please contact Fred Bagley of our staff, telephone number 601/960-4912 or FTS 490-4912.

We appreciate your participation in the effort to ensure the survival of endangered species.

Sincerely,

*Nennin B. Sudan*  
Gary L. Hickman  
Area Manager

cc: RD, FWS, Atlanta, GA (ARD-FA/SE)  
ES, FWS, Lafayette, LA  
Department of Wildlife & Fisheries  
New Orleans, LA





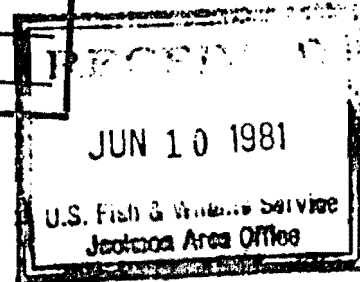
LMNPD-RE

Mr. Gary Hickman  
Area Manager  
US Department of Interior  
Fish and Wildlife Service  
200 East Pascagoula St., Suite 300  
Jackson, MS 39201

*Section 7*  
DEPARTMENT OF THE ARMY  
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS

P. O. BOX 60267  
NEW ORLEANS, LOUISIANA 70160  
Log No. 4381-147  
File No. \_\_\_\_\_  
IRP. \_\_\_\_\_  
Lead \_\_\_\_\_  
Findings \_\_\_\_\_  
MH \_\_\_\_\_

9 June 1981



Dear Mr. Hickman:

In compliance with Section 7(c) of the Endangered Species Act Amendments of 1978, we are requesting information concerning the threatened and/or endangered species associated with the project, Larose to Golden Meadow, Louisiana, Hurricane Protection, located in Lafourche Parish in southeast Louisiana (Inclosure 1).

Plans for the project include the construction of a floodgate on Bayou Lafourche south of Golden Meadow, construction of the portions of the levee remaining to be built on the west and east side of the bayou, and proposed construction along alignments around Clovelly Farms and the Louisiana Lands and Exploration area (shown in blue, Inclosure 2).

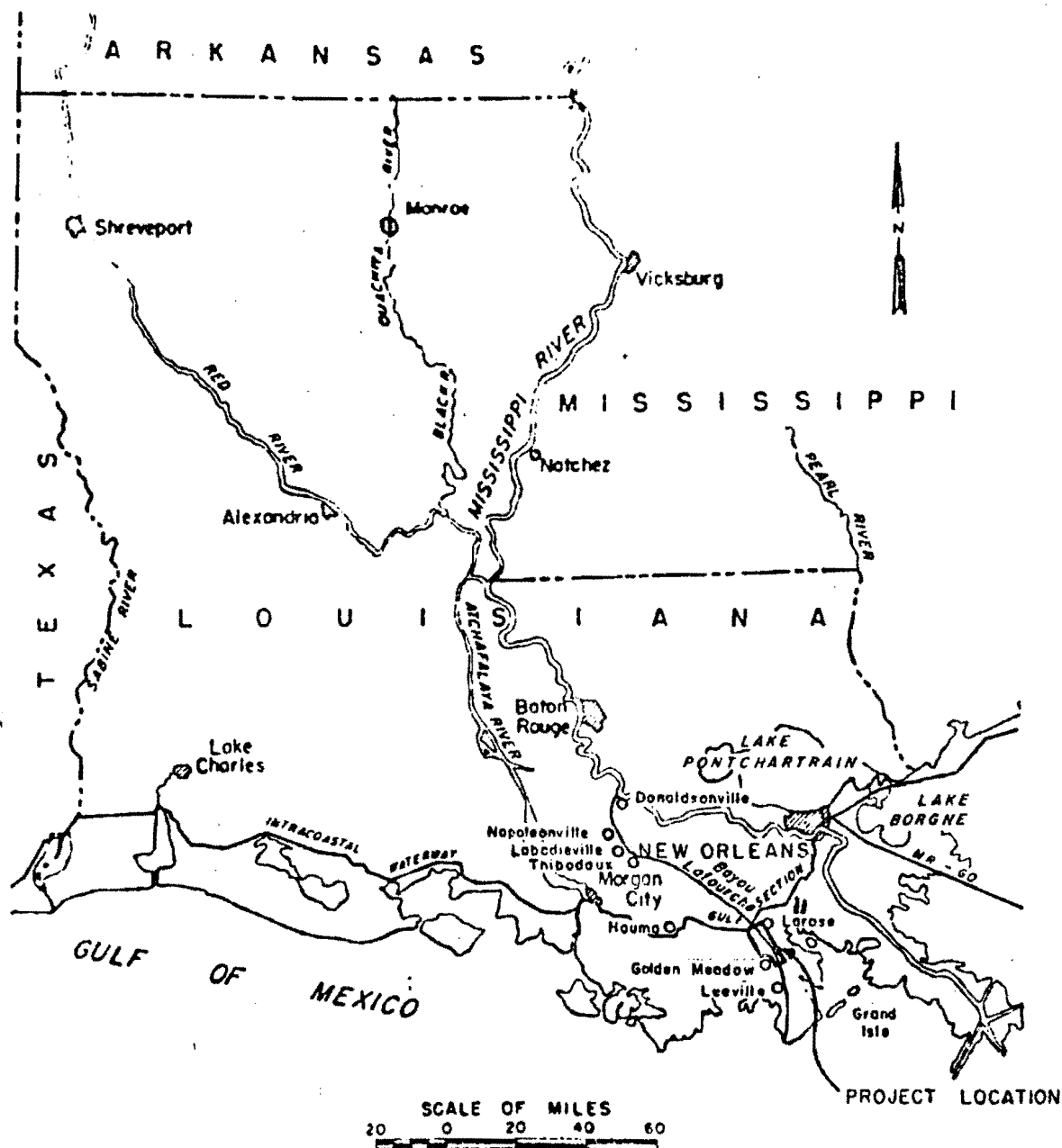
The project area is primarily drained wetlands surrounded by intermediate and brackish marsh, cypress-tupelogum swamp, and some natural ridge forest.

Please provide us with a list of endangered and threatened species and species proposed for listing which may occur in the project area.

Sincerely,

2 Inclosures  
As stated

JAMES F. ROY  
Chief, Planning Division



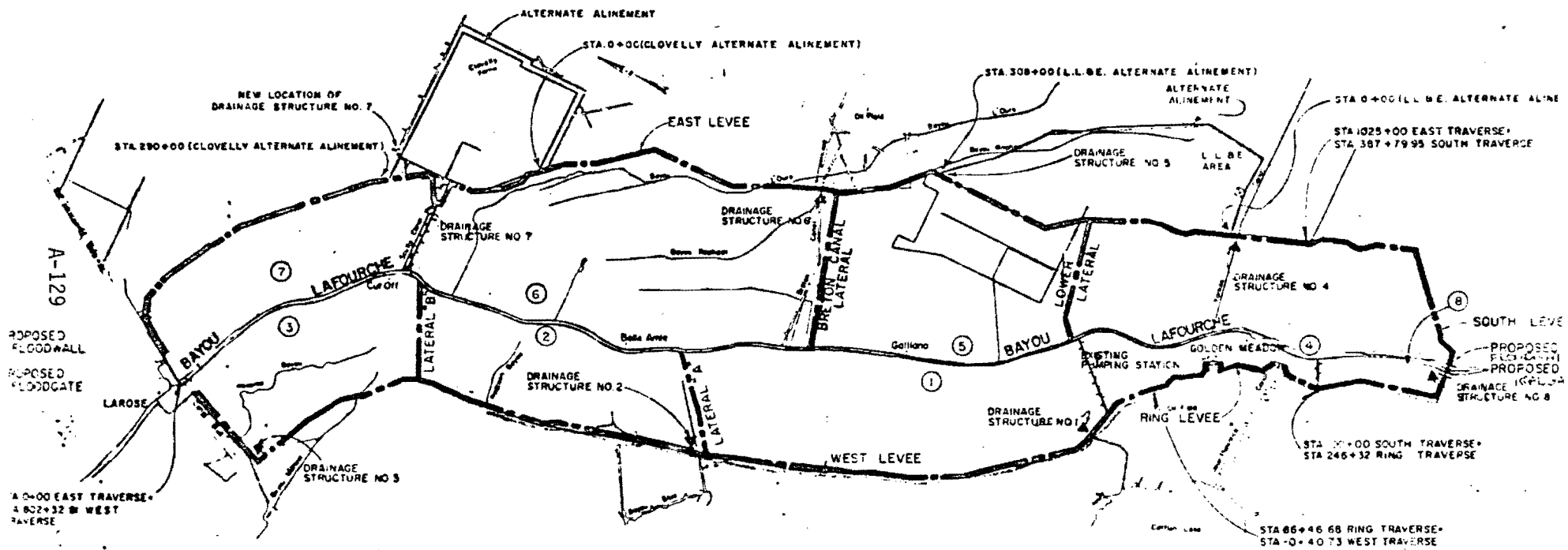
GRAND ISLE LOUISIANA AND VICINITY  
HURRICANE PROTECTION  
(LAROSE TO VICINITY OF GOLDEN MEADOW)

### PROJECT LOCATION

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS, LA  
CORPS OF ENGINEERS

APRIL 1973

FILE NO



SCALE IN FEET  
4000 0 4000

LIMITS OF TRAVERSES

EAST TRAVERSE STA. 0+00 TO STA. 1025+00  
SOUTH TRAVERSE STA. 387+79.95 TO STA. 100+00  
RING TRAVERSE STA. 246+32 TO STA. 86+46.68  
WEST TRAVERSE STA. 0+40.73 TO STA. 802+32.81

Indepat



**APPENDIX A-2**

**USFWS RECOMMENDATIONS AND RESPONSES**





## USFWS RECOMMENDATIONS & RESPONSES

| RECOMMENDATION   | RESPONSE   |
|--|--|
| 1. The levee south of Yankee Canal and east of Bayou Lafourche shall be realigned to, as nearly as possible, follow the natural levee along Bayou Lafourche.   | 1. The levee has been moved as near to Bayou Lafourche as engineeringly feasible.  |
| 2. In the Clovelly Farms area:<br><br>a. all borrow material shall be obtained from upland sources or from existing borrow canals, and<br><br>b. the enclosure of the triangle of marsh near the northwest corner of Clovelly Farms shall be deleted from project plans. | 2. a. As much borrow material as is practicable will be obtained from existing borrow canals. Obtaining borrow from the nearest upland areas (immediately landward of the levee) would cost over \$300,000 more in first costs than floodside borrow and would reduce the annual benefits by removing agricultural land from production, and would preserve only 45 acres of marsh.<br><br>b. Deleting the triangle of marsh would increase the first costs by approximately \$800,000 since the length of levee would be more than doubled. Since less than 75 acres of marsh and open water would be protected, the costs of such a realignment were deemed excessive. |
| 3. In the LL&E area:<br><br>a. no borrow material shall be removed from intermediate marsh, brackish marsh, or forested wetlands,  | 3. a. Existing borrow areas will be utilized to the maximum extent practicable. The first cost of acquiring borrow from the nearest non-wetland areas has been estimated at nearly \$250,000. Since only 54 acres of marsh and 55 acres of bottomland hardwoods would be saved by borrow realignment, such costs were deemed excessive.  |

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## USFWS RECOMMENDATIONS & RESPONSES

| RECOMMENDATION   | RESPONSE   |
|--|--|
| b. the proposed levee segment located north of Centerline Station 224+00 shall be moved west of its present alinement to avoid destruction of forested wetlands along the Bayou Raphael ridge,   | b. The cost of moving the alinement westward would be approximately \$1.4 million more than the proposed alinement on the Bayou Raphael ridge and only approximately 130 acres of forest would be preserved.   |
| c. the proposed levee segment located between Baseline Stations 66+63 and 77+38 shall be realigned approximately 170 feet to the east to avoid impacts on nesting cover at a wading bird nesting colony located in that segment, and   | c. & d. The realinement would be exceedingly expensive, costing \$530,000 more in first costs than the proposed alinement. The colony has been deteriorating and was abandoned sometime prior to 1983. Prior to commencing levee work, a survey would be made and, if the colony is reestablished, construction would be prohibited between Baseline Stations 29+00 and 99+00 from 15 February to 15 August. |
| d. construction activity shall be prohibited between Baseline Station 29+00 and 99+00 during the period of February 15 to August 15 of each year in order to minimize disturbance of the wading bird rookery.  |  |
| 4. The levee north of Breton Canal and east of Bayou Lafourche shall be realigned to exclude the nearly 1,700 acres of wetlands in that area from levee protection, or water control structures, that would remain open during normal water periods to allow for tidal exchanges through the levee system, shall be constructed in the proposed levee to preserve the integrity of those wetlands. | 4. The proposed levee realinement would cost \$4.3 million more than the recommended plan and is not considered a practicable alternative.   |

A-132

## USFWS RECOMMENDATIONS & RESPONSES

| RECOMMENDATION  | RESPONSE  |
|---|---|
| 5. If the above recommendations cannot be implemented as an integral part of this hurricane protection project, the full extent of unavoidable adverse impacts to fish and wildlife resources shall be mitigated via implementation of the water management plan for the Pointe au Chien Wildlife Management Area, as outlined in the text of this report, concurrently with construction of the hurricane protection project.  | 5. As discussed in Paragraphs 24-26, we are developing a plan to fully mitigate wildlife impacts by implementation of a water management plan on the Pointe au Chien WMA. Portions of our previous plan were constructed by others and we are currently finalizing the revised plan with LDWF and USFWS. The Mitigation Report/FEIS will be released in the spring of 1985. |
| 6. In view of the fact that the remainder of the wetlands of the Pointe-au-Chien Wildlife Management Area not proposed for inclusion under the mitigation proposal will continue to deteriorate at an ever increasing rate, a program to enhance the fish and wildlife habitat of that area shall be implemented as provided for in the Federal Water Project Recreation Act, Public Law 89-72, as amended. That enhancement proposal is being developed cooperatively by the FWS and the LDWF, in consultation with the National Marine Fisheries Service. | 6. We feel that such enhancement is not a proper concern of the Corps of Engineers at this time. We are examining ways to reduce wetland loss in coastal Louisiana jointly with the USFWS in the Louisiana Coastal Area Study.  |



**APPENDIX B**

**RECREATIONAL/COMMERCIAL ANALYSIS**



## **INTRODUCTION**

This recreational/commercial analysis was performed to provide a tangible means to evaluate habitat productivity by using a common element, the 1985 net dollar per acre value, to compare losses and gains for each habitat type impacted by the project. This analysis was conducted for both the with and without project conditions in the areas impacted by construction of the hurricane protection levee and the proposed mitigation site.

This analysis is not designed to provide a benefit to cost ratio or to determine the NED attributes, but to supplement the habitat-based evaluation method (HEP) presented in this document. To determine the monetary losses and gains, the annualized acreage available over the project life was multiplied by the value of these acreages to recreation and commercial uses for fish and wildlife in the year 1985. Although the analysis conducted to evaluate the project overall benefit to cost ratio (B/C) utilizes the same data base presented in this appendix, the B/C analysis considers the value of the fish and wildlife over time and present worths these to 1986 dollars.

## **PROJECT AREA ANALYSIS**

### **RECREATIONAL ANALYSIS**

Project construction would impact both the existing and future use of lands and waters that provide opportunity for fish- and wildlife-oriented recreation. Project impacts generally can be classified as direct or secondary. Direct impacts result directly from project construction, i.e., levee building, etc. Secondary impacts occur as a result of the project being in place, i.e., pumping of leveed wetlands, clearing of bottomland hardwoods for agriculture, etc. Both types of impacts would, in this case, affect recreational resources from the land-use perspective. The impacts of each

plan alternative are evaluated on the basis of sport hunting potential losses or gains incurred as a result of construction of the project.

The capacity of the land to support a given number of man-days per acre of hunting supply, based upon a biological sustained harvest rate (hunting carrying capacity), can be measured. These man-days serve as an effective method of evaluating project impacts on the consumptive wildlife recreation predominates in the study area. Man-days of supply were calculated by first assuming that, based upon a high market area demand, each acre of available hunting habitat would be used to this optimal carrying capacity for each respective hunting activity type. The hunting carrying capacity is expressed in terms of hunting man-days per acre for each habitat type and hunting activity type. Carrying capacity multiplied by the number of habitat acres yields man-days of potential hunting supply.

These man-days of supply can be translated into an overall monetary worth, and are based upon a unit-day values (UDV) previously derived for this region in the recreational analysis of the Louisiana Coastal Area Freshwater Diversion Study which overlaps this study area. Unit-day values were assigned to each hunting activity through the analysis of evaluation criteria and standards as prescribed in the Water Resource Council's Principles and Guidelines. The five criteria and associated measurement standards are designed to reflect quality, relative scarcity, ease of access, and esthetic features of the recreational resource to be evaluated. The evaluation of these criteria with respect to the resource yield a point value, which is converted into a corresponding specific dollar value contained in a range of UDV provided in the most current published schedule. The approved FY 85 ranges of values are:

|                        |                   |
|------------------------|-------------------|
| General Recreation     | \$1.70 - \$5.10   |
| Specialized Recreation | \$11.80 - \$22.20 |



UDV's selected for use in this study are based upon a point value of 60 for each hunting activity in its respective range classification under the FY 85 schedule. Tables B-1 through B-3 display the man-days/acre, the total man-day/use, and associated dollar values of each for the future without and future with project conditions. Construction of the hurricane protection features would result in the average annual loss of about \$7,064 of potential recreational attributes in 1985 dollars.

#### COMMERCIAL FISHERIES

The area to be impacted lies within Hydrologic Unit IV, as defined by Chabreck (1972). Recent studies (Ader, 1980) have shown that the total acreage of marsh in Hydrologic Unit IV declined from 532,000 acres in 1956 to 406,000 acres in 1978. To estimate the number of acres present in Hydrologic Unit IV in base year 1975, the percent per year loss over the 22-year period was calculated based on acreage of marsh present in 1956 and 1978. It was calculated that total marsh acreage was being lost at 1.22 percent per year. Thus, in base year 1975, there would have been 421,726 acres of marsh in Hydrologic Unit IV.

Table B-4 provides a summary of the 1963-1978 average annual commercial harvest and value of the major estuarine-dependent commercial fishes and shellfishes for Hydrologic Unit IV. To determine value per acre of marsh, the net average annual value reported for Hydrologic Unit IV (\$17,570,000) was divided by the acres of marsh available (421,726) and this calculation yielded a net average commercial value of \$41.66 per acre. Without the project, the annualized 983 acres of marsh represents a net monetary value of \$40,954, and with the project, 161 the annualized acres represents a net of \$6,707 annually. Implementation of the hurricane protection feature would result in a net loss of \$34,247 per annualized acre over the project life expressed in 1985 dollar values.

TABLE B-1. The potential sport hunting (man-day) uses per acre of habitat within both the hurricane protection project and mitigation areas. This use value is the harvestable population (population density X maximum sustainable annual harvest) multiplied by the hunter success rate, and is from data provided by the U.S. Fish and Wildlife Service (Appendix A).

| HABITAT                  | TYPE OF HUNTING |              |                 |              |                 |              |
|--------------------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|
|                          | Big Game        |              | Small Game      |              | Waterfowl       |              |
|                          | Without Project | With Project | Without Project | With Project | Without Project | With Project |
| Fresh/Intermediate Marsh | .250            | .250         | .430            | .430         | .488            | .488         |
| Brackish Marsh           | -               | -            | .402            | .402         | .383            | .383         |
| Levee/Pasture (Upland)   | -               | -            | .176            | .176         | -               | -            |
| Wooded Swamp             | .130            | .043         | .337            | .113         | .053            | .018         |
| Bottomland Hardwood      | .130            | .043         | .337            | .113         | .016            | .005         |

TABLE B-2. The man-day use of each habitat type within the area affected by the hurricane protection project for various hunting activities. The man-day value is the carry capacity of each habitat (Table B-1) multiplied by the annualized acreage (Table 2).

| HABITAT                  | ANNUALIZED ACREAGE |              | TYPE OF HUNTING |              |                 |              |                 |              |
|--------------------------|--------------------|--------------|-----------------|--------------|-----------------|--------------|-----------------|--------------|
|                          | Without Project    | With Project | Big Game        |              | Small Game      |              | Waterfowl       |              |
|                          |                    |              | Without Project | With Project | Without Project | With Project | Without Project | With Project |
| Fresh/Intermediate Marsh | 298                | 83           | 74.5            | 20.75        | 128.1           | 35.7         | 145.4           | 40.5         |
| Brackish Marsh           | 685                | 78           | -               | -            | 275.4           | 31.3         | 262.4           | 29.9         |
| Wooded Swamp             | 32                 | 20           | 4.2             | .086         | 10.8            | 2.3          | 1.7             | 0.4          |
| Bottomland Hardwood      | 456                | 242          | 59.3            | 10.4         | 153.7           | 27.3         | 7.3             | 1.2          |
| Levee/Pasture            | 488                | 2,965        | -               | -            | 78.8            | 521.8        | -               | -            |
| Total Manday Use         |                    |              | 138.0           | 32.0         | 646.8           | 618.4        | 416.8           | 72.0         |

TABLE B-3. Dollar value of hunting in the area affected by the hurricane protection project. Value is the product of the man-day use multiplied by the unit day value (in 1985 dollars).

| Hunting           | Man-Day<br>Use | Unit<br>Day<br>Value | Dollar<br>Valuation | Annual<br>Change   |
|-------------------|----------------|----------------------|---------------------|--------------------|
| <b>Big Game</b>   |                |                      |                     |                    |
| Without Project   | 138.0          | \$15.40              | \$2,125.20          |                    |
| With Project      | 32.0           |                      | \$ 492.80           | -\$1,632.40        |
| <b>Small Game</b> |                |                      |                     |                    |
| Without Project   | 646.8          | \$ 4.30              | \$2,781.24          |                    |
| With Project      | 618.4          |                      | \$2,659.12          | - \$122.12         |
| <b>Waterfowl</b>  |                |                      |                     |                    |
| Without Project   | 416.8          | \$15.40              | \$6,418.72          |                    |
| With Project      | 72.0           |                      | \$1,108.80          | <u>-\$5,309.92</u> |
| <b>Total</b>      |                |                      |                     |                    |
| Without Project   |                |                      | \$11,325.00         |                    |
| With Project      |                |                      | \$ 4,261.00         | -\$7,064.44        |

TABLE B-4. The average annual commercial harvest a/ and 1985 dollar value of major estuarine-dependent finfishes and shellfishes attributable to Hydrologic Unit IV (Barataria Bay).

| SPECIES                    | HYDROLOGIC UNIT IV<br>(Millions lbs./\$) |
|----------------------------|--|
| Menhaden                   |  |
| Harvest <u>b/</u>          | 225.81                                   |
| Gross Value <u>c/</u>      | 13.55                                    |
| Net Value                  | 2.03                                     |
| Shrimp                     |  |
| Harvest                    | 23.23                                    |
| Adjusted Harvest <u>d/</u> | 42.26                                    |
| Gross Value                | 50.83                                    |
| Net Value                  | 10.11                                    |
| Oyster                     |  |
| Harvest                    | 5.05                                     |
| Adjusted harvest <u>e/</u> | 10.13                                    |
| Gross Value                | 16.61                                    |
| Net Value                  | 4.98                                     |
| Croaker <u>f/</u>          |  |
| Harvest                    | 15.25                                    |
| Gross Value                | 0.92                                     |
| Net Value                  | 0.14                                     |
| Blue Crab                  |  |
| Harvest                    | 3.56                                     |
| Gross Value                | 1.28                                     |
| Net Value                  | 0.18                                     |
| Sea Trout <u>f/</u>        |  |
| Harvest                    | 2.70                                     |
| Gross Value                | 0.51                                     |
| Net Value                  | 0.08                                     |
| Spot <u>f/</u>             |  |
| Harvest                    | 2.88                                     |
| Gross Value                | 0.14                                     |
| Net Value                  | 0.02                                     |
| Red Drum                   |  |
| Harvest                    | 0.36                                     |
| Gross Value                | 0.18                                     |
| Net Value                  | 0.03                                     |
| Total                      |  |
| Harvest                    | 277.84                                   |
| Adjusted Harvest           | 302.95                                   |
| Gross Value                | 80.46                                    |
| Net Value                  | 17.57                                    |

TABLE B-4. (Continued)

Source: National Marine Fisheries Service landing records for the years 1963-1978, compiled by New Orleans District, Corps of Engineers.

- a/ Harvest refers to total recorded commercial catch of a particular species from an area. The catch from offshore waters was assigned to inshore areas based on the relative abundance of estuarine marsh habitat.
- b/ Millions of pounds.
- c/ Millions of 1985 dollars. Value for all species except oysters represents running average of 1974-1978 exvessel prices brought to 1983 price levels using the Consumer Price Index for foods. Average price for oysters calculated for periods 1976-1980.
- d/ Reflects 200 percent increase of reported inshore landings, based on surveys conducted by Louisiana Department of Wildlife and Fisheries (C. J. White, personal communication, letter dated April 23, 1979).
- e/ Reflects 150 percent increase of reported landings, based on Mackin and Hopkins (1962) and Lindall et al. (1972).
- f/ Includes food fish and industrial bottomfish. Quantities of croaker, spot, and seatrout calculated after Lindall et al. (1972).

## COMMERCIAL TRAPPING

The value of commercially harvestable species was determined from the data in Tables B-5 and B-6, and can be found in Table B-7. These values were calculated by multiplying the average catch per acre of each habitat type by the average value to determine a gross value per acre. A harvest cost of 25 percent was to estimate the net value per acre. A net loss of \$2,131 of commercially harvestable species could occur based on 1985 dollar values.

TABLE B-5. The fur catch and value for the project area in 1985 dollars.

| SPECIES                      | MARSH              |                  | FORESTED<br>WETLANDS |
|------------------------------|--------------------|------------------|----------------------|
|                              | Fresh/Intermediate | Brackish         |                      |
| <u>Muskrat</u>               |                    |                  |                      |
| Average Catch/Acre <u>a/</u> | 0.0880 <u>b/</u>   | 0.0844           | 0.0140               |
| Value/Pelt <u>c/</u>         | \$5.87             | \$5.87           | \$5.59               |
| Value/Acre                   | \$0.5166           | \$0.4954         | \$0.08               |
| <u>Nutria</u>                |                    |                  |                      |
| Average Catch/Acre           | 0.3988 <u>b/</u>   | 0.0864           | 0.0620               |
| Value/Pelt                   | \$7.99             | \$7.99           | \$14.08              |
| Value/Acre                   | \$3.19             | \$0.6903         | \$0.87               |
| <u>Mink</u>                  |                    |                  |                      |
| Average Catch/Acre           | 0.0015 <u>b/</u>   | 0.0011           | .0015                |
| Value/Pelt                   | \$14.79            | \$14.79          | \$14.08              |
| Value/Acre                   | \$0.0222           | \$0.0163         | \$0.02               |
| <u>Otter</u>                 |                    |                  |                      |
| Average Catch/Acre           | 0.0005 <u>b/</u>   | 0.0002           | Negligible           |
| Value/Pelt                   | \$48.20            | \$48.20          | "                    |
| Value/Acre                   | \$0.0241           | \$0.0096         | "                    |
| <u>Raccoon</u>               |                    |                  |                      |
| Average Catch/Acre           | 0.0093 <u>e/</u>   | 0.0078 <u>f/</u> | 0.0480               |
| Value/Pelt                   | \$12.39            | \$12.03          | \$11.80              |
| Value/Acre                   | \$0.1119           | \$0.0938         | \$ .57               |
| <u>TOTAL</u>                 |                    |                  |                      |
| Gross Value/Acre             | \$3.87             | \$1.31           | \$1.54               |
| Net Value/Acre <u>g/</u>     | \$2.90             | \$0.98           | \$1.16               |

a/ Average catch per acre, unless otherwise noted, from Palmisano (1973).

b/ Represents mean of fresh and intermediate marsh average/acre.

c/ Calculated as 25 percent of brackish marsh average harvest/acre reported by Palmisano (1973).

d/ Based on a 1976-81 running average of prices received by the trapper, expressed in 1985 dollars using the Consumer Price Index for Hides, Skins, Leather, and Related Products. Base price data compiled by Louisiana Department of Wildlife and Fisheries.

e/ Represents one half of the combined maximum production for fresh and intermediate marsh types reported by Palmisano (1973).

f/ Represents one half the maximum value reported by Palmisano (1973).

g/ Cost of harvest equals 25 percent of gross returns; net value equals gross returns minus cost of harvest.



TABLE B-6. The 1985 value of potential alligator harvest in the Barataria Bay Basin. <sup>a/</sup>

|  | MARSH              |          | FORESTED<br>WETLANDS |
|--|--------------------|----------|----------------------|
|  | Fresh/Intermediate | Brackish |                      |
| Mean Harvest (Animals/Acre)                | 0.0075             | 0.0038   | Negligible           |
| Mean Value/Hide <sup>b/</sup>              | \$144.20           | \$144.20 | N/A                  |
| Mean Value of Meat<br>Animal <sup>c/</sup> | \$77.59            | \$77.59  | N/A                  |
| Mean Total                                 | \$221.79           | \$221.79 |                      |
| Total Value (Gross)/<br>Acre               | \$1.66             | \$0.84   | Negligible           |
| Net Value Per Acre <sup>d/</sup>           | \$1.25             | \$0.63   | Negligible           |

<sup>a/</sup> Data on hide value, mean hide length, mean weight, and harvest provided by Ted Joanen and David Richard, Louisiana Department of Wildlife and Fisheries, Grand Cheniere, Louisiana.

<sup>b/</sup> Based on mean length/hide of 7 feet and estimated 1985 hide price of \$20.60 per linear foot.

<sup>c/</sup> Based on mean dressed weight/animal of 47.6 pounds and estimated 1985 mean price of \$1.63 per pound.

<sup>d/</sup> Based on cost of harvest equal to 25 percent of total gross value.

TABLE B-7. The total net value of fur and hides in the hurricane protection project area. The total net value is the annualized acreage times the net values from Tables B-5 and B-6.

| HABITAT   | ANNUALIZED ACREAGE |              | HARVEST VALUE (in dollars) |              |                 |              |                 |              |
|---|--------------------|--------------|----------------------------|--------------|-----------------|--------------|-----------------|--------------|
|   | Without Project    | With Project | Fur                        |              | Alligator Hide  |              | Total           |              |
|   |                    |              | Without Project            | With Project | Without Project | With Project | Without Project | With Project |
| Fresh/Intermediate Marsh                                    | 298                | 83           | 864                        | 241          | 372             | 104          | 1,236           | 345          |
| Brackish Marsh  | 685                | 78           | 671                        | 76           | 432             | 49           | 1,103           | 125          |
| Forested Wetland<br>(Wooded Swamp &<br>Bottomland Hardwood) | 488                | 262          | 566                        | 304          | -               | -            | 566             | 304          |
| Levee/Pasture   | 488                | 2,965        | -                          | -            | -               | -            | -               | -            |
| Total   |                    |              |                            |              |                 |              | \$2,905         | \$774        |

## MITIGATION AREA ANALYSIS

The procedures and data bases used to calculate the economic analysis of the mitigation area were the same as used for the analysis of the protected area. This information can be presented in Tables B-7 to B-10, and was calculated from the information found in Tables B-1, and B-4, B-5 and B-6. The final analysis can be found in Table 8 of the mitigation report.

### RECREATIONAL ANALYSIS.

A recreational analysis of the proposed mitigation area can be found in Tables B-8 and B-9, and is summarized in Table 8 of the mitigation report. Implementation of the proposed mitigation plan would result in a net gain of \$16,755 of potential recreational attributes within the management area.

### FISHERIES VALUES

From the data in Table B-4 and analysis in the evaluation of fishery values for the project, a net harvest value of \$41.66 per acre of marsh was determined. Without the mitigation plan, an annualized 2,210 acres of marsh would be present in the mitigation area and represents a net monetary value of \$92,069 and with the mitigation plan, on annualized acres which are valued at \$118,481. Implementation of the mitigation feature would result in an annual gain of \$26,412 expressed in 1985 dollars.

### COMMERCIAL TRAPPING

The potential value of commercially harvestable species in the mitigation area was calculated from the data in Tables B-5, B-6, and B-11. Without mitigation work, a potential \$6,242 of fur and hides could be harvested per annualized acre in 1985 dollars, and with the mitigation features, \$11,683, for a net gain of \$5,441 annually.

TABLE B-8. The potential man-day use of each habitat type for various hunting activities in the mitigation area. The total value is the potential sport hunting in man-days per acre of each habitat (Table B-1) multiplied by the annualized acreage. (Table 5 of the mitigation report).

| <u>HABITAT</u>              | <u>ANNUALIZED ACREAGE</u> |                 | <u>TYPE OF HUNTING</u> |                 |                    |                 |                    |                 |
|-----------------------------|---------------------------|-----------------|------------------------|-----------------|--------------------|-----------------|--------------------|-----------------|
|                             | Without<br>Project        | With<br>Project | <u>Big Game</u>        |                 | <u>Small Game</u>  |                 | <u>Waterfowl</u>   |                 |
|                             |                           |                 | Without<br>Project     | With<br>Project | Without<br>Project | With<br>Project | Without<br>Project | With<br>Project |
| Fresh/Intermediate<br>Marsh | 684                       | 2,797           | 171                    | 699             | 294                | 1,203           | 344                | 1,365           |
| Brackish Marsh              | 1,526                     | 47              | -                      | -               | 613                | 19              | 584                | 18              |
| Upland                      | 167                       | 307             | -                      | -               | 29                 | 54              | -                  | -               |
| Total Man-day Use           |                           |                 | 171                    | 699             | 936                | 1,276           | 918                | 1,383           |

TABLE B-9. Dollar value of hunting in the mitigation area. Value is the product of the man-day use multiplied by the unit day value.

| Hunting         | Man-Day<br>Use | Unit<br>Day<br>Value | Dollar<br>Valuation | Annual<br>Change |
|-----------------|----------------|----------------------|---------------------|------------------|
| Big Game        |                |                      |                     |                  |
| Without Project | 171            | \$15.40              | \$2,633             |                  |
| With Project    | 699            |                      | \$10,765            | \$8,132          |
| Small Game      |                |                      |                     |                  |
| Without Project | 936            | \$4.30               | \$4,025             |                  |
| With Project    | 1,276          |                      | \$5,487             | \$1,462          |
| Waterfowl       |                |                      |                     |                  |
| Without Project | 918            | \$15.40              | \$14,137            |                  |
| With Project    | 1,383          |                      | \$21,298            | \$7,161          |
| Total           |                |                      |                     |                  |
| Without Project |                |                      | \$20,795            |                  |
| With Project    |                |                      | \$37,550            | \$16,755         |

TABLE B-10. The value of fur and hides in the mitigation area. The harvest value is calculated by multiplying the annualized acreage by the net value/acre from Tables B-5 and B-6.

| <u>HABITAT</u>              | <u>ANNUALIZED ACREAGE</u> |                 | <u>HARVEST VALUE (in dollars)</u> |                 |                       |                 |                    |                 |
|-----------------------------|---------------------------|-----------------|-----------------------------------|-----------------|-----------------------|-----------------|--------------------|-----------------|
|                             | Without<br>Project        | With<br>Project | <u>Fur</u>                        |                 | <u>Alligator Hide</u> |                 | <u>Total</u>       |                 |
|                             |                           |                 | Without<br>Project                | With<br>Project | Without<br>Project    | With<br>Project | Without<br>Project | With<br>Project |
| Fresh/Intermediate<br>Marsh | 684                       | 2,797           | 1,984                             | 8,111           | 855                   | 3,496           | 2,839              | 11,607          |
| Brackish Marsh              | 1,526                     | 47              | 1,495                             | 46              | 1,908                 | 30              | 3,403              | 76              |
| Total                       |                           |                 |                                   |                 |                       |                 | \$6,242            | \$11,683        |

## LITERATURE CITED

- Ader, Robert R. 1980. Mississippi Deltaic Plain region habitat acreage data. National Coastal Ecosystems Team, U.S. Fish and Wildlife Service, Office of Biological Services.
- Chabreck, R. H. 1972. Vegetation, water, and soil characteristics of the Louisiana State University, Agricultural Experiment Station Bulletin 664. 72 pp.
- Lindall, W.M., J.R. Hall, J.E. Sykes, and E.L. Arnold, Jr. 1972. Louisiana coastal zone: analyses of resources and resource development needs in connection with estuarine ecology. Sections 10 and 13 - fishery resources and their needs. Prepared by National Marine Fisheries Service Biological Laboratory, St. Petersburg, Florida, for Department of the Army, New Orleans District, Corps of Engineers.
- Mackin, J.G., and S.W. Hopkins. 1962. Studies on oyster mortality in relation to natural environments and to oil fields in Louisiana. Publications of the Institute of Marine Science, University of Texas, 7:1-126.





**APPENDIX C**

**LETTERS**





EDWIN W. EDWARDS  
GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

B. JIM PORTER  
SECRETARY

Coastal Management Division

September 20, 1985

Colonel Eugene S. Witherspoon  
District Engineer  
U.S. Army Corps of Engineers  
New Orleans District  
P. O. Box 60267  
New Orleans, LA 70160

RE: C840312, Coastal Zone Consistency  
**Corps of Engineers**  
Larose to Golden Meadow  
Hurricane Protection Project  
and mitigation of a weir and levee  
in Point au Chein WMA  
Lafourche Parish, LA

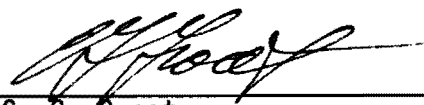
Dear Colonel Witherspoon:

The above referenced project has been received by this office and has been found to be consistent, to the maximum extent practicable, with the Louisiana Coastal Resources Program as required in Section 307(c)(1)(2) of the Coastal Zone Management Act of 1972, as amended.

Sincerely,

B. JIM PORTER

By:

  
C. G. Groat  
Assistant to the Secretary

BJP:CGG/se

cc: Mr. Ron Ventola  
U. S. Army Corps of Engineers  
Mr. Burton Angelle, LDWF





PATRICIA L. NORTON  
SECRETARY

OFFICE OF WATER RESOURCES

J. DALE GIVENS  
ASSISTANT SECRETARY

October 25, 1985

WQC 850904-08

U.S. Army Corps of Engineers  
New Orleans District  
Planning Division  
P.O. Box 60267  
New Orleans, La. 70160

Attention: Mr. Ken Froehlich

Gentlemen:

RE: Proposal for constructing an earthen-filled levee and a low water weir within the Point-au-Chien Wildlife Management Area, Lafourche Parish, La. to retard the movement of saltwater into the marshes northwest of Grand Bayou. Approx. 700,000 cy of dredged material would be used to construct the levee.

This is to acknowledge receipt of "Proof of Publication" of public notice, above reference, forwarded to you with our letter dated September 20, 1985 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 402 of the Clean Water Act (P.L. 95-217), the Office of Water Resources certifies that it is reasonable to expect that water

U.S. Army Corps of Engineers  
October 25, 1985  
Page 2

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

Very truly yours,

A handwritten signature in cursive script that reads "J. Dale Givens".

J. Dale Givens, Assistant Secretary  
Office of Water Resources

JDG/LW/mp

cc: Corps of Engineers  
Coastal Zone Management

**BOARD OF COMMISSIONERS**  
**SOUTH LAFOURCHE LEVEE DISTRICT**  
Post Office Box 426  
GALLIANO, LOUISIANA 70354

July 28, 1983

Larose to Golden Meadow  
Hurricane Protection Project  
Mitigation

Mr. C. Wagahoff  
Chief, Planning Division  
U. S. Army Engineer District, New Orleans  
P. O. Box 60267  
New Orleans, LA 70160

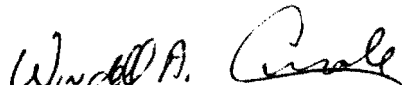
Dear Mr. Wagahoff:

Enclosed is a true and exact copy of a resolution unanimously adopted by the Board of Commissioners of the South Lafourche Levee District at its regularly scheduled monthly meeting held on July 11, 1983.

If any further information is required, please do not hesitate to notify this office.

Very truly yours,

SOUTH LAFOURCHE LEVEE DISTRICT

  
Windell A. Curole  
General Manager

jr

Enclosure: As stated.

R E S O L U T I O N

Moved by Roy Gisclair, seconded by James Danos, and unanimously adopted on this 11th day of July, 1983.

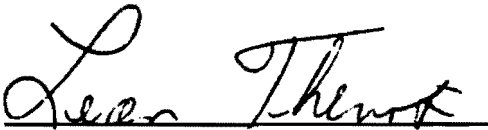
WHEREAS, The Board of Commissioners of the South Lafourche Levee District has been requested to participate with the U. S. Army Corps of Engineers in a mitigation plan for wetlands disturbed by the levee project, and

WHEREAS, The Board of Commissioners of the South Lafourche Levee District is vitally interested in any plan that will preserve wetland areas within the District, and

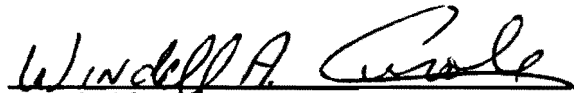
WHEREAS, after due consideration of the mitigation proposals of the U. S. Army Corps of Engineers relative to construction of seven-mile levee system to protect the Pointe Au Chien Reserve,

NOW, THEREFORE, BE IT RESOLVED that the Board of Commissioners of the South Lafourche Levee District does hereby approve the U. S. Army Corps of Engineers mitigation plan on a 70/30 cost sharing basis.

UNANIMOUSLY ADOPTED.



Leon Theriot  
President



Windell A. Curole  
Executive Secretary

\* \* \*

I, WINDELL A. CUROLE, Executive Secretary of South Lafourche Levee District, do hereby certify that the foregoing is a true and correct copy of the Resolution adopted by the Board of Commissioners in regular session on July 11, 1983, at which meeting a quorum was present.

Given under my official signature & seal of office this 26th day of July, 1983.



Windell A. Curole  
Executive Secretary



**BOARD OF COMMISSIONERS**  
**SOUTH LAFOURCHE LEVEE DISTRICT**  
Post Office Box 426  
GALLIANO, LOUISIANA 70354

December 10, 1982

Larose to Golden Meadow  
Hurricane Protection Project  
Proposed Mitigation Plan  
LMNPD-RE

Cletis R. Wagahoff  
Chief, Planning Division  
Department of the Army  
New Orleans District  
Corps of Engineers  
P. O. Box 60267  
New Orleans, LA 70160

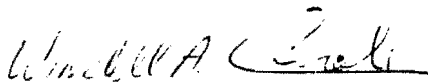
Dear Mr. Wagahoff:

Enclosed is a true and exact copy of a resolution unanimously adopted by the Board of Commissioners of the South Lafourche Levee District at its regularly acheduled monthly meeting held on October 11, 1982.

If further information is required, please do not hesitate to contact me.

Very truly yours,

SOUTH LAFOURCHE LEVEE DISTRICT



Windell A. Curole  
General Manager

WAC/jr

Enclosure: As stated.

EXCERPT FROM THE MINUTES OF THE OCTOBER 11, 1982 REGULAR MEETING

RESOLUTION

WHEREAS, The Board of Commissioners of the South Lafourche Levee District has been requested to participate with the U. S. Army Corps of Engineers in a mitigation plan for wetlands disturbed by the levee project, and

WHEREAS, The Board of Commissioners of the South Lafourche Levee District is vitally interested in any plan that will preserve wetland areas within the District, and

WHEREAS, After due consideration of the mitigation proposals of the U. S. Army Corps of Engineers relative to construction of a seven-mile levee system to protect the Pointe au Chien Reserve,


NOW, THEREFORE, BE IT RESOLVED that the Board of Commissioners of the South Lafourche Levee District does hereby tentatively approve the U. S. Army Corps of Engineers mitigation plan on a 70/30 cost-sharing basis.

NOW, THEREFORE, BE IT FURTHER RESOLVED that said tentative approval is contingent upon prior completion of the levee system, acquisition of additional outside funding to finance the mitigation project, and the take over of the maintenance of the completed mitigation project by some outside agency.

UNANIMOUSLY ADOPTED.

And the resolution was declared adopted on this 11th day of October, 1982.

This is to certify that the above and foregoing is a true and correct copy of a resolution from the minutes of a regular meeting of the South Lafourche Levee District held at Galliano, Louisiana, on Oct. 11, 1982.

  
\_\_\_\_\_  
Windell A. Curole, General Manager &  
Executive Secretary

**APPENDIX D**

**INCREMENTAL ANALYSIS**



## INCREMENTAL ANALYSIS

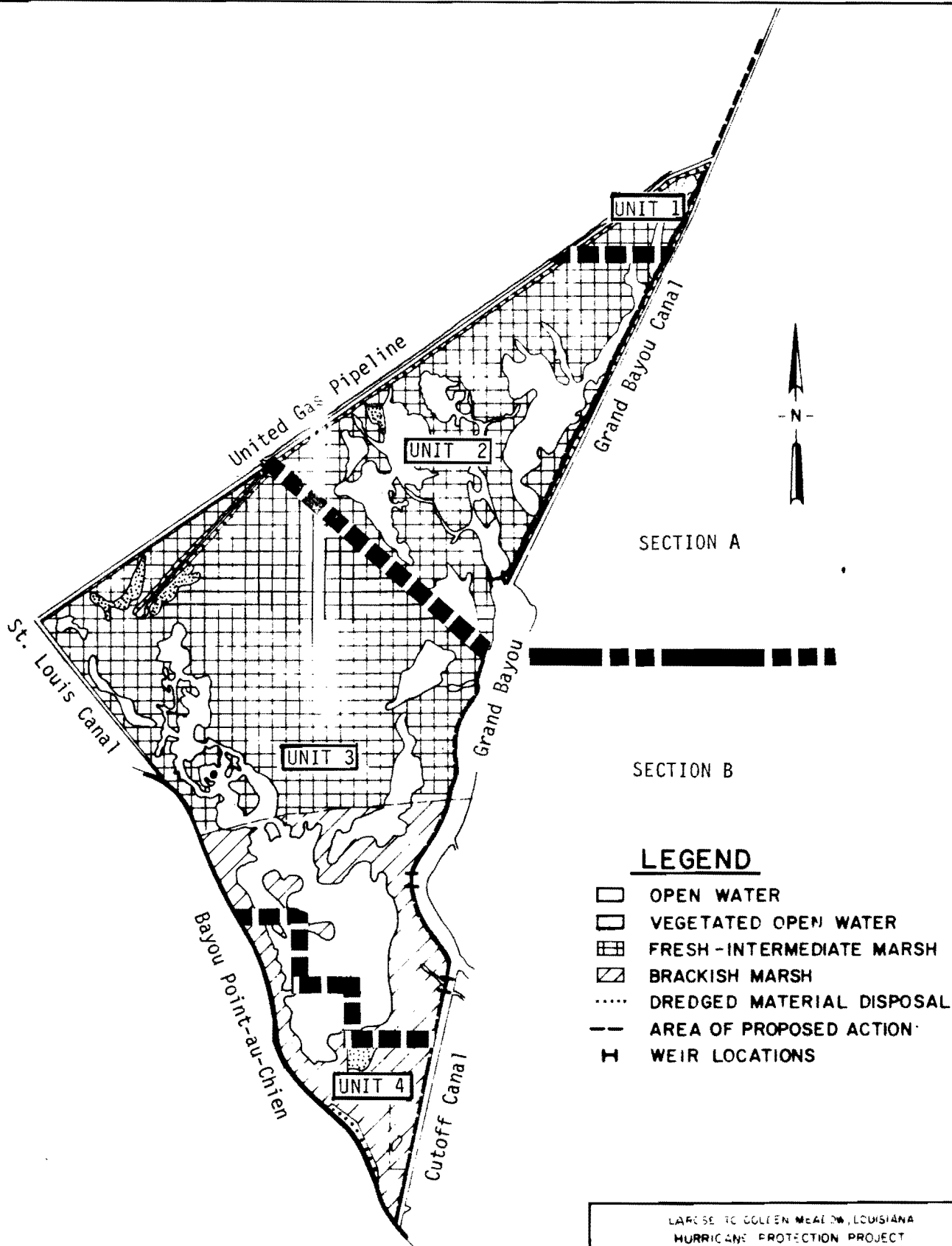
### LAROSE TO GOLDEN MEADOW, LOUISIANA

#### Mitigation

Corps regulations (ER 1105-2-50) require that the "justification of separable mitigation measures shall be based upon analyses that demonstrate that the combined monetary and nonmonetary value of the last increment of losses prevented exceeds the combined monetary and nonmonetary costs of the last added increment so as to reasonably maximize overall project benefits (losses prevented)."

To analyze this mitigation plan, the proposed 4,598-acre mitigation area on the Pointe-au-Chein Wildlife Management Area was divided into units and sections. The mitigation area was initially divided into four units by using an existing canal and property lines (Figure 1), and each was evaluated separately. The two northern units (1 and 2) and the two southern units (3 and 4) were then combined into Sections A and B, respectively. For each unit and section, as well as the total area, the acreage, annualized habitat units, construction costs in 1984 dollars, and costs per habitat unit were examined to determine its ability to achieve 100-percent mitigation in a cost-effective manner (Tables 1 and 2). If treated independently, Units 1 to 4 would have a total first cost of approximately \$6.4 million and a total cost, including capitalized (percent worth) of maintenance, of \$9.7 million. Sections A and B would have a total first cost of about \$3.8 million and a total cost, including maintenance, of \$5.8 million. With the total mitigation area evaluated as a whole, a cost of about \$2.8 million is estimated and a total cost, including maintenance, is \$4.2 million.

Figure 2 presents an incremental analysis of the mitigation costs. It shows that building the total area is the most effective method of mitigating, since 100-percent mitigation is attained at a first cost of about \$2.8 million and a total cost of \$4.2 million. Construction of Section B alone would mitigate about 63 percent of the losses at a cost of \$2.7 million. Adding Section A to achieve 100-percent mitigation would cost another \$3.0 million so that full mitigation would cost about \$5.7



LAROSE TO GOLDEN MEADOW, LOUISIANA  
HURRICANE PROTECTION PROJECT

**PROPOSED MITIGATION PLAN  
STUDY AREA**

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS

AUGUST 1982

TABLE 1  
FIRST COST DATA

TABLE 1a Habitat and First Cost Data, in 1984 dollars, for Units 1, 2, 3, and 4 of the Pointe-au-Chien Mitigation Area.

| UNITS | AREA<br>(in acres) | ANNUALIZED<br>HABITAT UNITS |                   |         | COST <sup>1/</sup>        | COST PER<br>HABITAT UNIT |
|-------|--------------------|-----------------------------|-------------------|---------|---------------------------|--------------------------|
|       |                    | FWOM <sup>2/</sup>          | FWM <sup>3/</sup> | Change  |                           |                          |
| 1     | 50                 | 1,635                       | 2,564             | + 929   | \$ 666,000                | \$ 717                   |
| 2     | 1,493              | 49,396                      | 74,775            | +25,379 | \$2,038,000               | \$ 80                    |
| 3     | 2,703              | 92,529                      | 141,863           | 49,334  | \$2,375,000               | \$ 48                    |
| 4     | 352                | 11,926                      | 19,175            | 7,249   | \$1,339,000               | \$ 185                   |
| TOTAL | 4,598              | 155,486                     | 238,377           | 82,891  | \$6,418,000 <sup>4/</sup> |                          |

TABLE 1b Habitat and Cost Data for Sections A and B on the Pointe-au-Chien Mitigation Area.

| SECTION | AREA  | ANNUALIZED<br>HABITAT UNITS |         |        | COST                      | COST PER<br>HABITAT UNIT |
|---------|-------|-----------------------------|---------|--------|---------------------------|--------------------------|
|         |       | FWOM                        | FWM     | Change |                           |                          |
| A       | 1,543 | 51,031                      | 77,339  | 26,308 | \$1,988,000               | \$ 76                    |
| B       | 3,055 | 104,455                     | 161,038 | 56,583 | \$1,810,000               | \$ 32                    |
| TOTAL   | 4,598 | 155,486                     | 238,377 | 82,891 | \$3,798,000 <sup>4/</sup> |                          |

TABLE 1c Habitat and Cost Data for the Entire Pointe-au-Chien Mitigation Area.

| UNITS | AREA  | ANNUALIZED<br>HABITAT UNITS |         |                      | COST                      | COST PER<br>HABITAT UNIT |
|-------|-------|-----------------------------|---------|----------------------|---------------------------|--------------------------|
|       |       | FWOM                        | FWM     | Change               |                           |                          |
| TOTAL | 4,598 | 155,486                     | 238,377 | 82,889 <sup>5/</sup> | \$2,843,100 <sup>6/</sup> | \$ 34                    |

<sup>1/</sup> First Cost.

<sup>2/</sup> Future without mitigation.

<sup>3/</sup> Future with mitigation.

<sup>4/</sup> The minor discrepancy in Habitat Unit changes shown in Tables 1, 2, and 3 is due to rounding in calculations.

<sup>5/</sup> The sum of each independent unit/section.

<sup>6/</sup> The cost in 1986 dollars is \$2,908,763.

TABLE 2  
FIRST AND MAINTENANCE COST DATA

TABLE 2a Habitat and Cost, Including Capitalized Maintenance, Data, in 1984 dollars, for the Units 1, 2, 3, and 4 of the Pointe-au-Chien Mitigation Area.

| UNITS | AREA<br>(in acres) | ANNUALIZED<br>HABITAT UNITS |                   |         | COST <sup>1/</sup>        | COST PER<br>HABITAT UNIT |
|-------|--------------------|-----------------------------|-------------------|---------|---------------------------|--------------------------|
|       |                    | FWOM <sup>2/</sup>          | FWM <sup>3/</sup> | Change  |                           |                          |
| 1     | 50                 | 1,635                       | 2,564             | + 929   | \$ 932,000                | \$1,003                  |
| 2     | 1,493              | 49,396                      | 74,775            | +25,379 | \$3,119,000               | \$ 132                   |
| 3     | 2,703              | 92,529                      | 141,863           | 49,334  | \$3,703,000               | \$ 75                    |
| 4     | 352                | 11,926                      | 19,175            | 7,249   | \$1,908,000               | \$ 263                   |
| TOTAL | 4,598              | 155,486                     | 238,377           | 82,891  | \$9,662,000 <sup>4/</sup> |                          |

TABLE 2b Habitat and Cost Data for Sections A and B on the Pointe-au-Chien Mitigation Area.

| SECTION | AREA  | ANNUALIZED<br>HABITAT UNITS |         |        | COST                      | COST PER<br>HABITAT UNIT |
|---------|-------|-----------------------------|---------|--------|---------------------------|--------------------------|
|         |       | FWOM                        | FWM     | Change |                           |                          |
| A       | 1,543 | 51,031                      | 77,339  | 26,308 | \$3,088,000               | \$ 117                   |
| B       | 3,055 | 104,455                     | 161,038 | 56,583 | \$2,757,000               | \$ 49                    |
| TOTAL   | 4,598 | 155,486                     | 238,377 | 82,891 | \$5,845,000 <sup>4/</sup> |                          |

TABLE 3c Habitat and Cost Data for the Entire Pointe-au-Chien Mitigation Area.

| UNITS | AREA  | ANNUALIZED<br>HABITAT UNITS |         |        | COST                    | COST PER<br>HABITAT UNIT |
|-------|-------|-----------------------------|---------|--------|-------------------------|--------------------------|
|       |       | FWOM                        | FWM     | Change |                         |                          |
| TOTAL | 4,598 | 155,486                     | 238,377 | 82,889 | 4,171,180 <sup>5/</sup> | \$ 50                    |

1/ Cost including capitalized (present worth) maintenance.

2/ Future without mitigation.

3/ Future with mitigation.

4/ The minor discrepancy in Habitat Unit changes shown in Tables 1, 2, and 3 is due to rounding in calculations.

5/ The cost in 1986 dollars is \$4,236,843.



AN INCREMENTAL ANALYSIS OF THE LAROSE TO GOLDEN MEADOW MITIGATION PLAN

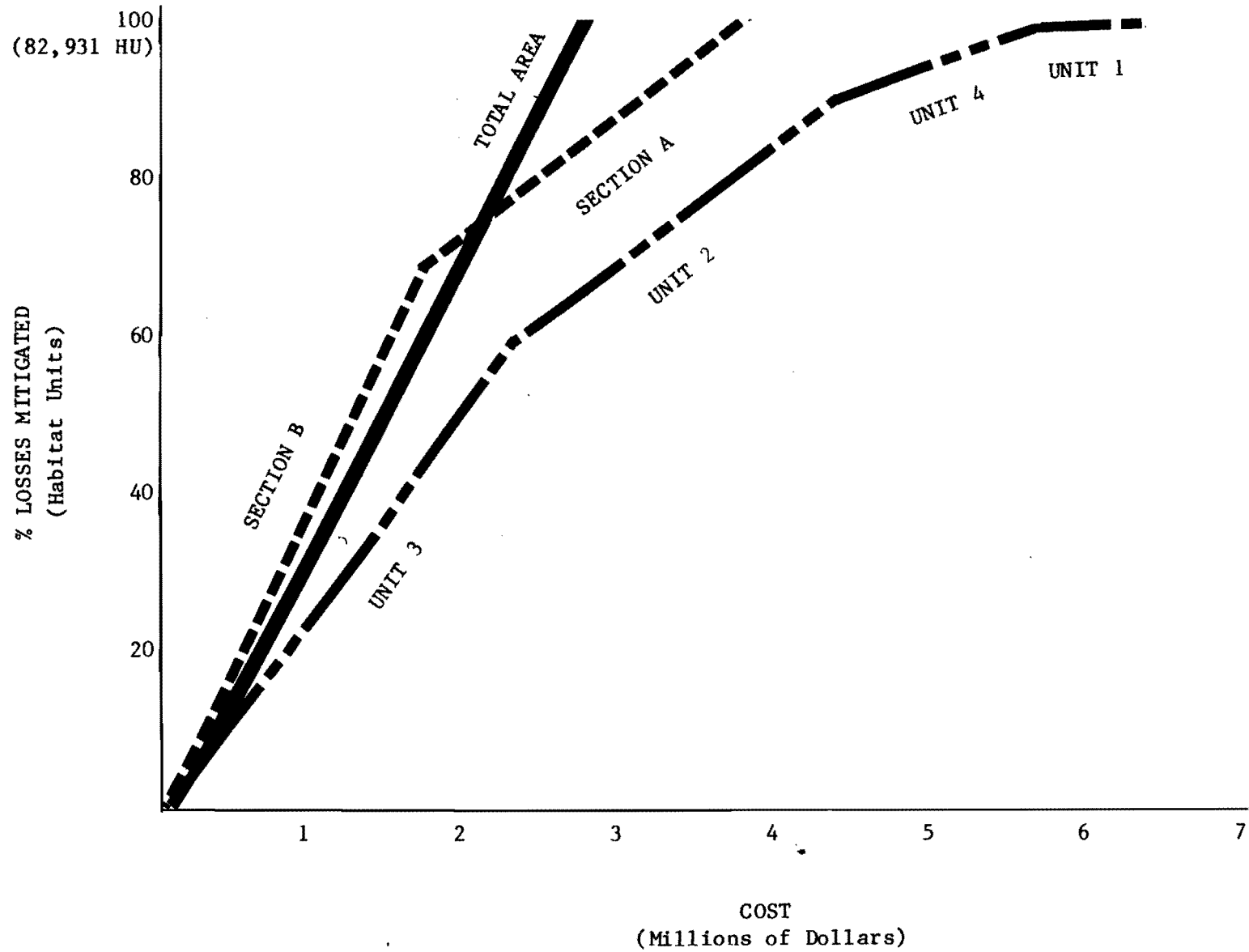


Figure 2

million. Dividing the area into four separate units would be even less effective and cost about \$9.7 million.

The least expensive unit (unit 3) would cost about \$3.7 million to construct and maintain over the project life, and would mitigate for 58% of the losses incurred as a result of the hurricane protection project. The least expensive section (section B) would cost approximately \$2.8 million, and compensate for 68% of the impacts.

The incremental cost of achieving 100% mitigation as compared to 58% mitigation provided by unit 3 is about \$468,000. The incremental cost of 100% mitigation as compared to the 68% achieved by section B is approximately \$1,414,000. Based on the low per unit costs of the additional increments compared to the unit costs of the initial increment (Tables 2a, b, c), and further based on professional judgement as to the non-monetary benefits of 100% mitigation, the additional increment of benefits is considered to outweigh the additional costs.

**APPENDIX E**

404 (b)(1) Evaluation



**LAROSE TO GOLDEN MEADOW  
HURRICANE PROTECTION - MITIGATION**

**SECTION 404 (b)(1) EVALUATION**

**I. PROJECT DESCRIPTION**

a. Location. The project is located within the Pointe-au-Chien Wildlife Management Area, Lafourche Parish, Louisiana (Figure 1), and includes a 4,600-acre tract northwest of Cutoff Canal, Grand Bayou, and Grand Bayou Canal.

b. General Description. The project consists of constructing an earthen-filled levee and a low-water weir to retard the movement of saltwater into the marshes northwest of Grand Bayou. The 105-foot long constant-level timber weir would be constructed to retard saltwater from entering the mitigation area. A submerged shell ramp placed on each side of the weir would provide an access route for estuarine organisms into and out of the mitigation site. The complete mitigation plan also includes replacement of two existing 55-foot weirs. Since this would be maintenance of currently serviceable structures, this action will not be analyzed in this Evaluation.

c. Authority and Purpose. The Larose to Golden Meadow, Louisiana, Hurricane Protection project was authorized by Public Law 298, 89th Congress, and approved on October 27, 1965. This feature, designed to mitigate for project induced losses, is being proposed to fulfill the U.S. Army Corps of Engineers' obligations as mandated by Corps policy for mitigation, the Fish and Wildlife Coordination Act of 1958 (P.L. 85-624), and the National Environmental Policy Act of 1969 (P.L. 91-190).

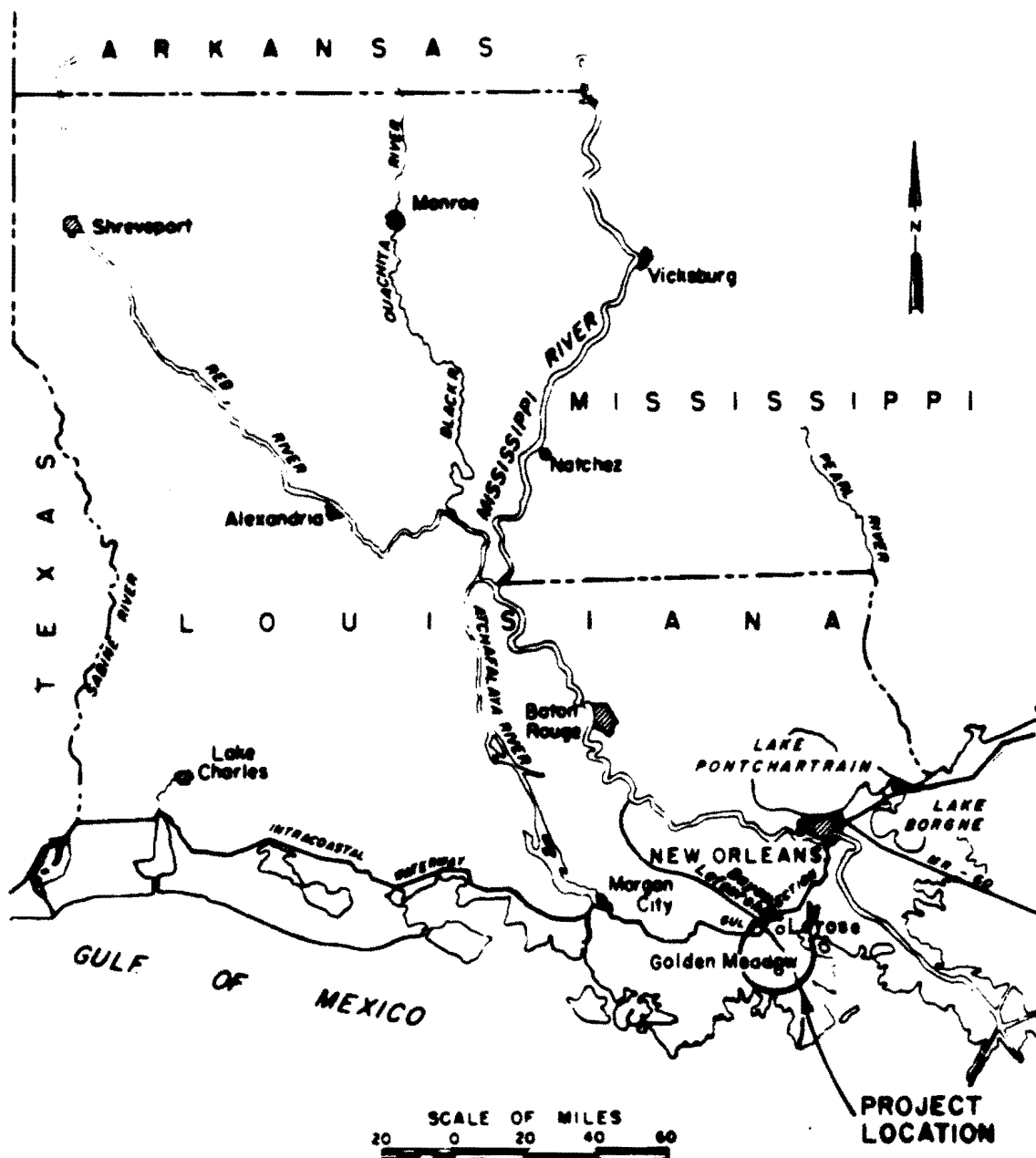


FIGURE 1

LAROSE TO GOLDEN MEADOW, LOUISIANA  
HURRICANE PROTECTION PROJECT

## PROJECT LOCATION

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS

AUGUST 1982

FILE NO. H-2-29491

d. General Description of Dredged or Fill Material.

(1) General Characteristics of Material. The levee material consists of clay and silt. The weir would be built of timbers. The ramps would be composed of shell.

(2) Quantity of Material. Approximately 700,000 cubic yards of material would be used for the levee. Construction of the shell ramps would require approximately 4,000 cubic yards of shell material for the 105-foot weir.

(3) Source of Material. The material for levee construction would be obtained from Grand Bayou Canal, Grand Bayou, and the Cutoff Canal. The material for the weir and ramps would be commercially purchased.

e. Description of the Proposed Discharge Site (s).

(1) Location. The dredged material would be deposited along the northwestern banks of Cutoff Canal, Grand Bayou, and Grand Bayou Canal, Louisiana (Figure 2). The weir would be placed at the opening to Grand Bayou.

(2) Size and Type of Habitat. Approximately 75 acres of marsh and 10 acres of water bottom would be impacted.

(3) Type of Site. The excavated material would be placed in unconfined areas.

(4) Timing and Duration of Discharge. Discharge would proceed generally from May through September.

f. Description of Disposal Method. A barge-mounted dragline would be used to remove and place the dredged material. Barge-mounted equipment would be used to construct the weir and ramps.

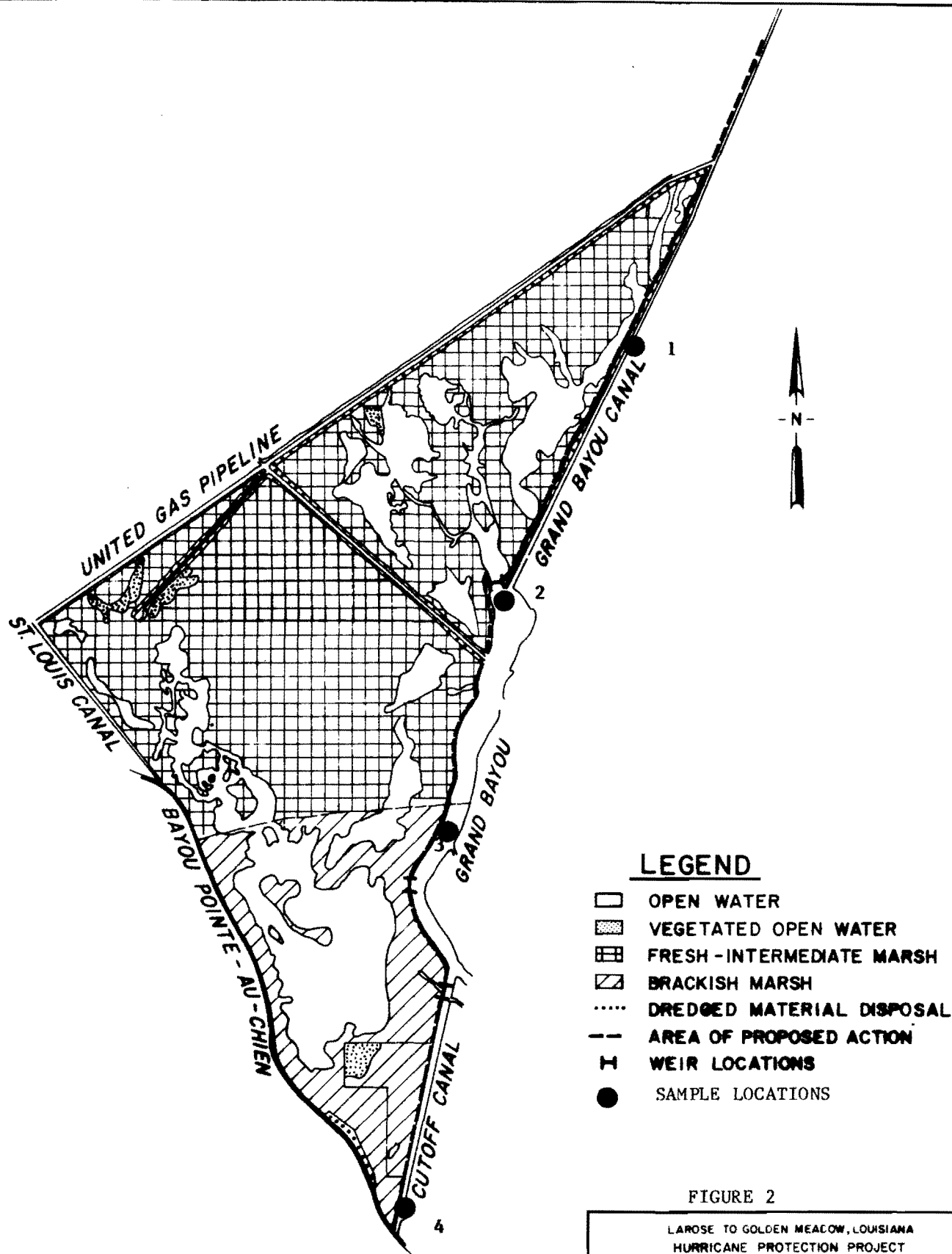


FIGURE 2

LAROSE TO GOLDEN MEADOW, LOUISIANA  
HURRICANE PROTECTION PROJECT

### PROPOSED MITIGATION PLAN STUDY AREA

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS

AUGUST 1982

FILE NO. H-2-29491



## II. FACTUAL DETERMINATION

### a. Physical Substrate Determinations.

(1) Substrate Elevation and Slope. The levee would be constructed initially to +6.0 National Geodetic Vertical Datum (NGVD); however, with expected compaction and dewatering, the final design height would be +4.0 NGVD. The crown width would be 4 feet with a 1:4 side slope stabilized by small lateral berms. The shell ramp would have a slope of 1:4 and would come to the crown of the weir. The crown would be set 0.6 to 0.8 feet below marsh level.

(2) Sediment Type. The composition of dredged material would be similar to material at the designated disposal site.

(3) Dredged/Fill Material Movement. No significant movement of levee or ramp material is anticipated.

(4) Physical Effects on Benthos. As a result of the placement of dredged material, bottom-dwelling organisms would be buried in the immediate vicinity of the discharge for the levee and ramp.

(5) Actions to Minimize Impacts. No action to be undertaken.

### b. Water Circulation, Fluctuation, and Salinity Determinations.

#### (1) Effects on Water.

(a) Salinity. Long-term average salinity levels in the mitigation area would be reduced as an indirect consequence of the proposed fill-material discharge.

(b) Water Chemistry. Minor and temporary alteration of local water chemistry is anticipated during fill-material discharge. Typical changes in local water chemistry include elevated oxygen demand, dissolved solids, nitrogen, iron, and manganese concentrations. Normally, the affected surface waters have sufficient buffer capacity to prevent radical shifts in pH. Dilution tends to limit the degree and areal extent of modifications in water chemistry.

(c) Clarity. Elevated suspended particulate levels would significantly diminish surface water clarity during dredged-material discharge.

(d) Color. Increased suspended solids concentration would cause the apparent color of surface waters to be intensified at the dredged-material discharge sites.

(e) Odor. NA.

(f) Taste. NA

(g) Dissolved Gas Levels. Dissolved oxygen (DO) would be depressed at the discharge sites due to the oxygen demands associated with dredged sediments.

(h) Nutrients. Normally, dissolved nitrogen concentrations would increase substantially during dredged-material discharge. Phosphorus would be released from dredged sediments to a much lesser extent, if at all. Phosphorus compounds would usually remain associated with finely-divided suspended solids if oxidizing conditions were maintained at the discharge site.

(i) Eutrophication. The proposed dredged-material discharge would be of short duration. Consequently, long-term enrichment of water-bodies at or near the discharge site is not expected.

(2) Effects on Current Patterns and Circulation.

(a) Current Patterns and Flow. The construction of a dredged-material levee and water-control weir would result in long-term alteration of current, flow, and circulation patterns in the mitigation area.

(b) Velocity. NA.

(c) Stratification. NA.

(d) Hydrologic Regime. NA.

(3) Normal Water Level Fluctuations. The proposed levee construction would alter the existing pattern of water level fluctuations in the mitigation area. Water level in the area would be managed to reduce average salinity and affect attendant habitat shifts.

(4) Salinity Gradients. NA.

c. Suspended Particulate/Turbidity Determinations.

(1) Expected Changes in Suspended Particulate and Turbidity Levels in the Vicinity of the Discharge Sites. Both suspended particulate and turbidity levels would increase substantially during dredged-material discharge. Suspended particulate and turbidity levels would return to pre-discharge levels rapidly upon cessation of dredging operations.

(2) Effects on the Chemical and Physical Properties of the Water Column.

(a) Light Penetration. Elevated suspended particulate and turbidity levels attendant to the dredged-material discharges would diminish the depth of light penetration into the water column. This usually would be a short-term effect which would cease when suspended particulate and turbidity levels returned to ambient conditions.

(b) Dissolved Oxygen. Dissolved oxygen levels would be depressed or depleted by oxygen demands associated with suspended organic sediments.

(c) Toxic Metals and Organics. Surface water and bottom sediment samples were collected January 10, 1984, at the four locations shown on Figure 2. The standard elutriate test was used to simulate interactions between dredged sediments and surface water at the proposed discharge sites. Sediment quality data for the four locations sampled are shown on Table 1. General water quality data are shown on Table 2. Table 3 presents comparative concentrations of several parameters in ambient water and elutriates. The data of Table 3 show that nitrogen tended to be released from all of the sediment samples and significantly elevate concentrations in the elutriates. Conversely, phosphorus tended to be adsorbed, reducing concentrations in the elutriates to less than ambient levels. Generally, cadmium, copper, lead, and nickel concentrations increased in the elutriates relative to ambient water at the two freshwater sites (sites 1 and 2) but not at the more saline locations. Surface water, bottom sediments, and elutriates were also analyzed for dieldrin, endrin, DDD, DDE, DDT, heptachlor, heptachlor epoxide, PCB, chlordane, lindane, and toxaphene. None of the compounds were found above analytic detection limits in the ambient samples or elutriates.

TABLE 1. BULK SEDIMENT ANALYSIS (All values of mg/kg dry weight)

| PARAMETERS                       | Site 1 | Site 2 | Site 3 | Site 4 |
|----------------------------------|--------|--------|--------|--------|
| Chlorides                        | 610    | 1,910  | 5,260  | 11,800 |
| Total Nitrogen                   | 3,260  | 3,830  | 1,410  | 2,200  |
| Total Kjeldahl Nitrogen          | 3,250  | 3,820  | 1,410  | 2,200  |
| NH <sub>3</sub> -N               | 40     | 62     | 32     | 38     |
| NO <sub>2</sub> +NO <sub>3</sub> | 6.44   | 8.38   | 0.426  | 3.24   |
| Total Phosphorus                 | 965    | 924    | 527    | 594    |
| Cadmium                          | 0.58   | 0.37   | 0.32   | 0.29   |
| Copper                           | 25     | 19     | 13     | 24     |
| Lead                             | 22     | 15     | 13     | 17     |
| Nickel                           | 23     | 15     | 16     | 20     |
| Zinc                             | 88     | 53     | 51     | 60     |
| Mercury                          | <0.100 | <0.100 | <0.100 | <0.100 |

TABLE 2. GENERAL WATER QUALITY DATA FOR THE SAMPLING SITES

| PARAMETERS                    | Site 1   |         | Site 2   |         | Site 3   |         | Site 4   |         |
|-------------------------------|----------|---------|----------|---------|----------|---------|----------|---------|
|                               | 5'-depth | Surface | 5'-depth | Surface | 5'-depth | Surface | 5'-depth | Surface |
| Dissolved Oxygen, mg/L        | 7.3      | 7.0     | 7.8      | 7.8     | 9.1      | 9.0     | 9.9      | 10.0    |
| pH, Standard Units            | 6.3      | 6.2     | 6.5      | 6.4     | 7.0      | 7.1     | 7.5      | 7.5     |
| Temperature, °C               | 11.6     | 11.6    | 12.1     | 12.3    | 13.2     | 13.2    | 13.5     | 13.6    |
| Conductivity,<br>Micromhos/cm | 250      | 230     | 280      | 300     | 8,800    | 7,730   | 20,600   | 20,790  |
| Salinity, ppt                 | 0.1      | 0.1     | 0.2      | 0.2     | 6.6      | 5.7     | 16.2     | 16.3    |

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E-11

[illegible]

(d) Pathogens. NA.

(e) Esthetics. Disposal activities may not be very pleasing to certain individuals. However, the project location precludes large numbers of people from observing the disposal.

(3) Effects on Biota.

(a) Primary Production, Photosynthesis. Temporary reductions in primary productivity would occur as a result of increased turbidity levels. These impacts are expected to be of a short duration.

(b) Suspension/Filter Feeders. The temporary turbidity would interfere with filter feeding mechanisms, impede growth, and cause some impairment of respiratory and excretory functions. These effects could cause death. The more mobile species would quickly migrate from the area of impact.

(c) Sight Feeders. Sight feeders, principally nekton, would not be adversely affected by increased turbidities. These organisms have the ability to vacate an area under adverse conditions and return when conditions return to normal.

(4) Actions Taken to Minimize Impacts. The shell ramp is designed to reduce possible adverse impacts caused by the weir. The ramp should prevent interruption of ingress of bottom-moving fish and shellfish.

d. Contaminant Determination. Evaluation of data from water, sediment, and elutriate analyses suggests that the proposed dredged-material discharge would neither introduce new contaminants nor significantly increase contaminant levels at the discharge sites.

e. Aquatic Ecosystem and Organism Determinations.



(1) Effects on Plankton. A temporary reduction in plankton populations is possible as a result of clumping and flocculation. Zooplankton are susceptible to siltation and turbidity influences. The small volume of runoff from fill material would be sufficiently diluted by the receiving waters. Any reduction in biomass would be minor and of short duration.

(2) Effects on Benthos. Most species of organisms located in the disposal sites for the levee and ramp would experience mortality. Repopulation with different species would occur upon completion of the ramp.

(3) Effects on Nekton. Most species would not be directly affected by the project since they would vacate the area during construction. Some planktonic feeders might be temporarily attracted to turbidity plumes for short-term feeding.

(4) Effects on Aquatic Food Web. Impacts on aquatic food web are expected to be minimal. Degradation of water quality in the project area would produce temporary local adverse impacts. No significant long-term impacts are expected.

(5) Effects on Special Aquatic Sites.

(a) Sanctuaries and Refuges. The discharge would slightly reduce the quality of feeding and nursery areas in the adjacent marsh. The secondary impacts of the levee ramp and weir would be to reduce saltwater intrusion into a portion of the Pointe-au-Chien Wildlife Management Area which would significantly improve habitat and preserve marsh that would be lost without the mitigation features.

(b) Effects on Threatened and Endangered Species. The project would not jeopardize the continued existence of any threatened or endangered species, nor their critical habitat.

(7) Effects On Other Wildlife. The project would result in the conversion of about 75 acres of marsh to a grass/shrub-scrub habitat.

(8) Actions Taken To Minimize Impacts. None.

f. Proposed Discharge Site Determination.

(1) Mixing Zone Determination. The proposed discharge does not involve "disposal" of dredged material. Dredged sediments would be discharged for use as levee fill in such a way as to minimize the loss of solids to waterbodies. Therefore, mixing zone determinations are not applicable.

(2) Determination of Compliance With Applicable Water Quality Standards. Louisiana water quality standards applicable to the discharge sites include a minimum 4.0 mg/L for dissolved oxygen, a pH range of 6.5 to 9.0 standard units, and a maximum surface water temperature of 35°C. The proposed discharge is not likely to cause violations of the standards, with the exception of the dissolved oxygen standard. The dissolved oxygen standard probably would be violated in shallow surface waters immediately adjacent to the discharge sites.

(3) Potential Effects On Human Use Characteristics.

(a) Municipal and Private Water Supply. NA.

(b) Recreational and Commercial Fisheries. The adverse impacts expected to occur on recreational and commercial fisheries would be minimal.

(c) Water-Related Recreation. Water-related activities may be temporarily interrupted in the vicinity of the disposal activity. No significant effects are expected.

(d) Esthetics. The placement of the levee material and a weir would alter the current marsh landscape and may be objectionable to some individuals.

(e) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves. The project would occur on a state wildlife management area. The secondary impacts would be habitat improvement on the management area.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. The most severe effects expected by project construction would be the direct loss of 10 acres of water bottom as a result of the placement of the levee and weir.

h. Determination of Secondary Effects on the Aquatic Ecosystem. The most significant secondary effect would be the isolation of the marshes from further saltwater intrusion. In effect, the isolation would stabilize existing water levels and provide more suitable habitat. The weir and levee would reduce wetland losses and preserve an annualized 630 acres of marsh.

### III. FINDING OF COMPLIANCE FOR LAROSE TO GOLDEN MEADOW HURRICANE PROTECTION - MITIGATION.

a. This evaluation was prepared in accordance with the 1980 EPA Guidelines for Section 404(b)(1) with minor adaptations.

b. The no-action alternative would preclude marsh preservation.

c. No significant contravention of Louisiana Water Quality Standards would be expected. Section 307(a)(1) of the Clean Water Act is not applicable in Louisiana.

d. No threatened or endangered species or critical habitat would be adversely impacted by the project.

e. No significant adverse effect would be expected on human health and welfare, municipal and private water supplies, recreational and commercial fisheries, plankton, nekton, shellfish, wildlife, and special aquatic sites.

f. Appropriate steps have been taken to minimize impacts.

g. On the basis of the guidelines, the proposed discharge sites for the disposal of dredged material are specified as complying with the requirements of the guidelines with the inclusion of appropriate and practical measures to minimize pollution and adverse effects on the affected aquatic ecosystem.

29 MAY 85

Date

Eugene S. Witherspoon

Eugene S. Witherspoon  
Colonel, CE  
District Engineer