



## United States Department of the Interior

FISH AND WILDLIFE SERVICE  
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Lafayette, Louisiana 70506



February 18, 2009

Colonel Alvin B. Lee  
District Engineer  
U.S. Army Corps of Engineers  
Post Office Box 60267  
New Orleans, Louisiana 70160-0267

Dear Colonel Lee:

Enclosed is the Fish and Wildlife Coordination Act Report for the Individual Environmental Report (IER) 12, Improved Protection from Harvey to Algiers, Jefferson, Orleans and Plaquemines Parishes, Louisiana. The preferred alternative was developed through proactive coordination between the U.S. Army Corps of Engineers and the natural resource agencies. The preferred alternative would include construction of navigable floodgate and ancillary structures on the GIWW south of the confluence of the Algiers and Harvey Canals and construction of approximately 4,200 linear feet of new floodwall along the north bank of the Gulf Intracoastal Waterway and within the Bayou aux Carpes 404 (c) designated area. The levees and floodwalls between the Old Estelle pumping station and the Harvey Canal, and south along the V-levee would be also raised to the 100-year level of protection.

This report is transmitted under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), and has been provided to the Louisiana Department of Wildlife and Fisheries and the National Oceanic and Atmospheric Administration's (NOAA), National Marine Fisheries Service (NOAA's NMFS), and their comments are incorporated.

Should your staff have any questions regarding the enclosed report, please have them contact Angela Trahan of this office at 337/291-3137.

Sincerely,



James F. Boggs  
Supervisor

Louisiana Field Office

Enclosures



cc: EPA, Dallas, TX  
FWS, Atlanta, GA (ES/HC)  
Corps, Planning Division, New Orleans, LA  
Jean Lafitte National Historical Park and Preserve, New Orleans, LA  
NMFS, Baton Rouge, LA  
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA

# **Fish and Wildlife Coordination Act Report**

## **Individual Environmental Report (IER) 12, Harvey to Algiers**



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

PREPARED BY  
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U.S. FISH AND WILDLIFE SERVICE  
ECOLOGICAL SERVICES  
LAFAYETTE, LOUISIANA  
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U.S. FISH AND WILDLIFE SERVICE – SOUTHEAST REGION

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## **Executive Summary**

The U.S. Fish and Wildlife Service (Service) has prepared the attached Fish and Wildlife Coordination Act Report for the proposed Westbank and Vicinity of New Orleans (WBV), Harvey to Algiers, 100-year level hurricane protection project, Individual Environmental Report 12 (IER 12). The Corps of Engineers, New Orleans District (Corps) is preparing, that IER under the approval of the Council on Environmental Quality (CEQ). IERs will partially fulfill the Corps compliance with the National Environmental Policy Act of 1969 (83 Stat. 852, as amended; 42 U.S.C. 4321- 4347). IERs are a CEQ approved alternative arrangement for compliance with NEPA that would allow expedited implementation of improved hurricane protection measures. Work proposed in the IERs would be conducted under the authority of Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4). That law authorized the Corps to upgrade two existing hurricane protection projects (i.e., WBV and Lake Pontchartrain and Vicinity) in the Greater New Orleans area in southeast Louisiana.

This report addresses IER 12 and contains a description of the existing fish and wildlife resources of the project area, discusses future with- and without-project habitat conditions, identifies fish and wildlife-related impacts of the proposed project, and provides recommendations for the proposed project. This report incorporates and supplements our Fish and Wildlife Coordination Act (FWCA) Reports that addressed impacts and mitigation features for the WBV (dated November 10, 1986, August 22, 1994, November 15, 1996, and June 20, 2005) Hurricane Protection project, and the November 26, 2007, Draft Programmatic FWCA Report that addresses the hurricane protection improvements authorized in Supplemental 4. Impacts and mitigation needs resulting from government and contractor provided borrow areas are being addressed in separate IERs; therefore this report will not address those project features. This document constitutes the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). This report has been provided to the Louisiana Department of Wildlife and Fisheries and the National Oceanic and Atmospheric Administration's (NOAA), National Marine Fisheries Service (NOAA's NMFS), and their comments are incorporated (Appendix A).

The IER 12 study area is located in the upper Barataria Basin and includes the Belle Chasse, Gretna-Algiers, and Harvey-Westwego sub-basins along the west bank of the Mississippi River in Jefferson, Orleans and Plaquemines Parishes, Louisiana. The Jean Lafitte National Historical Park and Preserve (JLNHPP) and the Bayou aux Carpes wetland complex are located to the south of the Harvey-Westwego sub-basin and are managed by the National Park Service (NPS). The Bayou aux Carpes wetland complex is subject to an Environmental Protection Agency (EPA) Final Determination under the Clean Water Act (CWA) Section 404(c) invoked in 1985, and according to the EPA Final Determination, the discharge of any dredged or fill material within the approximately 3,200-acre site, referred to as the EPA CWA Bayou aux Carpes 404 (c) area, is restricted.

Study area wetlands support nationally important fish and wildlife resources including floatant marsh and cypress swamp. Factors that will strongly influence future fish and wildlife resource conditions outside of the protection levees include freshwater and sediment input and loss of coastal wetlands. Regardless of which of the above factors ultimately has the greatest influence, emergent wetlands within, and adjacent to, the project area will probably experience losses due to subsidence, erosion, and relative sea-level rise.

During the alternatives analysis, the no-action alternative and the alternative to raise the existing Hurricane Protection System to a 100-year level of protection were considered. The no-action alternative would not be implemented because it fails to provide the authorized level of protection to the Belle Chasse, Gretna-Algiers, and Harvey-Westwego sub-basins. The Corps also considered a series of alternative gate locations within the project area that would minimize the need for parallel protection. One of these alternatives included constructing a sector gate across the EPA CWA Bayou aux Carpes 404 (c) area. That alternative was considered to have significant impacts to fish and wildlife resources and the EPA CWA Bayou aux Carpes 404 (c) area.

Developed through proactive coordination between the EPA, NPS, and the Corps, the preferred alternative would include construction of navigable floodgate and ancillary structures on the Gulf Intracoastal Waterway (GIWW) south of the confluence of the Algiers and Harvey Canals and upstream of the Hero Canal. The levees and floodwalls between the Old Estelle pumping station and the Harvey Canal, and south along the V-levee would be raised to the 100-year level of protection [i.e., approximately 14 to 16 foot elevation North American Vertical Datum of 1988 (NAVD 88)]. Approximately 4,200 linear feet of floodwall would be constructed within a 100-foot-wide right-of-way along the periphery of the GIWW and the EPA CWA Bayou aux Carpes 404 (c) area to connect the proposed GIWW navigable floodgate with the existing flood protection system. Existing levees and floodwalls along Algiers and Harvey Canals will be incorporated into the protected side of the closure complex and would be integrated as features of the parallel protection system retention basin. Expansions of existing rights-of-way along several levee reaches would occur as a result of bringing those existing levees up to authorized levels of protection in order to provide necessary storm water retention during major storm events. To ensure habitat functions of the Bayou aux Carpes drainage area are maintained, the proposed action includes several environmental augmentations along the Old Estelle pump station outfall canal and within the Bayou aux Carpes drainage area which will provide sheet flow and hydrologic exchange into, and within, the EPA CWA Bayou aux Carpes 404 (c) area.

Implementation of the preferred alternative would directly impact 252 acres of hydrologically-altered bottomland hardwood habitat, 2.4 acres of wet bottomland hardwood habitat, and approximately 75 acres of swamp habitat. Of those impacts approximately 2.4 acres of wet bottomland hardwood and 7.2 acres of swamp habitat (i.e., 9.6 acres) occur within the EPA CWA Bayou aux Carpes 404 (c) area along the GIWW interface. According to our Habitat Assessment Methodology (HAM) and Wetland Value Assessment (WVA) analyses the preferred alternative would result in the direct loss of 177.1 and 38.4 average annual habitat units (AAHUs), of bottomland hardwood forest and swamp, respectively. Mitigation for unavoidable

losses of wet and non-wet bottomland hardwoods and swamp habitat, caused by project features will be evaluated through a complementary comprehensive mitigation IER. However, mitigation for unavoidable impacts to the EPA CWA Bayou aux Carpes 404 (c) area would be provided concurrently with flood protection features and within the EPA CWA Bayou aux Carpes 404 (c) area, provided that EPA grants authorization to use the EPA CWA Bayou aux Carpes 404 (c) area. Aside from mitigation and flood protection features, environmental augmentation of the EPA CWA Bayou aux Carpes 404 (c) area may also be implemented as a project feature to ensure construction and maintenance of the flood protection features would not adversely impact the EPA CWA Bayou aux Carpes 404 (c) area. Proposed augmentations could supplement hydrologic exchange within approximately 3,000 acres of float marsh, cypress swamp, and wetland scrub-shrub habitat. To ensure that appropriate measures are implemented to maintain the quality of the area, the Corps' Engineer Research and Development Center (ERDC) will be conducting modeling of existing hydrologic conditions within the Bayou aux Carpes drainage area and the effects of directing additional flow and nutrients into the that wetland complex.

The Service does not object to providing improved hurricane protection to the greater New Orleans area provided the following fish and wildlife conservation recommendations are incorporated into future project planning and implementation:

1. Flood protection and ancillary features such as staging areas and access roads should be designed and positioned so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized to the greatest extent possible.
2. The Corps should fully compensate for any unavoidable losses of wetland habitat or non-wet bottomland hardwoods caused by project features.
3. The enclosure of wetlands with new levee alignments should be minimized to the fullest extent. When enclosure of wetlands is unavoidable, non-development easements on enclosed wetlands should be acquired, or hydrologic connections with adjacent, un-enclosed wetlands should be maintained. Such actions will serve to minimize secondary impacts from development and hydrologic alteration.
4. Material removed during project construction (i.e., dredging Algiers Canal, repositioning the WBV levee landward to accommodate the GIWW gate, and dredging along the GIWW bank line to install the flow control structure) should be tested to determine suitability as borrow material for levee construction and the presence of contaminants. The Corps should continue to coordinate with the natural resource agencies to determine the best use of that material.
5. A maintenance dredging management plan for material dredged from the Algiers Canal should be developed for the life of the project.
6. The Corps should avoid impacts to the EPA CWA Bayou aux Carpes 404 (c) area, if feasible. If not feasible the Corps should continue coordination with the NPS and EPA regarding any proposed project feature that may impact that area. Points of contacts for the agencies potentially impacted by project features are: National Park Service (NPS), contact

Superintendent David Luchsinger, (504) 589-3882 extension 137 ([david\\_luchsinger@nps.gov](mailto:david_luchsinger@nps.gov)) or Chief of Resource Management David Muth (504) 589-3882 extension 128, ([david\\_muth@nps.gov](mailto:david_muth@nps.gov)) and Ms. Barbara Keeler (214) 665-6698 with the EPA.

7. Construction within the EPA CWA Bayou aux Carpes 404 (c) area should not commence until the EPA's decision to modify the designation to accommodate discharges into that area has been resolved.
8. Hydrologic, nutrient, and contaminant modeling should be conducted to determine the best arrangement of environmental augmentation features (i.e., location of gaps and water control structures), if any, in the Bayou aux Carpes 404 (c) area.
9. Environmental augmentation features developed through the EPA 404 (c) modification procedures should be incorporated as project features, and the IER should be supplemented to address any additional augmentation features proposed through that process.
10. If hydraulic modeling demonstrates that environmental augmentation features are beneficial, operational plans to maximize freshwater retention or redirect freshwater flows into the EPA CWA Bayou aux Carpes 404 (c) area should be coordinated with the natural resource agencies, especially EPA and NPS. To accommodate changing goals and restoration needs, water control structures should be designed to incorporate operational flexibility through an adaptive management program.
11. The project's first Project Cooperation Agreement (or similar document) should include language that includes the responsibility of the local-cost sharer to provide operational, monitoring, and maintenance funds for mitigation and augmentation features. If the local project-sponsor is unable to fulfill the financial requirements for maintenance of the shoreline protection features, the Corps should provide the necessary funding to ensure maintenance obligations are met on behalf of the public interest.
12. To facilitate necessary adaptive management, the Corps in coordination with the natural resource agencies, should develop a monitoring plan. That monitoring plan should address hydrologic, nutrient, and contaminant changes throughout the system. The performance and funding of the monitoring of mitigation and augmentation features should be allocated as first-cost expenses of the project, and the local project-sponsor should be responsible for operational costs. If the local project-sponsor is unable to fulfill the financial mitigation requirements for operation, then the Corps should provide the necessary funding to ensure that local cost share obligations are met on behalf of the public interest.
13. Because of the sensitivity and significance of the EPA CWA Bayou aux Carpes 404 (c) area every effort should be made to minimize impacts during construction of the floodwall and navigational gate. Construction activities within the EPA CWA Bayou aux Carpes 404 (c) area should adhere to the following guidelines to avoid adverse impacts to that site:
  - A. Construction should be performed from the water side (i.e., Bayou Baratavia/GIWW

side) rather than from the 404(c) side;

- B. Construction of the floodwall within the EPA CWA Bayou aux Carpes 404 (c) area should be constructed within a 100-foot corridor width from the GIWW into the 404(c) area. No additional area within the 404(c) site would be required for the floodwall or any other construction;
  - C. The Corps should investigate and utilize innovative techniques to design and build a structure with the narrowest footprint possible; and,
  - D. Should existing oil and gas pipeline ROWs require relocation, impacts associated with those relocations should be avoided and minimized to the greatest extent possible.
14. If a proposed project feature is changed significantly or is not implemented within one year of the date of this report, the Corps should reinitiate coordination with each office to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat.
  15. Adverse impacts to bald eagle nesting locations and wading bird colonies should be avoided through careful design of project features and timing of construction. A qualified biologist should inspect the proposed work site for the presence of undocumented wading bird nesting colonies and bald eagles during the nesting season (i.e., February 16 through October 31 for wading bird nesting colonies, and October through mid-May for bald eagles).
  16. To minimize disturbance to colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present). In addition, we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests, and should avoid affecting them during the breeding season.
  17. If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation should be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: <http://www.fws.gov/southeast/es/baldeagle>. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.
  18. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.
  19. Forested areas cleared for staging areas and temporary construction zones should be managed for invasive species (i.e., Chinese tallowtree) after the completion of the project.

20. Acquisition, habitat development, maintenance and management of mitigation lands should be allocated as first-cost expenses of the project, and the local project-sponsor should be responsible for operational costs. If the local project-sponsor is unable to fulfill the financial mitigation requirements for operation, then the Corps should provide the necessary funding to ensure mitigation obligations are met on behalf of the public interest.
21. Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service, NMFS, LDWF, EPA, NPS, and the Louisiana Department of Natural Resources (LDNR). The Service should be provided an opportunity to review and submit recommendations on the all work addressed in those reports.
22. If mitigation lands are purchased for inclusion within Federally or State managed lands, those lands must meet certain requirements; therefore the land manager of that management area should be contacted early in the planning phase regarding such requirements.
23. If applicable, a General Plan should be developed by the Corps, the Service, and the managing natural resource agency in accordance with Section 3(b) of the FWCA for mitigation lands.
24. Flood protection water control structures in any watercourse should maintain pre-project cross section in width and depth to the maximum extent practicable.
25. Any flood protection water control structure sited in a canal, bayou, or navigation channel that does not maintain the pre-project cross section should be designed and operated with multiple openings within the structure. This should include openings near both sides of the channel as well as an opening in the center of the channel that extends to the bottom.
26. Flood protection water control structures should remain completely open except during storm events, unless otherwise determined by the natural resource agencies.
27. Flood protection structures within a waterway should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered, and coordination should continue with the natural resource agencies to ensure fish passage features are incorporated to the fullest extent practicable.
28. To the maximum extent practicable, structures should be designed and/or selected and installed such that average flow velocities during peak flood or ebb tides do not exceed 2.6 feet per second. However, this may not necessarily be applicable to tidal passes or other similar major exchange points.
29. To the maximum extent practicable, culverts (round or box) should be designed, selected, and installed such that the invert elevation is equal to the existing water depth. The size of the culverts should be selected that would maintain sufficient flow to prevent siltation.

30. Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to normal.
31. Any proposed change in mitigation or augmentation features or plans should be coordinated in advance with the Service, NMFS, LDWF, EPA and LDNR.
32. A report documenting the status of mitigation implementation and maintenance should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, EPA, LDNR and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

## INTRODUCTION

The U.S. Army Corps of Engineers, New Orleans District (Corps) is preparing an Individual Environmental Report (IER 12) for flood protection for the multi-basin area composed of Belle Chasse, Gretna-Algiers, Harvey-Westwego in Jefferson, Orleans, and Plaquemines Parishes, Louisiana. That IER is being prepared under the approval of the Council on Environmental Quality (CEQ) that will partially fulfill the Corps compliance with the National Environmental Policy Act (NEPA) of 1969 (83 Stat. 852, as amended; 42 U.S.C. 4321- 4347). IERs are a CEQ approved alternative arrangement for compliance with NEPA that would allow expedited implementation of improved hurricane protection measures. Work proposed in IERs would be conducted under the authority of Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4) and Public Law 110-28, U.S. Troop Readiness, Veterans' Care, Katrina Recovery, and Iraq Accountability Appropriations Act, 2007 (5th Supplemental). Those laws authorized the Corps to upgrade two existing hurricane protection projects [i.e., Westbank and Vicinity of New Orleans (WBV) and Lake Pontchartrain and Vicinity (LPV)] in the Greater New Orleans area in southeast Louisiana.

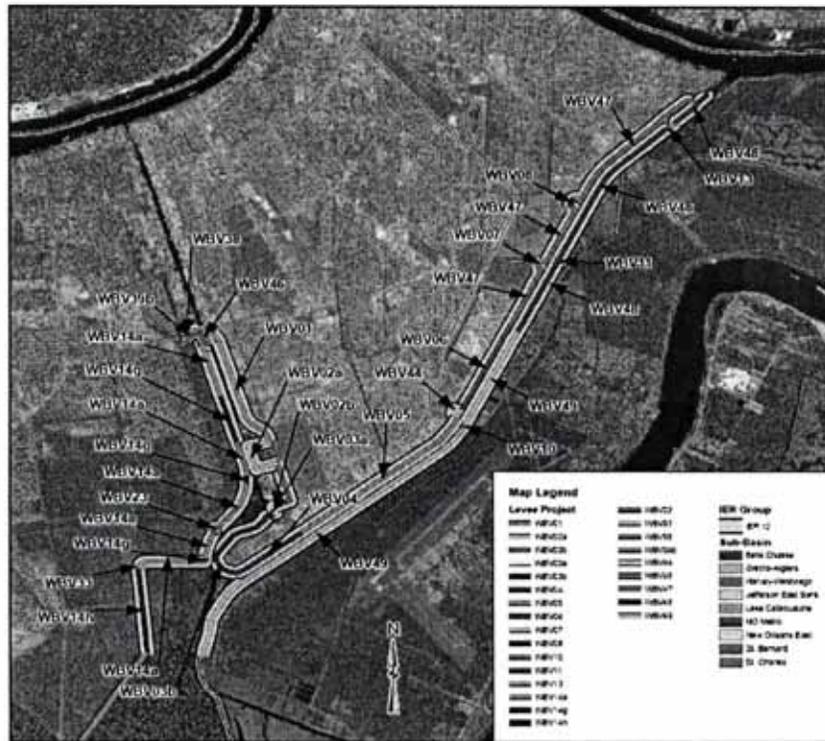
This report contains a description of the existing fish and wildlife resources of the project area, discusses future with- and without-project habitat conditions, identifies fish and wildlife-related impacts of the proposed project, and provides recommendations for the proposed project. This report incorporates and supplements our Fish and Wildlife Coordination Act (FWCA) Reports that addressed impacts and mitigation features for the WBV (dated November 10, 1986, August 22, 1994, November 15, 1996, and June 20, 2005) and the Lake Pontchartrain and Vicinity (dated July 25, 1984, and January 17, 1992) Hurricane Protection projects, and the November 26, 2007, Draft Programmatic FWCA Report that addresses the hurricane protection improvements authorized in Supplemental 4. Impacts and mitigation needs resulting from government and contractor provided borrow areas have been addressed in an October 25, 2007, and a November 1, 2007, FWCA reports, respectively, therefore this report will not address those project features. This document constitutes the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). This report has been provided to the Louisiana Department of Wildlife and Fisheries and the National Oceanic and Atmospheric Administration's (NOAA), National Marine Fisheries Service (NOAA's NMFS), and their comments are incorporated (Appendix A).

## DESCRIPTION OF THE STUDY AREA

The IER 12 study area is located in the upper Barataria Basin and includes the Belle Chasse, Gretna-Algiers, and Harvey-Westwego sub-basins along the west bank of the Mississippi River in Jefferson, Orleans and Plaquemines Parishes, Louisiana. Dividing the sub-basins are Harvey and Algiers Canals which drain into the Gulf Intracoastal Waterway (GIWW) at their confluence. Hero Canal defines the southern boundary of the Belle Chase sub-basin and the southeastern boundary of the study area. The Old Estelle pump station (PS) outfall canal and the WBV hurricane protection system's V-levee delineates the southeastern boundary of the Harvey-Westwego sub-basin. To the south of the V-levee are the Jean Lafitte National Historical Park

and Preserve (NHPP) and the EPA CWA Bayou aux Carpes 404 (c) wetland complex. Within the existing WBV hurricane protection system, natural levees and lower lying wetlands have been leveed and drained to accommodate residential, commercial, and agricultural development.

Figure 1. IER 12 Study Area, WBV, Jefferson, Orleans and Plaquemines Parishes, Louisiana, and Existing Hurricane and Flood Protection Features).



### FISH AND WILDLIFE RESOURCES

Habitat types in the project area include wet and non-wet bottomland hardwood habitat, cypress and tupelo swamp, scrub-shrub habitat, flotant marsh, open water, and developed areas. Open water areas are associated with the Harvey and Algiers Canals, Hero Canal, the GIWW (Bayou Barataria), the Old Estelle PS outfall canal, and interspersed open water areas within flotant marsh and swamp habitat. Due to urban development and a forced-drainage system, the hydrology of most of the forested habitat within the levee system has been altered. The forced-drainage system has been in operation for many years, and subsidence is evident throughout the areas enclosed by levees.

Wetlands (forested, marsh, and scrub-shrub) within the study area provide plant detritus to coastal waters downstream and thereby contribute to the production of commercially and recreationally important fishes and shellfishes. They also provide valuable water quality functions such as reduction of excessive dissolved nutrient levels, filtering of waterborne contaminants, and removal of suspended sediment. In addition, coastal wetlands buffer storm

surges reducing their damaging effect to man-made infrastructure within the coastal area. Factors that will strongly influence future fish and wildlife resource conditions outside of the protection levees include freshwater and sediment input and loss of coastal wetlands. Regardless of which of the above factors ultimately has the greatest influence, emergent wetlands within, and adjacent to, the project area will probably experience losses due to development, subsidence, erosion, and relative sea-level rise.

The Service has provided a FWCA Report for the authorized WBV hurricane protection project. That report contains a thorough discussion of the significant fish and wildlife resources (including habitats) that occur within the study area. For brevity, that discussion is incorporated by reference herein but the following information is provided to update the previously mentioned reports and provide IER specific information and recommendations.

An area within the Bayou aux Carpes wetland complex (Figure 2) adjacent to the JLNHPP was subject to an Environmental Protection Agency (EPA) Final Determination under the Clean Water Act (CWA) Section 404(c) in 1985. According to the EPA Final Determination, the discharge of any dredged or fill material within the approximately 3,200 acre site, referred to as the EPA CWA Bayou aux Carpes 404 (c) area, is restricted. The EPA action allowed for three specific exceptions, none of which appears to apply to the Corps' current hurricane protection proposal. Previous requests which have fallen outside those exceptions have been denied by EPA as being contrary to the CWA 404(c) determination. One such categorical denial prohibited the Corps from altering the alignment of the West Bank Hurricane Protection Levee such that it would encroach upon the EPA CWA Bayou aux Carpes 404 (c) site.

On November 4, 2008, the Corps requested that EPA modify the designation for the EPA CWA Bayou aux Carpes 404 (c) site designation to accommodate the Corps' preferred alignment. The Service provided comments to EPA's Request for Comments regarding the requested modification published in the Federal Register (Volume 74, No. 9, page 2072) on January 14, 2009 (Appendix B).

The EPA CWA Bayou aux Carpes 404 (c) area action is one of only 12 such actions ever completed by EPA. Approximately 2,800 acres within the site are in Federal ownership and Congress is considering legislation to adjust the boundary of the Jean Lafitte NHPP, Barataria Preserve Unit to include the Bayou aux Carpes area. In the meantime, the National Park Service (NPS) has constructive possession of the area. Therefore, the Corps should continue to coordinate with both the NPS and EPA regarding any proposed project feature that may impact that area. For the NPS please contact Superintendent, David Luchsinger, (504) 589-3882 extension 137 ([david\\_luchsinger@nps.gov](mailto:david_luchsinger@nps.gov)), or Chief of Resource Management, David Muth, (504) 589-3882 extension 128 ([david\\_muth@nps.gov](mailto:david_muth@nps.gov)). For the EPA please contact Ms. Barbara Keeler, 214/665-6698.

Figure 2. EPA CWA Bayou aux Carpes 404 (c) area.



The EPA CWA Bayou aux Carpes 404 (c) area is composed of two unique and critically important habitat types. Flotant marsh occurs along the northern portion of the area and transitions into cypress swamp habitat further to the south. The quality and health of these sensitive wetland habitats are greatly influenced by hydrologic parameters. Should water levels recede within flotant marsh, marsh vegetation could root into the soil drowning the vegetation when water levels rise again. Too much water flow can push flotant marsh vegetation out and create vast areas of open water. As flotant marsh vegetation thickens, new and larger plants (e.g., wax myrtle, red maple, and cypress) are supported by the mat of vegetation initiating the early successional stages of a cypress-tupelo swamp forest. Cypress and tupelo swamps also require hydrologic variations. Natural regeneration depends on periods of exceptionally long drought since cypress and tupelo seeds cannot germinate underwater. Cypress swamp habitat appears to be naturally regenerating as evident by saplings observed in the understory during recent field investigations. However, hydrologic stresses (e.g., spoil banks impeding water flow and producing ponding effects) may still be influencing sapling growth rates.

In 1985, the Service submitted a report to EPA detailing the value of the entire Bayou aux Carpes drainage area to fish and wildlife resources. The drainage area boundaries include the Harvey Canal/Bayou Barataria segment of the GIWW to the east and south, the Bayou des Familles ridge and Louisiana Highway 45 to the west, and the V-levee and Old Estelle PS outfall canal to the north. The area was historically drained by Bayou aux Carpes, a natural waterway; however, this

bayou was hydrologically disconnected when a plug was installed in the 1970s. Currently that plug may serve as a valuable function in keeping boat wakes from the GIWW from further eroding and widening the mouth of the bayou. The only flow exchange for this area is through the Southern Natural Gas (SNG) pipeline canal which runs north-south bisecting the Bayou aux Carpes drainage area. A few oil and gas canals branch off of the SNG pipeline canal connecting Bayou aux Carpes with the SNG pipeline canal. There are also several pipeline right-of-ways that traverse the area from east to west across the northern portion of the drainage area. It is highly probable that this system of canals and rights-of-way and their associated spoil banks influence the hydrology, impeding and directing flows throughout the area.

The Service's 1985 Habitat Evaluation Procedures (HEP) analysis determined that bottomland hardwood and wooded swamp habitats in the drainage area rated moderate to high value for all species evaluated (i.e., gray squirrel, pileated woodpecker, North American mink, wood duck, great egret, American alligator, and common muskrat). Upland forested habitat rated low for gray squirrel and pileated woodpecker and was found to be optimum for mink. Scrub-shrub wetlands in the study area were found to be of high quality as wood duck wintering habitat and alligator habitat, and were moderate quality for mink, great egret, and muskrat. Fresh marsh rated high to moderate as alligator, mink, and muskrat habitat (U.S. Fish and Wildlife Service 1985).

The Bayou aux Carpes wetland complex provides valuable habitat for resident waterfowl and migratory game species (i.e. wood ducks, mallards, and other waterfowl) and non-game species (i.e., great blue herons and great egrets). Bald eagles and osprey have been observed in the area as well. Several species of non-game, resident and migratory birds that are known or expected to utilize the project area (e.g., red-headed woodpecker, prothonotary warbler, and wood thrush) have exhibited substantial population declines over the last 30 years, primarily as the result of habitat loss and fragmentation, and are of particular concern to the Service. The Bayou aux Carpes drainage area and associated habitats provide valuable spawning, feeding, and nursery habitat for recreationally-important freshwater fish such as largemouth bass, and various sunfishes; crustaceans such as crawfish and grass shrimp; and estuarine species such as striped mullet and blue crab. Analysis of samples collected in 1985 indicated that forage species (e.g., mosquitofish, threadfin shad, and golden top minnow) were the most abundant fish species. This diverse assemblage of fisheries species is indicative of a stable fisheries community in a relatively unstressed environment (U.S. Fish and Wildlife Service 1985). The Bayou aux Carpes drainage basin provides plant detritus to adjacent coastal waters, and such detritus is essential to the maintenance of commercially and recreationally important fisheries. In addition to their habitat values, those wetlands provide floodwater storage, and aid in water quality maintenance by reducing excessive dissolved nutrient levels and removing suspended sediments.

At this time, the Service is unaware of any threatened or endangered species or their critical habitat within the project area. However, the project-area forested wetlands provide nesting habitat for the bald eagle (*Haliaeetus leucocephalus*), and a bald eagle nest was documented within the Bayou aux Carpes drainage area in 2007. The bald eagle was officially removed from the List of Endangered and Threatened Species on August 8, 2007. Bald eagles nest in Louisiana from October through mid-May. Eagles typically nest in mature trees (e.g., bald cypress,

sycamore, willow, etc.) near fresh to intermediate marshes or open water in the southeastern Parishes. Major threats to this species include habitat alteration, human disturbance, and environmental contaminants (i.e., organochlorine pesticides and lead).

Breeding bald eagles occupy "territories" that they will typically defend against intrusion by other eagles, and that they likely return to each year. A territory may include one or more alternate nests that are built and maintained by the eagles, but which may not be used for nesting in a given year. Potential nest trees within a nesting territory may, therefore, provide important alternative bald eagle nest sites. Nest sites typically include at least one perch with a clear view of the water or area where the eagles usually forage. Shoreline trees or snags located near large water bodies provide the visibility and accessibility needed to locate aquatic prey. Bald eagles are vulnerable to disturbance during courtship, nest building, egg laying, incubation, and brooding. Disturbance during this critical period may lead to nest abandonment, cracked and chilled eggs, and exposure of small young to the elements. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest tree, thus reducing their chance of survival.

Although the bald eagle has been removed from the List of Endangered and Threatened Species, it continues to be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. A copy of the NBEM Guidelines is available at:

<<http://www.fws.gov/southeast/es/baldeagle/NationalBaldEagleManagementGuidelines.pdf>>.

Those guidelines recommend: (1) maintaining a specified distance between the activity and the nest (buffer area); (2) maintaining natural areas (preferably forested) between the activity and nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season. On-site personnel should be informed of the possible presence of nesting bald eagles within the project boundary, and should identify, avoid, and immediately report any such nests to this office. If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: <http://www.fws.gov/southeast/es/baldeagle>. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary. Results of that determination should be provided to this office. The Service's Division of Migratory Birds for the Southeast Region (phone: 404/679-7051, e-mail: [SEmigratorybirds@fws.gov](mailto:SEmigratorybirds@fws.gov)) has the lead role in conducting such consultations. Should you need further assistance interpreting the guidelines or performing an on-line project evaluation, please contact this office.

The proposed study area is known to support colonial nesting waterbirds. Colonies may be present that are not currently listed in the database maintained by the LDWF. That database is updated primarily by monitoring the colony sites that were previously surveyed during the 1980s. Until a new, comprehensive coast-wide survey is conducted to determine the location of newly-established nesting colonies, we recommend that a qualified biologist inspect the proposed work

site for the presence of undocumented nesting colonies during the nesting season. To minimize disturbance to colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present). In addition, we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests, and should avoid affecting them during the breeding season.

### **Future Fish and Wildlife Resources**

The combination of subsidence and sea level rise is called submergence or land sinking. As the land sinks the wetlands become inundated with higher water levels stressing wetland vegetation. Even cypress-tupelo swamps can be stressed by prolonged inundation, thus leading to plant death and conversion to open water. Other major causes of wetland losses within the study area include altered hydrology, storms, saltwater intrusion (caused by marine processes invading fresher wetlands), shoreline erosion, herbivory, and development activities including the direct and indirect impacts of dredge and fill (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1998). The continued conversion of wetlands and forested habitat to open water or developed land represent the most serious fish and wildlife-related problems in the study area. Those losses could be expected to cause significant declines in coastal fish and shellfish production and in the study area's carrying capacity for numerous migratory waterfowl, wading birds, other migratory birds, alligators, furbearers, and game mammals. Wetland losses will also reduce storm surge protection of developed lands, and will likely contribute to water quality degradation associated with excessive nutrient inputs.

## **ALTERNATIVES UNDER CONSIDERATION**

During the alternatives analysis, the no-action alternative and the alternative to raise the existing Hurricane Protection System to a 100-year level of protection were considered. The no-action alternative would not be implemented because it fails to provide the authorized level of protection to the Belle Chasse, Gretna-Algiers, and Harvey-Westwego sub-basins. The Corps also considered a series of alternative gate locations within the project area that would reduce the length of parallel levee protection. One of these alternatives included constructing a sector gate across the EPA CWA Bayou aux Carpes 404 (c) area. That alternative would have significant impacts to fish and wildlife resources and EPA CWA 404 (c) designated wetlands. The following are brief descriptions of the alternatives:

#### Alternative 1:

A floodgate and permanent by-pass channel in the GIWW below the confluence of the Algiers and Harvey Canals with the flood wall bisecting the Bayou aux Carpes 404 (c) designated area;

#### Alternative 2 [Gulf Intracoastal Waterway- West Closure Complex (GIWW WCC)]:

Floodgate and permanent by-pass channel in the GIWW below the confluence of the Algiers and Harvey Canals with 100-year floodwall protection proposed along the periphery of the EPA

CWA Bayou aux Carpes 404 (c) area and the GIWW and continuing around to the V-levee;

Alternative 3:

Sector floodgate in the Algiers Canal with 100-year floodwall protection along the Harvey Canal to the Lapalco floodgate continuing along the existing WBV flood protection levee alignment;

Alternative 4:

Parallel levee protection to raise the existing levees and floodwalls along Algiers and Harvey Canals to the 100-year level of protection. The Lapalco floodgate and the Cousins PS discharge channel walls would also be raised to the 100-year level of protection.

**Proposed Action**

The GIWW WCC alternative (Alternative 2) was developed through proactive coordination primarily between the EPA, NPS, and the Corps. The GIWW WCC alternative would include construction of a navigable floodgate on the GIWW south of the confluence of the Algiers and Harvey Canals and upstream of the Hero Canal. A pumping station and a secondary by-pass canal/flow control structure would be constructed adjacent to the navigable floodgate. The levees and floodwalls between the Old Estelle pumping station and the Harvey Canal, and south along the WBV, V-levee would be raised to the 100-year level of protection [i.e., approximately 14 to 16 foot elevation North American Vertical Datum of 1988(NAVD 88)]. Approximately 4,200 linear feet of floodwall would be constructed within a 100-foot-wide new right-of-way along the periphery of the GIWW and the EPA CWA Bayou aux Carpes 404 (c) area to connect the proposed GIWW navigable floodgate with the existing flood protection system. Armoring of the floodwall along the GIWW is anticipated for protection against barge collisions and wave erosion.

Existing levees and floodwalls along Algiers and Harvey Canals will be incorporated into the protected side of the closure complex and would be integrated as features of the parallel protection system retention basin. Those levees would be lifted to the former authorized level of protection, and existing pump stations within the proposed detention basin would receive fronting protection and back flow prevention which would required additional right-of-way impacts. Approximately 700,000 cubic yards of material in the Algiers Canal would be dredged in order to maintain a still water level of less than 6 feet (NAVD 88) in the retention basin. Material dredged would be placed within the Jean Lafitte NHPP for marsh restoration along Lake Salvador.

Features of the structure that would cross the GIWW include a 150-to-300-foot-wide navigation channel closure gate and a 100-to-200-foot-wide bypass channel closure gate built to a protection elevation of 16 feet (NAVD 88), or greater, and tied into the nearest flood protection levee. A pumping station would provide positive backwater prevention. The bypass channel would be constructed to allow navigation on the GIWW during construction of the retaining structure, pumps and gates and will be used in the event of the closure of the primary channel structure. A water control structure is also proposed on the Old Estelle PS outfall canal.

In addition to levee and floodwall construction the proposed action includes several environmental augmentations to ensure that adverse impacts to the Bayou aux Carpes 404 (c) area are avoided. The southern side of the Old Estelle pump station outfall canal would be gapped to provide evenly distributed sheet flow into the EPA CWA Bayou aux Carpes 404 (c) area. After analysis of hydrologic modeling, existing obstructions (e.g., spoil banks, access roads) within the EPA CWA Bayou aux Carpes 404 (c) area may also be augmented, including modifying the shell plug at Bayou aux Carpes where it historically connected to Bayou Barataria to provide hydrological exchange. Long-term monitoring of the affects of the proposed flood protection system and augmentation features on the Bayou aux Carpes wetland complex would be conducted. Should monitoring indicate that augmentation features have an adverse affect on the EPA CWA Bayou aux Carpes 404 (c) area, flow from the Old Estelle pump station would be redirected away from the CWA 404 (c) area and through the proposed water control structure at the end of the Old Estelle outfall canal and into the GIWW.

In the GIWW adjacent to the EPA CWA Bayou aux Carpes 404 (c) area and south of the navigation channel closure gate, 2,000 linear feet of foreshore dike protection would be constructed in front of the channel bank to prevent scouring or bank erosion within the EPA CWA Bayou aux Carpes 404 (c) area associated with discharge from the pump station.

The GIWW WCC alternative provides 100-year protection based upon improvements, enhancements, and construction confined to the GIWW reach in concert with tie-ins to improvements to the Hero Canal Levee (IER #13) and the V-line Levee (IER #14).

## EVALUATION METHOD

Direct impacts to bottomland hardwood and swamp habitat were quantified by acreage and habitat quality (i.e., average annual habitat units or AAHUs) and are presented in Table 1 (Appendix B). The Service used the Louisiana Department of Natural Resources Habitat Assessment Methodology (HAM) to quantify the impacts of proposed project features on upland and wetland bottomland hardwood habitat and used the Wetland Value Assessment (WVA) methodology to quantify the impacts on swamp habitat. The habitat assessment models for bottomland hardwoods within the Louisiana Coastal Zone utilized in this evaluation were modified from those developed in the Service's Habitat Evaluation Procedures (HEP). For each habitat type, those models define an assemblage of variables considered important to the suitability of an area to support a diversity of fish and wildlife species. The HAM, however, is a community-level evaluation instead of the species-based approach used with HEP. The WVA is used to evaluate coastal restoration projects, and is similar to the Service's HEP, in that habitat quality and quantity (acreage) are measured for baseline conditions, and predicted for future without-project and future with-project conditions. As with HEP, the WVA provides a quantitative estimate of project-related impacts to fish and wildlife resources; however, the WVA is based on separate models for fresh/intermediate marsh, brackish marsh, and saline marsh. Further explanation of how impacts/benefits are assessed with the HAM and WVA and an explanation of the assumptions affecting habitat suitability (i.e., quality) index (HSI) values for each target year for impacts to bottomland hardwood and swamp habitat are available for review at the Service's Lafayette, Louisiana, field office.

**Table 1: Potential Impacts from Algiers-Harvey 100-year Hurricane Protection Project**

	protected side (hydrologically altered)				floodside (hydrologically connected)		
	pasture (acres)	early successional BLH (PFO1Ad)	mid-late successional BLH (PFO1Ad)	mid-late successional (temporary impacts) (PFO1Ad)	riparian swamp (PFO2)	404c BLH (PFO1r)	404c Swamp (PFO2)
Algiers Eastbank Levee Expansion	----	1.2	23.7	----	43.0	----	----
Algiers Westbank Levee Exp	----	6.7	13.8	----	3.8	----	----
East Bank Nav Structure	----	7.8	126.2	----	8.3	----	----
EBNS- staging areas	63.6	----	----	6.9	----	----	----
Levee Exp N of Estelle O/F canal	----	----	3.1	----	2.7	----	----
Levee Exp W of 404c	----	23.5	4.0	----	----	----	----
Levee Exp W of Harvey	----	----	34.8	----	9.7	----	----
Floodwall construction 404c	----	----	----	----	----	2.4	7.4
Total Acres (392.6)	63.6	39.2	205.6	6.9	67.5	2.4	7.2
Total AAHUs lost	0.0	22.3	150.2	2.6	34.3	2.0	4.1
Total BLH protected side =252 ac, 175.1 AAHUs							
Total BLH flood side (404c) = 2.4 ac, 2.0 AAHUs							
Total swamp flood side = 67.5 ac + 7.2 ac in 404c = 74.7 ac, 38.4 AAHUs							

Acreeage values estimated from 2005 aerial photography and LIDAR data in ArcGIS.

As indicated in Table 1, based on our HAM and WVA analyses (Appendix C) project implementation would result in the direct loss of 254.4 and 75 acres, and 177.1 and 38.4 AAHUs, of bottomland hardwood forest and swamp, respectively. Implementation of the preferred alternative would directly impact 252 acres of hydrologically-altered bottomland hardwood habitat, 2.4 acres of wet bottomland hardwood habitat, and approximately 75 acres of swamp habitat. Of those impacts approximately 2.4 acres of wet bottomland hardwood and 7.2 acres of swamp habitat (i.e., 9.6 acres) occur within the EPA CWA Bayou aux Carpes 404 (c) area along the GIWW interface.

### PROJECT IMPACTS

Proposed project impacts associated with the GIWW WCC alternative would result primarily from construction of new levees, expansion of levee rights-of-way and associated features. Although some construction will occur in cleared areas and on existing levees, project implementation will directly impact wet and non-wet bottomland hardwoods and tupelo swamp that provide medium to high habitat value for diverse fish and wildlife resources. While some construction staging and processing areas are located in open, non-forested areas, approximately

7 acres of bottomland hardwood forest associated with one staging location would be impacted.

Direct impacts to 252 acres of hydrologically-altered (i.e., non-wet) bottomland hardwood habitat would occur as a result of the GIWW WCC alternative. Impacts would be associated with expanding the existing flood protection levee right-of-way to bring it to the authorized level of protection and with realigning and expanding the levee on the south bank of the GIWW to accommodate the proposed bypass channel, navigable floodgate, pump station and a current reduction flow structure. The footprint of the proposed pump station would also impact non-wet bottomland hardwood habitat; however, by repositioning the levee landward an undetermined amount of previously-altered bottomland hardwood habitat would be returned to a natural overbank flooding regime.

Direct impacts to 2.4 acres of bottomland hardwood habitat and 7.2 acres of swamp habitat would occur as a result of constructing a new floodwall within a 100-foot right-of-way along the EPA CWA Bayou aux Carpes 404 (c) area and the GIWW interface. Impacts are also associated with floodside armoring of the proposed floodwall. Construction of this floodwall and armoring would impact riparian habitat and disrupt wildlife passage between the Bayou aux Carpes wetland complex and adjacent habitats. Riparian habitats are particularly valuable to wildlife as transition zones between aquatic and forested habitats, and contribute vital elements to fishery resources in the form of detritus, shade, and in-stream cover.

Although proposed impacts to the EPA CWA Bayou aux Carpes 404 (c) area have been minimized, the discharges of any dredged or fill material within the EPA CWA Bayou aux Carpes 404 (c) area is currently restricted and would require the EPA to modify the CWA Section 404 (c) determination. To ensure that potential impacts resulting from the construction of a flood protection structure/barrier do not compromise the value of this nationally-significant wetland ecosystem, the Corps is proposing to incorporate features into the proposed hurricane protection project to maintain the integrity EPA CWA Bayou aux Carpes 404 (c) area habitat (i.e., floatant marsh and cypress swamp). Storm water discharge from the Old Estelle pump station would be directed into the EPA CWA Bayou aux Carpes 404 (c) area by strategically gapping along the southern edge of the canal spoil bank. The Corps also proposes to modify interior hydrologic obstructions and the Bayou aux Carpes shell plug to provide additional hydrological exchange, if deemed necessary. To ensure that appropriate measures are implemented to maintain the function and quality of the wetland complex, the Corps' Engineer Research and Development Center (ERDC) will be conducting modeling of existing hydrologic conditions within the Bayou aux Carpes drainage area and the effects of directing additional flow and nutrients into the that wetland complex.

On the protected side of the navigation structure the Algiers and Harvey Canals would be integrated as features of the parallel protection system retention basin. Approximately 700,000 cubic yards in the Algiers Canal would be dredged in order to maintain a still water level of less than 6 feet (NAVD 88) in the retention basin. Existing tidal fluctuations within the retention basin would not be affected during normal conditions. That material would be used beneficially to create marsh along the Lake Salvador shoreline within the Jean Lafitte NHPP.

Development is ongoing within the hurricane protection levees; therefore, the Service has assumed that, for this specific IER, project-induced development within enclosed wetlands would be insignificant. However, project impacts to non-wet bottomland hardwoods and swamp habitat as a result of flood protection improvements should be mitigated.

### **FISH AND WILDLIFE CONSERVATION AND MITIGATION MEASURES**

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

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

The Service supports and adopts this definition of mitigation and considers its specific elements to represent the desirable sequence of steps in the mitigation planning process. Based on current and expected future without-project conditions, the planning goal of the Service is to develop a balanced project, i.e., one that is responsive to demonstrated hurricane protection needs while addressing the co-equal need for fish and wildlife resource conservation.

The Service's Mitigation Policy (Federal Register, Volume 46, No. 15, January 23, 1981) identifies four resource categories that are used to ensure that the level of mitigation recommended by Service biologists will be consistent with the fish and wildlife resource values involved. Considering the high value of forested wetlands and marsh for fish and wildlife and the relative scarcity of that habitat type, those wetlands are usually designated as Resource Category 2 habitats, the mitigation goal for which is no net loss of in-kind habitat value. Potential direct and indirect impacts to float marsh have been avoided by aligning the floodwall along the periphery of the Bayou aux Carpes wetland complex. While the preferred alignment has resulted in greater impacts to forested wetlands, the proposed flood protection structure would enclose fewer wetland acres, and the damaging hydrologic effects associated with bisecting the Bayou aux Carpes float marsh with a structural barrier would be avoided. Therefore, remaining direct project impacts to forested wetlands should be mitigated via in-kind compensatory replacement of the habitat values lost. Degraded (i.e., non-wet) bottomland hardwood forest and any wet pastures that may be impacted, however, are placed in Resource Category 3 due to their reduced value to wildlife, fisheries and lost/degraded wetland functions. Project impacts to wetlands will be minimized to some extent by hauling in material for the levee. The mitigation goal for Resource Category 3 habitats is no net loss of habitat value.

Mitigation for unavoidable losses of wet and non-wet bottomland hardwoods and swamp habitat, caused by project features will be evaluated through a complementary comprehensive mitigation

IER. However, mitigation for unavoidable impacts to the EPA CWA Bayou aux Carpes 404 (c) area should be provided concurrently with flood protection features and within the EPA CWA Bayou aux Carpes 404 (c) area, provided EPA determines that modification of the 404 (c) designation is warranted.

We commend the Corps efforts to ensure fish and wildlife habitats within the EPA CWA Bayou aux Carpes 404 (c) area are maintained by augmenting the proposed hurricane protection project. Because of the hydrologically sensitive nature of the floatant marsh and cypress swamp habitat, the implementation and design of proposed augmentations to the EPA CWA Bayou aux Carpes 404 (c) area should be closely coordinated with the results ERDC hydrologic investigations. The natural resource agencies, particularly the NPS and EPA, should be intimately involved in determining what hydrologic parameters should be investigated, reviewing the results of the investigations, and developing the best solution to maintaining and improving the hydrology of the floatant marsh and cypress swamp habitats. Depending on the results of those investigations, a plan should be designed and implemented to modify hydrologic and nutrient inflow effects to the Bayou aux Carpes area (e.g., gapping the Estelle Pump Station Outfall Canal, gapping or grading down interior canal banks such as the Southern Natural Gas and Shell pipeline canals, and/or modifying the shell plug at Bayou aux Carpes). Should proposed long-term monitoring efforts reveal that any of the proposed augmentation features would result in adverse impacts, the Corps should restore those features to pre-project conditions in coordination with the natural resource agencies.

To minimize impacts associated with removing additional borrow from forested areas, material dredged from the Algiers Canal and removed during project construction (i.e., repositioning the WBV, levee landward to accommodate the GIWW gate, and dredging along the GIWW bankline to install the flow control structure) should be tested to determine its suitability for levee construction. According to 2005 sediment sampling conducted for maintenance of the Inner Harbor Navigation Canal (IHNC) project in Orleans Parish, Louisiana, some sediment collected from GIWW and IHNC was considered unsuitable for open water disposal, and other options for disposal were necessary. Material dredged from the GIWW/Algiers Canal should be tested for contaminants, and the Corps should continue to coordinate with the natural resource agencies to determine the best use of that material. Should the material be used beneficially on NPS lands, the Corps should continue to coordinate with that agency. Please contact Superintendent, David Luchsinger, (504) 589-3882 extension 137 ([david\\_luchsinger@nps.gov](mailto:david_luchsinger@nps.gov)), or Chief of Resource Management, David Muth, (504) 589-3882 extension 128 ([david\\_muth@nps.gov](mailto:david_muth@nps.gov)).

### **SERVICE POSITION AND RECOMMENDATIONS**

Construction of the increased flood protection would result in direct impacts to 177.1 and 38.5 AAHUs, of bottomland hardwood forest and swamp, respectively. The Service does not object to providing improved hurricane protection to the greater New Orleans area provided the following fish and wildlife conservation recommendations are incorporated into future project planning and implementation:

1. Flood protection and ancillary features such as staging areas and access roads should be designed and positioned so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized to the greatest extent possible.
2. The Corps should fully compensate for any unavoidable losses of wetland habitat or non-wet bottomland hardwoods caused by project features.
3. The enclosure of wetlands with new levee alignments should be minimized to the fullest extent. When enclosure of wetlands is unavoidable, non-development easements on enclosed wetlands should be acquired, or hydrologic connections with adjacent, un-enclosed wetlands should be maintained. Such actions will serve to minimize secondary impacts from development and hydrologic alteration.
4. Material removed during project construction (i.e., dredging Algiers Canal, repositioning the WBV levee landward to accommodate the GIWW gate, and dredging along the GIWW bank line to install the flow control structure) should be tested to determine suitability as borrow material for levee construction and the presence of contaminants. The Corps should continue to coordinate with the natural resource agencies to determine the best use of that material.
5. A maintenance dredging management plan for material dredged from the Algiers Canal should be developed for the life of the project.
6. The Corps should avoid impacts to the Bayou aux Carpes CWA 404 (c) site, if feasible. If not feasible the Corps should continue coordination with the NPS and EPA regarding any proposed project feature that may impact that area. Points of contacts for the agencies potentially impacted by project features are: National Park Service (NPS), contact Superintendent David Luchsinger, (504) 589-3882 extension 137 ([david\\_luchsinger@nps.gov](mailto:david_luchsinger@nps.gov)) or Chief of Resource Management David Muth (504) 589-3882 extension 128, ([david\\_muth@nps.gov](mailto:david_muth@nps.gov)) and Ms. Barbara Keeler (214) 665-6698 with the EPA.
7. Construction within the Bayou aux Carpes CWA Section 404 (c) site should not commence until the EPA's decision to modify the designation to accommodate discharges into that area has been resolved.
8. Hydrologic, nutrient, and contaminant modeling should be conducted to determine the best arrangement of environmental augmentation features (i.e., location of gaps and water control structures), if any, in the Bayou aux Carpes 404 (c) area.
9. Environmental augmentation features developed through the EPA 404 (c) modification procedures should be incorporated as project features, and the IER should be supplemented to address any additional augmentation features proposed through that process.

10. If hydraulic modeling demonstrates that environmental augmentation features are beneficial, operational plans to maximize freshwater retention or redirect freshwater flows into the Bayou aux Carpes 404 (c) area should be coordinated with the natural resource agencies, especially EPA and NPS. To accommodate changing goals and restoration needs, water control structures should be designed to incorporate operational flexibility through an adaptive management program.
11. The project's first Project Cooperation Agreement (or similar document) should include language that includes the responsibility of the local-cost sharer to provide operational, monitoring, and maintenance funds for mitigation and augmentation features. If the local project-sponsor is unable to fulfill the financial requirements for maintenance of the shoreline protection features, the Corps should provide the necessary funding to ensure maintenance obligations are met on behalf of the public interest.
12. To facilitate necessary adaptive management, the Corps in coordination with the natural resource agencies, should develop a monitoring plan. That monitoring plan should address hydrologic, nutrient, and contaminant changes throughout the system. The performance and funding of the monitoring of mitigation and augmentation features should be allocated as first-cost expenses of the project, and the local project-sponsor should be responsible for operational costs. If the local project-sponsor is unable to fulfill the financial mitigation requirements for operation, then the Corps should provide the necessary funding to ensure that local cost share obligations are met on behalf of the public interest.
13. Because of the sensitivity and significance of the Bayou aux Carpes 404 (c) area every effort should be made to minimize impacts during construction of the floodwall and navigational gate. Construction activities within the Bayou aux Carpes 404 (c) area should adhere to the following guidelines to avoid adverse impacts to the Bayou aux Carpes 404 (c) area:
  - A. Construction should be performed from the water side (i.e., Bayou Barataria/GIWW side) rather than from the 404(c) side;
  - B. Construction of the floodwall within the Bayou aux Carpes 404 (c) area should be constructed within a 100-foot corridor width from the GIWW into the 404(c) area. No additional area within the 404(c) site would be required for the floodwall or any other construction;
  - C. The Corps should investigate and utilize innovative techniques to design and build a structure with the narrowest footprint possible; and,
  - D. Should existing oil and gas pipeline ROWs require relocation, impacts associated with those relocations should be avoided and minimized to the greatest extent possible.
14. If a proposed project feature is changed significantly or is not implemented within one year of the date of this report, the Corps should reinitiate coordination with each office to ensure

that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat.

15. Adverse impacts to bald eagle nesting locations and wading bird colonies should be avoided through careful design of project features and timing of construction. A qualified biologist should inspect the proposed work site for the presence of undocumented wading bird nesting colonies and bald eagles during the nesting season (i.e., February 16 through October 31 for wading bird nesting colonies, and October through mid-May for bald eagles).
16. To minimize disturbance to colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present). In addition, we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests, and should avoid affecting them during the breeding season.
17. If a bald eagle nest is discovered within or adjacent to the proposed project area, then an evaluation should be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: <http://www.fws.gov/southeast/es/baldeagle>. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary and those results should be forwarded to this office.
18. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.
19. Forested areas cleared for staging areas and temporary construction zones should be managed for invasive species (i.e., Chinese tallowtree) after the completion of the project.
20. Acquisition, habitat development, maintenance and management of mitigation lands should be allocated as first-cost expenses of the project, and the local project-sponsor should be responsible for operational costs. If the local project-sponsor is unable to fulfill the financial mitigation requirements for operation, then the Corps should provide the necessary funding to ensure mitigation obligations are met on behalf of the public interest.
21. Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service, NMFS, LDWF, EPA, NPS, and the Louisiana Department of Natural Resources (LDNR). The Service should be provided an opportunity to review and submit recommendations on the all work addressed in those reports.
22. If mitigation lands are purchased for inclusion within Federally or State managed lands, those lands must meet certain requirements; therefore the land manager of that management

area should be contacted early in the planning phase regarding such requirements.

23. If applicable, a General Plan should be developed by the Corps, the Service, and the managing natural resource agency in accordance with Section 3(b) of the FWCA for mitigation lands.
24. Flood protection water control structures in any watercourse should maintain pre-project cross section in width and depth to the maximum extent practicable.
25. Any flood protection water control structure sited in a canal, bayou, or navigation channel that does not maintain the pre-project cross section should be designed and operated with multiple openings within the structure. This should include openings near both sides of the channel as well as an opening in the center of the channel that extends to the bottom.
26. Flood protection water control structures should remain completely open except during storm events, unless otherwise determined by the natural resource agencies.
27. Flood protection structures within a waterway should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered, and coordination should continue with the natural resource agencies to ensure fish passage features are incorporated to the fullest extent practicable.
28. To the maximum extent practicable, structures should be designed and/or selected and installed such that average flow velocities during peak flood or ebb tides do not exceed 2.6 feet per second. However, this may not necessarily be applicable to tidal passes or other similar major exchange points.
29. To the maximum extent practicable, culverts (round or box) should be designed, selected, and installed such that the invert elevation is equal to the existing water depth. The size of the culverts should be selected that would maintain sufficient flow to prevent siltation.
30. Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to normal.
31. Any proposed change in mitigation or augmentation features or plans should be coordinated in advance with the Service, NMFS, LDWF, EPA and LDNR.
32. A report documenting the status of mitigation implementation and maintenance should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, EPA, LDNR and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

## LITERATURE CITED

- Louisiana Coastal Wetland Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. 1998. Coastal 2050: Toward a Sustainable Coastal Louisiana. Louisiana Department of Natural Resources. Baton Rouge, LA. 70898.
- U.S. Fish and Wildlife Service 1985. "Fish and Wildlife Resources of the Bayou aux Carpes Drainage Area, Jefferson Parish, Louisiana." U.S. Fish and Wildlife Service - Division of Ecological Services, Lafayette, Louisiana.

## **Appendix A**

### **Agency Coordination**



2856  
UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office  
263 13th Avenue, South  
St. Petersburg, Florida 33701

November 18, 2008 F/SER46/RH:jk  
225/389-0508

Mr. James F. Boggs, Field Supervisor  
Louisiana Field Office  
U.S. Fish and Wildlife Service  
646 Cajundome Blvd., Suite 400  
Lafayette, Louisiana 70506



Dear Mr. Boggs:

NOAA's National Marine Fisheries Service (NMFS) has received the draft Fish and Wildlife Coordination Act Report (Report) on the Individual Environmental Report (IER) 12 transmitted for our review by your letter dated October 27, 2008. The Report discusses the U.S. Fish and Wildlife Services' findings and recommendations associated with plans to elevate hurricane protection features of the West Bank and Vicinity, Harvey to Algiers, project in Jefferson, Orleans and Plaquemines Parishes, Louisiana. Portions of the recommended plan would be located in a wetland complex subject to an Environmental Protection Agency Final Determination under Section 404(c) of the Clean Water Act.

NMFS has reviewed the Report and concurs with the recommended fish and wildlife conservation recommendations detailed in the document. In addition, NMFS believes the document adequately quantifies potential project-related impacts to wetlands and forested habitats that could result from the implementation of the proposed plan. As such, NMFS has no revisions to the Report to recommend.

We appreciate the opportunity to review and comment on this Report.

Sincerely,

 Miles M. Croom  
Assistant Regional Director  
Habitat Conservation Division

c:  
LA DNR, CMD, Consistency  
F/SER46 - Swafford  
Files





*Patti  
Walthers*

BOBBY JINDAL  
GOVERNOR

## State of Louisiana

ROBERT J. BARHAM  
SECRETARY

DEPARTMENT OF WILDLIFE AND FISHERIES  
OFFICE OF WILDLIFE

JIMMY L. ANTHONY  
ASSISTANT SECRETARY

January 22, 2009

Mr. James F. Boggs, Supervisor  
Louisiana Field Office  
Fish and Wildlife Service  
646 Cajundome Blvd.  
Lafayette, LA 70506

RE: *Fish and Wildlife Coordination Act Report on the Individual Environmental Report 12*  
*Notice Date: December 24, 2008*

Dear Mr. Boggs:

The professional staff of the Louisiana Department of Wildlife and Fisheries (LDWF) has reviewed the above referenced notice. Based upon this review, the following has been determined:

LDWF's concerns have been well addressed by the recommendations provided in the U.S. Fish and Wildlife Service report. However, the department would like to remain part of any Bayou aux Carpes management plan development, as well as have opportunity to review any modifications, and additional impacts.

The Louisiana Department of Wildlife and Fisheries appreciates the opportunity to review and provide recommendations to you regarding this report. Please do not hesitate to contact Habitat Section biologist Matthew Weigel at 225-763-3587 should you need further assistance.

Sincerely,

A handwritten signature in black ink that reads "Kyle F. Balkum".

Kyle F. Balkum  
Biologist Program Manager

mw

c: Matthew Weigel, Biologist

## **Appendix B**

### **FWS's February 9, 2009, Letter Regarding EPA's Clean Water Act Section 404 (c) Designation**



## United States Department of the Interior



FISH AND WILDLIFE SERVICE  
646 Cajundome Blvd.  
Suite 400  
Lafayette, Louisiana 70506

February 9, 2009

Ms. Barbara Keeler (6WQ-EC)  
Environmental Protection Agency  
Region 6  
1445 Ross Avenue  
Dallas, Texas 75202-2733

Dear Ms. Keeler:

Please reference the Environmental Protection Agency's (EPA) Notice of Public Hearing and Request for Comments published in the Federal Register (Volume 74, No. 9, pg. 2072) on January 14, 2009. The U.S. Army Corps of Engineers (Corps), New Orleans District, has requested an amendment to EPA's Clean Water Act (CWA) Section 404 (c) designation which prohibits discharges of dredged or fill material into the Bayou aux Carpes Site in Jefferson Parish, Louisiana. That amendment is requested to allow the Corps to construct the proposed Westbank and Vicinity of New Orleans (WBV), Harvey to Algiers, 100-year level hurricane protection project, Individual Environmental Report 12 (IER 12), which is authorized in accordance with Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4). The EPA has requested comments as to whether the 1985 Bayou aux Carpes CWA Section 404 (c) EPA Final Determination should be modified as requested by the Corps. The Service submits the following comments in accordance with the National Environmental Policy Act of 1969 (83 Stat. 852, as amended; 42 U.S.C. 4321 et seq.), Migratory Bird Treaty Act (MBTA) (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.), and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

The Service recognizes the importance of the Bayou aux Carpes wetland complex to fish and wildlife resources and believes that the designation is warranted to protect these sensitive areas from development. In cooperation with Federal and State partners, the Corps has minimized potential direct and indirect impacts to significant floatant marsh and cypress swamp habitat by aligning the floodwall along the periphery of the Bayou aux Carpes CWA Section 404 (c) site. While the preferred alignment has resulted in greater direct impacts to forested wetlands, those forested wetlands at one time were previously altered by fill material. The preferred alignment would enclose fewer wetland acres, and avoid the damaging hydrologic consequences associated with bisecting the Bayou aux Carpes floatant marsh with a structural barrier. Moreover, unlike the Harvey Canal-Bayou Barataria Levee project which was the catalyst for EPA's determination, the preferred alternative alignment would avoid inclusion of the Bayou aux Carpes floatant and cypress swamp complex into the flood protection system and subsequently placing the area under

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pumped drainage.

During the alternatives analysis for IER 12, the Corps considered a series of alternative gate locations within the project area that would minimize the need for parallel protection. One of these alternatives included constructing a sector gate across the Bayou aux Carpes CWA Section 404 (c) site and was initially the Corps' preferred alternative. The proposed floodwall alignment within the Bayou aux Carpes CWA Section 404 (c) site would have, not only directly impacted high-quality floatant marsh and forested wetlands, but would have isolated approximately 500 acres of floatant marsh by placing them within the flood protection system. Constructing a floodwall across floatant marsh would disrupt the dynamic hydrologic conditions characteristic of a floatant marsh and would disrupt the natural hydrologic regimes within the entire Bayou aux Carpes wetland complex negatively impacting significant fish and wildlife resources. As proposed, the preferred alternative would minimize impacts by avoiding bisecting the Bayou aux Carpes CWA Section 404 (c) site and by implementing innovative design and construction techniques (e.g., floodwall design, construction sequencing).

At this time, the Service is unaware of any threatened or endangered species or their critical habitat within the proposed hurricane protection system project footprint for IER 12. However, the project-area forested wetlands provide nesting habitat for the bald eagle (*Haliaeetus leucocephalus*), and a bald eagle nest was documented within the Bayou aux Carpes drainage area in 2007. This should be considered when designing environmental augmentation features. The bald eagle was officially removed from the List of Endangered and Threatened Species on August 8, 2007. Bald eagles nest in Louisiana from October through mid-May. Eagles typically nest in mature trees (e.g., bald cypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water in the southeastern Parishes. Major threats to this species include habitat alteration, human disturbance, and environmental contaminants (i.e., organochlorine pesticides and lead). Although the bald eagle has been removed from the List of Endangered and Threatened Species, it continues to be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. The Service's Division of Migratory Birds for the Southeast Region (phone: 404/679-7051, e-mail: SEMigratorybirds@fws.gov) has the lead role in conducting such consultations. Should you need further assistance interpreting the guidelines or performing an on-line project evaluation, please contact this office.

Direct impacts to bottomland hardwood and swamp habitat associated with the preferred alternative were quantified by acreage and habitat quality (i.e., average annual habitat units or AAHUs). The Service used the Louisiana Department of Natural Resources Habitat Assessment Methodology (HAM) to quantify the impacts of proposed project features on upland and wetland bottomland hardwood habitat and used the Wetland Value Assessment (WVA) methodology to quantify the impacts on swamp habitat. The Service determined that direct impacts to approximately 9.6 acres of forested habitat (i.e., 2.4 acres of bottomland hardwood habitat and 7.2 acres of swamp habitat) within the proposed 100-foot right-of-way of the Bayou aux Carpes CWA Section 404 (c) site would result in the loss of 6.1 AAHUs. Riparian habitat and

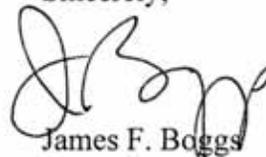
associated fish and wildlife resources would be minimally reduced within the Bayou aux Carpes CWA Section 404 (c) site. Mitigation for unavoidable losses of wet and non-wet bottomland hardwoods and swamp habitat, caused by project features of the entire hurricane protection system will be evaluated through a complementary comprehensive mitigation IER. However, should this designation be amended and the Corps' proposed alternative authorized, mitigation for unavoidable impacts to the Bayou aux Carpes 404 (c) area would be provided concurrently with flood protection features and within the Bayou aux Carpes 404 (c) area.

To ensure that potential impacts resulting from the construction of a flood protection structure do not compromise the value of this nationally-significant wetland ecosystem and to maintain the integrity of the Bayou aux Carpes CWA Section 404 (c) site, the Corps is proposing to incorporate environmental augmentation features into the proposed hurricane protection project. Stormwater from the Old Estelle Pump Station canal is currently being directed into the GIWW bypassing the Bayou aux Carpes wetland complex. Because of the invaluable water quality functions wetlands provide, stormwater will be redirected through the Bayou aux Carpes CWA Section 404 (c) site which would restore the natural process of nutrient cycling and reduce the risk of eutrophication in the lower basin waterbodies, provided modeling results support that action. Proposed augmentations could supplement hydrologic exchange within approximately 3,000 acres of floatant marsh, cypress swamp, and wetland scrub-shrub habitat.

Although complete avoidance of the Bayou aux Carpes CWA Section 404 (c) site would be preferred, it is the Service's opinion that amending the designation as proposed would not have an unacceptable adverse effect on fish and wildlife resources within the Bayou aux Carpes wetland complex. The Corps has incorporated proposed environmental augmentation features as a feature of the proposed project. Provided that hydrologic modeling supports implementation of those features, the Service believes that those augmentations coupled with long-term monitoring will ensure that unforeseen impacts to the Bayou aux Carpes CWA Section 404 (c) site are avoided. On the condition that the Corps moves forward with modeling and design of the environmental augmentation features concurrently with hurricane protection features, the Service would not be opposed to EPA modifying the 1985 Bayou aux Carpes CWA Section 404 (c) EPA Final Determination.

We appreciate the opportunity to comment on the proposed amendment and look forward to the continued coordination with the EPA, the Corps, and other State and Federal resource agencies with regards to the proposed hurricane protection system project. Should you have any questions regarding our comments, please give me a call (337/291-3115).

Sincerely,



James F. Boggs  
Supervisor  
Louisiana Field Office

cc: FWS, Atlanta, GA (ES/HC)  
Corps, New Orleans, LA  
Jean Lafitte National Historical Park and Preserve, New Orleans, LA  
NMFS, Baton Rouge, LA  
LDWF, Baton Rouge, LA  
LDNR, CMD, Baton Rouge, LA

**Appendix C**

**Wetland Value Assessment**

# COMMUNITY HABITAT SUITABILITY MODEL

## Bottomland Hardwoods

Project..... IER 12, Alt 2, Mid-Late Succ. BLH

Acres: 206

Condition: Future With Project

Variable		TY 0		TY 1		TY 50				
		Class/Value	SI	Class/Value	SI	Class/Value	SI			
V1	Species Assoc.	Class		Class		Class				
		4	0.80	1		1				
V2	Maturity (input age or dbh, not both)	Age		Age		Age				
		dbh		dbh		dbh				
		14	0.66	0		0				
V3	Understory / Midstory	Understory %		Understory %		Understory %		1.00	0.10	0.10
		45		0		0				
		Midstory %		Midstory %		Midstory %		0.95	0.10	0.10
		55	0.98	0		0				
V4	Hydrology	Class		Class		Class				
		2	0.50	1	0.10	1	0.10			
V5	Forest Size	Class		Class		Class				
		4	0.80	1		1				
V6	Surrounding Land Use	Values %		Values %		Values %				
	Forest / marsh	33	0.43	73	0.83	73	0.83			
	Abandoned Ag	25		24		24				
	Pasture / Hay									
	Active Ag	42		3		3				
	Development									
V7	Disturbance	Class		Class		Class				
	Type	2	0.50	1	0.01	1	0.01			
	Distance	Class		Class		Class				
		2		1		1				
		HSI = 0.68		HSI =		HSI =				

Project..... IER 12, Alt 2, Mid-Late Succ. BLH  
FWP

Variable		TY		TY		TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Species Assoc.	Class		Class		Class	
V2	Maturity (input age or dbh, not both)	Age		Age		Age	
		dbh		dbh		dbh	
V3	Understory / Midstory	Understory %		Understory %		Understory %	
		Midstory %		Midstory %		Midstory %	
V4	Hydrology	Class		Class		Class	
V5	Forest Size	Class		Class		Class	
V6	Surrounding Land Use	Values %		Values %		Values %	
	Forest / marsh						
	Abandoned Ag						
	Pasture / Hay						
	Active Ag						
	Development						
V7	Disturbance	Class		Class		Class	
	Type	Class		Class		Class	
	Distance	Class		Class		Class	
		HSI =		HSI =		HSI =	

# COMMUNITY HABITAT SUITABILITY MODEL

## Bottomland Hardwoods

Project..... IER 12, Alt 2, Mid-Late Succ. BLH

Acres:

206

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20				
		Class/Value	SI	Class/Value	SI	Class/Value	SI			
V1	Species Assoc.	Class 4	0.80	Class 4	0.80	Class 4	0.80			
V2	Maturity (input age or dbh, not both)	Age dbh 14.94	0.66	Age dbh 15.22	0.68	Age dbh 18.27	0.89			
V3	Understory / Midstory	Understory % 45 Midstory % 55	0.98	Understory % 45 Midstory % 55	0.98	Understory % 30 Midstory % 60	0.95	1.00	1.00	1.00
V4	Hydrology	Class 2	0.50	Class 2	0.50	Class 2	0.50			
V5	Forest Size	Class 4	0.80	Class 4	0.80	Class 4	0.80			
V6	Surrounding Land Use	Values %  Forest / marsh Abandoned Ag Pasture / Hay Active Ag Development	0.43	Values %  33 25 42	0.43	Values %  33 25 42	0.43			
V7	Disturbance  Type  Distance	Class 2  Class 2	0.50	Class 2  Class 2	0.50	Class 2  Class 2	0.50			
		HSI =	0.68	HSI =	0.69	HSI =	0.73			

Project..... IER 12, Alt 2, Mid-Late Succ. BLH  
FWP

Variable		TY 50		TY		TY				
		Class/Value	SI	Class/Value	SI	Class/Value	SI			
V1	Species Assoc.	Class 4	0.80	Class		Class				
V2	Maturity (input age or dbh, not both)	Age dbh 21.19	1.00	Age dbh		Age dbh				
V3	Understory / Midstory	Understory % 30 Midstory % 30	1.00	Understory %  Midstory %		Understory %  Midstory %		1.00		1.00
V4	Hydrology	Class 2	0.50	Class		Class				
V5	Forest Size	Class 4	0.80	Class		Class				
V6	Surrounding Land Use	Values %  Forest / marsh Abandoned Ag Pasture / Hay Active Ag Development	0.43	Values %  33 25 42		Values %  33 25 42				
V7	Disturbance  Type  Distance	Class 2  Class 2	0.50	Class 2  Class 2		Class 2  Class 2				
		HSI =	0.76	HSI =		HSI =				



# COMMUNITY HABITAT SUITABILITY MODEL

## Bottomland Hardwoods

Project..... IER 12, Alt 2, BLH early successional

Acres:

39

Condition: Future With Project

Variable		TY 0		TY 1		TY 50	
		Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Species Assoc.	Class 1	0.20	Class 1		Class 1	
V2	Maturity (input age or dbh, not both)	Age 10 dbh	0.10	Age 0 dbh	0.00	Age 0 dbh	0.00
V3	Understory / Midstory	Understory % 60 Midstory % 50	1.00	Understory % 0 Midstory % 0		Understory % 0 Midstory % 0	1.00 1.00
V4	Hydrology	Class 2	0.50	Class 2	0.50	Class 2	0.50
V5	Forest Size	Class 4	0.80	Class 1		Class 1	
V6	Surrounding Land Use	Values %		Values %		Values %	
	Forest / marsh	84	0.90	84	0.90	84	0.90
	Abandoned Ag Pasture / Hay Active Ag Development	16		16		16	
V7	Disturbance Type	Class 2	1.00	Class 2	1.00	Class 2	1.00
	Distance	Class 3		Class 3		Class 3	
		HSI = 0.31		HSI =		HSI =	

Project..... IER 12, Alt 2, BLH early successional  
FWP

Variable		TY		TY		TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Species Assoc.	Class		Class		Class	
V2	Maturity (input age or dbh, not both)	Age dbh		Age dbh		Age dbh	
V3	Understory / Midstory	Understory % Midstory %		Understory % Midstory %		Understory % Midstory %	
V4	Hydrology	Class		Class		Class	
V5	Forest Size	Class		Class		Class	
V6	Surrounding Land Use	Values %		Values %		Values %	
	Forest / marsh						
	Abandoned Ag Pasture / Hay Active Ag Development						
V7	Disturbance Type	Class		Class		Class	
	Distance	Class		Class		Class	
		HSI =		HSI =		HSI =	

# COMMUNITY HABITAT SUITABILITY MODEL

## Bottomland Hardwoods

Project..... IER 12, Alt 2, BLH early successional

Acres:

39

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20		
		Class/Value	SI	Class/Value	SI	Class/Value	SI	
V1	Species Assoc	Class 1	0.20	Class 1	0.20	Class 2	0.40	
V2	Maturity (input age or dbh, not both)	Age 10 dbh	0.10	Age 11 dbh	0.12	Age 31 dbh	0.62	
V3	Understory / Midstory	Understory % 60 Midstory % 40	1.00	Understory % 60 Midstory % 50	1.00	Understory % 50 Midstory % 70	0.90	1.00 1.00
V4	Hydrology	Class 2	0.50	Class 2	0.50	Class 2	0.50	
V5	Forest Size	Class 4	0.80	Class 4	0.80	Class 4	0.80	
V6	Surrounding Land Use	Values %		Values %		Values %		
	Forest / marsh	84	0.90	84	0.90	82	0.88	
	Abandoned Ag	16		16		16		
	Pasture / Hay					2		
	Active Ag							
	Development							
V7	Disturbance	Class 2	1.00	Class 2	1.00	Class 2	1.00	
	Type	Class 3		Class 3		Class 3		
	Distance							
		HSI =	0.31	HSI =	0.33	HSI =	0.61	

Project..... IER 12, Alt 2, BLH early successional  
FWP

Variable		TY 50		TY		TY		
		Class/Value	SI	Class/Value	SI	Class/Value	SI	
V1	Species Assoc	Class 2	0.40	Class		Class		
V2	Maturity (input age or dbh, not both)	Age 61 dbh	1.00	Age dbh		Age dbh		
V3	Understory / Midstory	Understory % 30 Midstory % 60	0.95	Understory % Midstory %		Understory % Midstory %		1.00 0.90
V4	Hydrology	Class 2	0.50	Class		Class		
V5	Forest Size	Class 4	0.80	Class		Class		
V6	Surrounding Land Use	Values %		Values %		Values %		
	Forest / marsh	82	0.88					
	Abandoned Ag	16						
	Pasture / Hay							
	Active Ag							
	Development							
V7	Disturbance	Class 2	1.00	Class		Class		
	Type	Class 3		Class		Class		
	Distance							
		HSI =	0.69	HSI =		HSI =		



# COMMUNITY HABITAT SUITABILITY MODEL

## Bottomland Hardwoods

Project..... IER 12, Alt 2, BLH east staging area                      Acres:                      6.9

Condition: Future With Project

Variable		TY 0		TY 1		TY 3				
		Class/Value	SI	Class/Value	SI	Class/Value	SI			
V1	Species Assoc.	Class	4	0.80	Class	1		Class	1	
V2	Maturity (input age or dbh, not both)	Age			Age			Age		
		dbh	17.8	0.85	dbh	0.1	0.00	dbh	0.1	0.00
V3	Understory / Midstory	Understory %	80		Understory %	0		Understory %	0	0.80 0.10 0.10
		Midstory %	17	0.83	Midstory %	0		Midstory %	0	0.87 0.10 0.10
V4	Hydrology	Class	2	0.50	Class	2	0.50	Class	2	0.50
V5	Forest Size	Class	5	1.00	Class	0		Class	0	
V6	Surrounding Land Use	Values %			Values %			Values %		
	Forest / marsh		60	0.72		60	0.72		60	0.72
	Abandoned Ag		29			29			29	
	Pasture / Hay									
	Active Ag		11			11			11	
	Development									
V7	Disturbance	Class	2	0.26	Class	1	0.01	Class	1	0.01
	Type	Class	1		Class	1		Class	1	
	Distance	Class	1		Class	1		Class	1	
		HSI =		0.72	HSI =		0.01	HSI =		0.01

Project..... IER 12, Alt 2, BLH east staging area  
FWP

Variable		TY 4		TY 50		TY				
		Class/Value	SI	Class/Value	SI	Class/Value	SI			
V1	Species Assoc.	Class	2		Class	4	0.80	Class		
V2	Maturity (input age or dbh, not both)	Age	1	0.00	Age	46	0.92	Age		
		dbh			dbh			dbh		
V3	Understory / Midstory	Understory %	80		Understory %	20		Understory %		0.80 0.70
		Midstory %	80		Midstory %	60	0.80	Midstory %		0.70 0.90
V4	Hydrology	Class	2	0.50	Class	2	0.50	Class		
V5	Forest Size	Class	1		Class	1	0.20	Class		
V6	Surrounding Land Use	Values %			Values %			Values %		
	Forest / marsh		60	0.72		60	0.72			
	Abandoned Ag		29			29				
	Pasture / Hay									
	Active Ag		11			11				
	Development									
V7	Disturbance	Class	2	0.26	Class	2	0.26	Class		
	Type	Class	1		Class	1		Class		
	Distance	Class	1		Class	1		Class		
		HSI =		0.04	HSI =		0.65	HSI =		

# COMMUNITY HABITAT SUITABILITY MODEL

## Bottomland Hardwoods

Project..... IER 12, Alt 2, BLH east staging area                      Acres:                      6.9

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20				
		Class/Value	SI	Class/Value	SI	Class/Value	SI			
V1	Species Assoc.	Class 4	0.80	Class 4	0.80	Class 4	0.80			
V2	Maturity (input age or dbh, not both)	Age dbh 17.8	0.85	Age dbh 18.08	0.87	Age dbh 18.27	0.89			
V3	Understory / Midstory	Understory % 80 Midstory % 17	0.83	Understory % 80 Midstory % 17	0.83	Understory % 30 Midstory % 60	0.95	0.80	0.80	1.00
V4	Hydrology	Class 2	0.50	Class 2	0.50	Class 2	0.50			
V5	Forest Size	Class 4	0.80	Class 4	0.80	Class 4	0.80			
V6	Surrounding Land Use	Values %  Forest / marsh Abandoned Ag Pasture / Hay Active Ag Development	0.72	Values %  60 29 11	0.72	Values %  60 29 11	0.72			
V7	Disturbance  Type  Distance	Class 2 Class 1	0.26	Class 2 Class 1	0.26	Class 2 Class 1	0.26			
		HSI = 0.71		HSI = 0.71		HSI = 0.73				

Project..... IER 12, Alt 2, BLH east staging area  
FWP

Variable		TY 50		TY		TY				
		Class/Value	SI	Class/Value	SI	Class/Value	SI			
V1	Species Assoc.	Class 5	1.00	Class		Class				
V2	Maturity (input age or dbh, not both)	Age dbh 21.19	1.00	Age dbh		Age dbh				
V3	Understory / Midstory	Understory % 45 Midstory % 40	1.00	Understory %  Midstory %		Understory %  Midstory %		1.00		1.00
V4	Hydrology	Class 1	0.10	Class		Class				
V5	Forest Size	Class 4	0.80	Class		Class				
V6	Surrounding Land Use	Values %  Forest / marsh Abandoned Ag Pasture / Hay Active Ag Development	0.72	Values %  60 29 11		Values %  60 29 11				
V7	Disturbance  Type  Distance	Class 2 Class 1	0.26	Class Class		Class Class				
		HSI = 0.65		HSI =		HSI =				



## WETLAND VALUE ASSESSMENT COMMUNITY MODEL Swamp

Project..... IER 12, Riparian BLH & Swamp

Project Area.....

68

Condition: Future Without Project

Variable		TY 0		TY 1		TY 10		
		Class/Value	SI	Class/Value	SI	Class/Value	SI	
V1	Stand Structure	% Cover Overstory		% Cover Overstory		% Cover Overstory		
		Scrub-shrub		Scrub-shrub		Scrub-shrub		
		Herbaceous		Herbaceous		Herbaceous		
		Class 3	0.40	Class 3	0.40	Class 3	0.40	
V2	Stand Maturity	Cypress %		Cypress %		Cypress %		
		Cypress dbh	30	Cypress dbh	30	Cypress dbh	30	0
		Tupelo et al. %	18	Tupelo et al. %	18	Tupelo et al. %	21	1
		Tupelo et al dbh	70	Tupelo et al dbh	70	Tupelo et al dbh	70	
		Basal Area	12.8	Basal Area	13.07	Basal Area	14.18	1.00
			25.15	Basal Area	25	Basal Area	38	0.20
V3	Water Regime	Flow/Exchange high		Flow/Exchange high		Flow/Exchange high		
		Flooding Duration seasonally	1.00	Flooding Duration seasonally	1.00	Flooding Duration seasonally	1.00	
V4	Mean High Salinity	2.5	0.325	2.5	0.325	2.5	0.325	
		HSI =	0.43	HSI =	0.43	HSI =	0.43	

Project..... IER 12, Riparian BLH & Swamp  
FWOP

Variable		TY 20		TY 50		TY		
		Class/Value	SI	Class/Value	SI	Class/Value	SI	
V1	Stand Structure	% Cover Overstory		% Cover Overstory		% Cover Overstory		
		Scrub-shrub		Scrub-shrub		Scrub-shrub		
		Herbaceous		Herbaceous		Herbaceous		
		Class 4	0.60	Class 4	0.60	Class		
V2	Stand Maturity	Cypress %		Cypress %		Cypress %	0	
		Cypress dbh	30	Cypress dbh	30	Cypress dbh	0	0
		Tupelo et al. %	24	Tupelo et al. %	30	Tupelo et al. %	0	1
		Tupelo et al dbh	70	Tupelo et al dbh	60	Tupelo et al dbh	0	
		Basal Area	11.6	Basal Area	19.39	Basal Area	0	0.00
			38.94	Basal Area	106.56	Basal Area	0	0.00
V3	Water Regime	Flow/Exchange high		Flow/Exchange high		Flow/Exchange		
		Flooding Duration seasonally	1.00	Flooding Duration seasonally	1.00	Flooding Duration		
V4	Mean High Salinity	2.5	0.325	2.5	0.325			
		HSI =	0.48	HSI =	0.62	HSI =		

## WETLAND VALUE ASSESSMENT COMMUNITY MODEL Swamp

Project.....

Project Area.....

68

Condition: Future With Project

Variable		TY 0		TY 1		TY 50	
		Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover Overstory		% Cover Overstory		% Cover Overstory	
		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		Herbaceous		Herbaceous		Herbaceous	
		Class 3	0.40	Class 1	0.10	Class 1	0.10
V2	Stand Maturity	Cypress %	30	Cypress %	0	Cypress %	0
		Cypress dbh	18	Cypress dbh	0	Cypress dbh	0
		Tupelo et al. %	70	Tupelo et al. %	0	Tupelo et al. %	0
		Tupelo et al dbh	12.8	Tupelo et al dbh	0	Tupelo et al dbh	0
		Basal Area	25.15	Basal Area	0	Basal Area	0
			1.00		0.00		0.00
V3	Water Regime	Flow/Exchange high Flooding Duration seasonal	1.00	Flow/Exchange None Flooding Duration None	0.10	Flow/Exchange none Flooding Duration none	0.10
V4	Mean High Salinity	2.5	0.325	2.5	0.325	2.5	0.325
		HSI =	0.43	HSI =	0.00	HSI =	0.00

Project..... IER 12, Riparian BLH & Swamp  
FWP

Variable		TY		TY		TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover Overstory		% Cover Overstory		% Cover Overstory	
		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		Herbaceous		Herbaceous		Herbaceous	
		Class		Class		Class	
V2	Stand Maturity	Cypress %	0	Cypress %	0	Cypress %	0
		Cypress dbh	0	Cypress dbh	0	Cypress dbh	0
		Tupelo et al. %	0	Tupelo et al. %	0	Tupelo et al. %	0
		Tupelo et al dbh	0	Tupelo et al dbh	0	Tupelo et al dbh	0
		Basal Area	0	Basal Area	0	Basal Area	0
			0		0.00		0.00
V3	Water Regime	Flow/Exchange Moderate Flooding Duration Semi-Permanent		Flow/Exchange Moderate Flooding Duration Semi-Permanent	0.65	Flow/Exchange Moderate Flooding Duration Semi-Permanent	0.65
V4	Mean High Salinity					3.0	0.1
		HSI =		HSI =		HSI =	



# COMMUNITY HABITAT SUITABILITY MODEL

## Bottomland Hardwoods

Project..... IER 12, Alt 2, 404c BLH

Acres:

2.4

Condition: Future With Project

Variable		TY 0		TY 1		TY 50				
		Class/Value	SI	Class/Value	SI	Class/Value	SI			
V1	Species Assoc.	Class	4	0.80	Class	1		Class	1	
V2	Maturity (input age or dbh, not both)	Age	35	0.70	Age			Age		
		dbh			dbh	0.1	0.00	dbh	0.1	0.00
V3	Understory / Midstory	Understory %	48		Understory %	0		Understory %	0	1.00 0.10 0.10
		Midstory %	65	0.93	Midstory %	0		Midstory %	0	0.85 0.10 0.10
V4	Hydrology	Class	3	1.00	Class	1	0.10	Class	1	0.10
V5	Forest Size	Class	5	1.00	Class	1		Class	1	
V6	Surrounding Land Use	Values %			Values %			Values %		
	Forest / marsh		73	0.83		73	0.83		73	0.83
	Abandoned Ag		24			24			24	
	Pasture / Hay									
	Active Ag		3			3			3	
	Development									
V7	Disturbance	Class			Class			Class		
	Type	Class	2	0.26	Class	2	0.26	Class	2	0.26
	Distance	Class	1		Class	1		Class	1	
		HSI =		0.77	HSI =		0.01	HSI =		0.01

Project..... IER 12, Alt 2, 404c BLH  
FWP

Variable		TY		TY		TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Species Assoc.	Class		Class		Class	
V2	Maturity (input age or dbh, not both)	Age		Age		Age	
		dbh		dbh		dbh	
V3	Understory / Midstory	Understory %		Understory %		Understory %	
		Midstory %		Midstory %		Midstory %	
V4	Hydrology	Class		Class		Class	
V5	Forest Size	Class		Class		Class	
V6	Surrounding Land Use	Values %		Values %		Values %	
	Forest / marsh						
	Abandoned Ag						
	Pasture / Hay						
	Active Ag						
	Development						
V7	Disturbance	Class		Class		Class	
	Type	Class		Class		Class	
	Distance	Class		Class		Class	
		HSI =		HSI =		HSI =	

# COMMUNITY HABITAT SUITABILITY MODEL

## Bottomland Hardwoods

Project..... IER 12, Alt 2, 404c BLH

Acres:

2.4

Condition: Future Without Project

Variable		TY 0		TY 1		TY 20				
		Class/Value	SI	Class/Value	SI	Class/Value	SI			
V1	Species Assoc.	Class	4	0.80	Class	4	0.80			
V2	Maturity (input age or dbh, not both)	Age	35	0.70	Age	36	0.72			
		dbh			dbh					
V3	Understory / Midstory	Understory %	48		Understory %	48		1.00	1.00	1.00
		Midstory %	65	0.93	Midstory %	65	0.93	0.85	0.85	1.00
V4	Hydrology	Class	3	1.00	Class	3	1.00			
V5	Forest Size	Class	5	1.00	Class	5	1.00			
V6	Surrounding Land Use	Values %			Values %					
	Forest / marsh		73	0.83		73	0.83			
	Abandoned Ag		24			24				
	Pasture / Hay		3			3				
	Active Ag									
	Development									
V7	Disturbance	Class	2	0.26	Class	2	0.26			
	Type	Class	1		Class	1				
	Distance									
		HSI =	0.77		HSI =	0.77				
		HSI =	0.85		HSI =	0.85				

Project..... IER 12, Alt 2, 404c BLH

FWP

Variable		TY 50		TY		TY				
		Class/Value	SI	Class/Value	SI	Class/Value	SI			
V1	Species Assoc.	Class	4	0.80	Class					
V2	Maturity (input age or dbh, not both)	Age	75	1.00	Age					
		dbh			dbh					
V3	Understory / Midstory	Understory %	35		Understory %			1.00		
		Midstory %	35	1.00	Midstory %			1.00		
V4	Hydrology	Class	3	1.00	Class					
V5	Forest Size	Class	5	1.00	Class					
V6	Surrounding Land Use	Values %			Values %					
	Forest / marsh		73	0.83						
	Abandoned Ag		24							
	Pasture / Hay		3							
	Active Ag									
	Development									
V7	Disturbance	Class	2	0.26	Class					
	Type	Class	1		Class					
	Distance									
		HSI =	0.85		HSI =					
		HSI =			HSI =					



## WETLAND VALUE ASSESSMENT COMMUNITY MODEL Swamp

Project..... IER 12, 404c Tupelo Swamp

Project Area.....

7.2

Condition: Future Without Project

Variable		TY 0		TY 1		TY 10	
		Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover Overstory 35 Scrub-shrub 50 Herbaceous 70 Class 5	0.80	% Cover Overstory 35 Scrub-shrub 50 Herbaceous 70 Class 5	0.80	% Cover Overstory 40 Scrub-shrub 50 Herbaceous 55 Class 5	0.80
V2	Stand Maturity	Cypress % 0 Cypress dbh 0 Tupelo et al. % 100 Tupelo et al dbh 12.8 Basal Area 25.15	1.00 0.20	Cypress % 0 Cypress dbh 0 Tupelo et al. % 100 Tupelo et al dbh 13.07 Basal Area 25	1.00 0.20	Cypress % 0 Cypress dbh 0 Tupelo et al. % 100 Tupelo et al dbh 14.18 Basal Area 38	1.00 0.20
V3	Water Regime	Flow/Exchange High Flooding Duration Semi-Permanent	0.75	Flow/Exchange High Flooding Duration Semi-Permanent	0.75	Flow/Exchange High Flooding Duration Semi-Permanent	0.75
V4	Mean High Salinity	2.5	0.325	2.5	0.325	2.5	0.325
		HSI =	0.48	HSI =	0.48	HSI =	0.48

Project..... IER 12, 404c Tupelo Swamp  
FWOP

Variable		TY 20		TY 50		TY 100	
		Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover Overstory 45 Scrub-shrub 40 Herbaceous 60 Class 5	0.80	% Cover Overstory 60 Scrub-shrub 35 Herbaceous 35 Class 6	1.00	% Cover Overstory  Scrub-shrub  Herbaceous  Class	
V2	Stand Maturity	Cypress % 10 Cypress dbh 6 Tupelo et al. % 90 Tupelo et al dbh 11.6 Basal Area 44	0.87 0.35	Cypress % 20 Cypress dbh 15 Tupelo et al. % 80 Tupelo et al dbh 19.39 Basal Area 106.56	0.99 0.59	Cypress % 0 Cypress dbh 0 Tupelo et al. % 0 Tupelo et al dbh 0 Basal Area 0	0.00 0.00
V3	Water Regime	Flow/Exchange High Flooding Duration Semi-Permanent	0.75	Flow/Exchange High Flooding Duration Semi-Permanent	0.75	Flow/Exchange Flooding Duration	
V4	Mean High Salinity	2.5	0.325	2.5	0.325		
		HSI =	0.56	HSI =	0.68	HSI =	

## WETLAND VALUE ASSESSMENT COMMUNITY MODEL Swamp

Project.....

Project Area.....

7.2

Condition: Future With Project

Variable		TY 0		TY 1		TY 50	
		Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory	
		35		Scrub-shrub		Scrub-shrub	
		50		Herbaceous		Herbaceous	
		70		Class		Class	
		5	0.80	1	0.10	1	0.10
V2	Stand Maturity	Cypress %		Cypress %		Cypress %	
		0		0		0	
		Cypress dbh		Cypress dbh		Cypress dbh	
		0		0		0	
		Tupelo et al. %		Tupelo et al. %		Tupelo et al. %	
		100		0		0	
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		12.8	1.00	0	0.00	0	0.00
		Basal Area		Basal Area		Basal Area	
		25.15	0.20	0	0.00	0	0.00
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange	
		High		None		none	
		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent	0.75	None	0.10	none	0.10
V4	Mean High Salinity		2.5		2.5		2.5
			0.325		0.325		0.325
		HSI =	0.48	HSI =	0.00	HSI =	0.00

Project..... IER 12, 404c Tupelo Swamp  
FWP

Variable		TY		TY		TY	
		Class/Value	SI	Class/Value	SI	Class/Value	SI
V1	Stand Structure	% Cover		% Cover		% Cover	
		Overstory		Overstory		Overstory	
		Scrub-shrub		Scrub-shrub		Scrub-shrub	
		Herbaceous		Herbaceous		Herbaceous	
		Class		Class		Class	
V2	Stand Maturity	Cypress %		Cypress %		Cypress %	
		0		0		0	
		Cypress dbh		Cypress dbh		Cypress dbh	
		0		0		0	
		Tupelo et al. %		Tupelo et al. %		Tupelo et al. %	
		0		0		0	
		Tupelo et al dbh		Tupelo et al dbh		Tupelo et al dbh	
		0		0	0.00	0	0.00
		Basal Area		Basal Area		Basal Area	
		0		0	0.00	0	0.00
V3	Water Regime	Flow/Exchange		Flow/Exchange		Flow/Exchange	
		Moderate		Moderate		Moderate	
		Flooding Duration		Flooding Duration		Flooding Duration	
		Semi-Permanent		Semi-Permanent	0.65	Semi-Permanent	0.65
V4	Mean High Salinity					3.0	0.1
		HSI =		HSI =		HSI =	

