REVISED SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT NUMBER 2 FOR THE ST. JOHNS BAYOU-NEW MADRID FLOODWAY PROJECT

The responsible lead agency is the Memphis District, U.S. Army Corps of Engineers.

ABSTRACT

The Final Revised Supplemental Environmental Impact Statement (2002 RSEIS) of the subject project was completed and filed with the U. S. Environmental Protection Agency on July 19, 2002. Subsequent to that final document filing, Clean Water Act, Section 401 Water Quality (WQ) Certification was received from the Missouri Department of Natural Resources (MDNR) on June 9, 2003, and a Record of Decision (ROD) was signed on August 25, 2003. The decision was to implement the recommended plan as described in the 2002 RSEIS and with additional environmental requirements as stipulated in the WQ Certification. Since the filing and execution of these documents, concerns were raised regarding the project and adequacy of mitigation. As a result, the ROD was withdrawn on June 23, 2005, and a decision was made to prepare this Revised Supplemental Environmental Impact Statement Number 2 (RSEIS 2) to clarify and address issues of concern.

These concerns include but are not limited to consideration of: mitigation requirements for the fishery and waterfowl resources, hypoxia, farmed wetlands (Swampbuster), and the cost-benefit ratio. A list of concerns is provided in Section 1.4.3. This RSEIS 2 addresses these concerns and analyzes additional mitigation techniques that demonstrate that all significant fish and wildlife resources impacted by the flood damage reduction project are compensated.

The entire 2002 RSEIS will not be revisited. The RSEIS 2 will only supplement and re-examine the concerns and issues which have been identified and provide clarification on and correct inconsistencies to the 2002 RSEIS.

There is no change to flood damage reduction features that were recommended in the 2002 RSEIS. Construction of the St. Johns Bayou – New Madrid Floodway project would reduce the duration and frequency of Mississippi River backwater flooding to the New Madrid Floodway and headwater flooding to the St. Johns Bayou Basin. This reduction in flooding decreases the adverse impacts to the area's infrastructure and agriculture. Construction of the project would adversely impact fish and wildlife resources in the project area, primarily due to a reduction in backwater inundation.

This document details changes that have been made to the overall compensatory mitigation strategy that the 2002 RSEIS recommended. The 2002 RSEIS recommended reforestation of frequently flooded cropland as the basic means to compensate for unavoidable impacts to mid-season fish rearing habitat. This document demonstrates that all unavoidable impacts to significant fish and wildlife resources can be compensated by implementing various compensatory mitigation techniques, in addition to reforestation.

Compensatory mitigation entails a basic mitigation feature and a variety of additional mitigation techniques. The basic mitigation feature consists of restoring hydrology to Big Oak Tree State Park, reforesting a minimum of 1,800 acres of cropland surrounding Big Oak Tree State Park, reforesting 1,293 acres of cropland in the St. Johns Basin, reforesting an additional 2,326 acres of cropland in the New Madrid Floodway, constructing modified moist soil units on 765 acres of cropland, restoring vegetated buffer strips along 64 miles of New Madrid Floodway channels, establishing a wildlife corridor that connects Big Oak Tree State Park to the Ten Mile Pond Conservation Area, and constructing 387 acres of borrow pits that are modified to benefit floodplain fish. Additional mitigation techniques that supplement the basic mitigation feature include methods that increase durations of flooding on mitigated tracts of lands during the mid-season fish rearing period, restore/create permanent waterbodies that benefit floodplain fish, and/or create spawning and rearing pools by modifying the gravity outlet structure. It is anticipated that the basic mitigation feature and the additional mitigation techniques would include the acquisition in fee of a minimum of 8,375 acres of real estate.

All aspects of the overall project including flood damage reduction, compensatory mitigation, and project monitoring will be coordinated with the interagency mitigation team. The interagency mitigation team is made up of members from the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (USFWS), Missouri Department of Natural Resources (MDNR), Missouri Department of Conservation (MDC) and the St. Johns Levee and Drainage District. The interagency mitigation team will play a significant role in the acquisition and development of compensatory mitigation lands; the planning, design, and construction of the Big Oak Tree State Park hydrologic restoration; and the development and implementation of project monitoring plans.

Copies of previous National Environmental Policy Act (NEPA) reports are available at the District office and on the Internet at the following address:

http://www.mvm.usace.army.mil/StJohns/default.asp

Comments: Please send your comments to:

District Engineer
U.S. Army Engineer District, Memphis
Attn: Environmental Branch
167 North Main Street, B-202
Memphis, TN 38103-1894

Comments should arrive no later than **May 1, 2006**, or within 30 days following publication of the Notice of Availability in the Federal Register. For further information, please contact Mr. Daniel D. Ward at daniel.d.ward@mvm02.usace.army.mil or (901) 544-0709.

Note: Unless otherwise noted or superseded by the clarification and information provided in this RSEIS 2, all information contained in the September 2000 Final Supplemental Environmental Impact Statement and the July 2002 Final Revised Supplemental Environmental Impact

Statement is incorporated by reference in this Revised Supplemental Environmental Impact Statement 2. In addition, unless otherwise noted, the format of this document will track the format used in the June 2002 RSEIS.

SUMMARY

S.1 MAJOR CHANGES FROM THE 2002 RSEIS

This RSEIS 2 does not make any changes to flood damage reduction features that were recommended during the 2002 RSEIS. Additionally, there are no changes to the description of impacts to fish and wildlife resources from the 2002 RSEIS. This RSEIS 2 does incorporate changes to the overall mitigation strategy that the 2002 RSEIS recommended. These changes include the following:

- Average Daily Flooded Acres (ADFAs) are used in determining compensatory mitigation benefits to mid-season fish rearing habitat. ADFAs were not used in determining mitigation requirements in the 2002 RSEIS.
- Transition periods for reforesting cropland are accounted for in determining compensatory mitigation benefits to mid-season fish rearing habitat. Transition periods were not calculated during the development of the 2002 RSEIS.
- Compensatory mitigation for impacts to mid-season fish rearing habitat do not rely solely on reforestation of frequently flooded agricultural lands. Additional techniques that increase durations of flooding or create permanent waterbodies are analyzed.
- Reforestation techniques depend on site-specific conditions. The 2002 RSEIS recommended reforesting all areas with 70% red oaks.
- The use of batture land as potential mitigation sites is analyzed. Benefits to mid-season fish rearing habitat were not analyzed in the 2002 RSEIS by restoring batture land.
- The mitigation benefits from borrow pit construction are analyzed. Borrow pits were recommended for construction in the 2002 RSEIS. However, potential benefits to mid-season fish rearing habitat were not quantified.

No changes to acreage of wetland impacts have been made in this RSEIS 2. However, a Hydrogeomorphic (HGM) analysis has been conducted to quantify direct impacts to jurisdictional wetlands and indirect impacts to farmed wetlands.

Table S.1 provides a description of project features that were recommended by the 2002 RSEIS and recommendations and considerations made by this RSEIS 2.

Table S.1. Project features recommended by the 2002 RSEIS and this RSEIS 2

Feature	2002 RSEIS	RSEIS 2
Flood Damage Reduction		
Channel Enlargement	4.5 miles St. Johns Bayou	No change
	8.1 miles Setback Levee Ditch	No change
	7.1 miles St. James Ditch	No change
New Madrid Floodway Closure	Located at the 1,500 – foot gap at the lower end of the Floodway	No change

Feature	2002 RSEIS	RSEIS 2
Pumping Stations	St. Johns Bayou - 1,000 cubic feet per second (cfs)	No change
	New Madrid Floodway – 1,500 cfs	No change
Gate Operation	Allow headwater flooding during spring fishery season up to elevation of 282.5 feet National Geodetic Vertical Datum (NGVD) in the St. Johns Basin	No change
	Allow backwater flooding during spring fishery season up to elevation 284.4 feet NGVD in the New Madrid Floodway	No change
Winter Waterfowl	Allow for waterfowl flooding up to 286.0 feet NGVD in the St. Johns Basin	No change
	Allow for waterfowl flooding up to 285.4 feet NGVD in the New Madrid Floodway	No change
Compensatory Mitigation		
In-stream mitigation features	One-sided construction	No change
	Placement of riprap at channel intersections	No change
	Installation of 29 habitat improvement structures	No change
Reforestation	1,317 acres in the St. Johns Basin with 70% red oaks	1,293 acres with species to be determined*
	5,258 acres in the New Madrid Floodway with 70% red oaks	2,326 acres with species to be determined*
	1,800 acres surrounding Big Oak Tree State Park	No change
Moist Soil Units	765 acres	No change
Vegetated Buffer Strips	64 miles of New Madrid Floodway channels	No change
Wildlife Corridor	Connect Big Oak Tree State Park with Ten Mile Pond Conservation Area	No change
Big Oak Tree State Park Hydrologic Restoration	Supply with a source of Mississippi River surface water	No change

Feature	2002 RSEIS	RSEIS 2
Borrow Pits	Not quantified	Construct 387 acres that would benefit floodplain fish
Additional Mitigation Techniques		
Additional reforestation	Not analyzed	Up to 3,000 acres
Increase Flood Durations on Reforested Areas	Not analyzed	Up to 2,326 acres
Creation/Restoration/ Enhancement of Large Waterbodies	Not analyzed	Up to 680 acres
Restoration of Small Waterbodies	Not analyzed	To be determined
Creation of a fish spawning and rearing pool	Not analyzed	Up to 2,000 acres

*To be determined during the formulation of detailed site-specific mitigation plans with input from the interagency mitigation team.

S.2 NEED FOR ACTION

During a State of Missouri WQ Certification Appeals process and a Federal court proceeding, an inconsistency was recognized with regard to the method of calculation of mitigation impacts and credits. The inconsistency is in the form of a transposition of units between an interim step in the impact analysis, and the calculation of mitigation requirements. Specifically, ADFAs were used to quantify impacts to mid-season fish rearing habitat. However, ADFAs were not used in calculating overall mitigation requirements. Additionally, other issues were raised concerning several aspects of the 2002 RSEIS. These concerns are listed in Section 1.4.3. The ROD was withdrawn due to the inconsistency and the additional concerns.

The Corps is committed to fully mitigating the unavoidable significant impacts of the project. This RSEIS 2 clarifies the inconsistency and addresses the issues of concern. The fisheries resource bears the greatest impact, and as such, requires the greatest amount of mitigation. However, more effective techniques for fisheries mitigation are explored in addition to a basic mitigation feature in this RSEIS 2.

S.3 PROJECT OVERVIEW

Construction of the St. Johns Bayou – New Madrid Floodway Project would significantly decrease headwater flooding in the St. Johns Bayou Basin and Mississippi River backwater flooding in the New Madrid Floodway. Agriculture is the primary economic resource within the project and accounts for 86 percent of the total land use in the two basins. The flood of record at the New Madrid gauge occurred in 1937. The most significant flood event since 1937 occurred in 1973, when over 56,500 acres of agricultural land in the New Madrid Floodway were inundated. According to recent data, the 2-year backwater flood occurrence in the New Madrid Floodway inundates 17,316 acres, of which 11,843 acres are agricultural lands. At high Mississippi River stages, the St. Johns Basin control gates are closed to prevent backwater

flooding. However, closing the gates prevents interior drainage and leads to headwater flooding. The 2-year headwater flood event under these circumstances inundates approximately 10,056 acres, of which 6,312 acres are agricultural lands. Construction of the flood damage reduction project would provide an annual benefit of $6,772,000 to the region and nation as well as locally to East Prairie, Pinhook, and other communities.

Unavoidable impacts to fish and wildlife resources would be incurred by the reduction of flooding. Environmental concerns include impacts to the following:

- 102 acres of jurisdictional wetlands due to channel enlargement and levee closure,
- jurisdictional status to up to 520 acres of farmed wetlands due to a decrease in flooding,
- 536 acres of forested areas due to clearing necessary for construction,
- shorebird habitat due to a likely change in agricultural practices,
- waterfowl habitat during February and March in the New Madrid Floodway due to a reduction in flooding,
- in-stream fish habitat due to channel widening, and
- fish spawning and rearing habitat due to a reduction in flooding.

Compensatory mitigation entails a basic mitigation feature and a variety of additional techniques that would fully compensate for all significant impacts to fish and wildlife resources from project construction. The basic mitigation feature includes the following:

- Restore hydrology to Big Oak Tree State Park with Mississippi River surface water. Big Oak Tree State Park is experiencing drier hydrologic conditions due to adjacent facilitated drainage. Restoring hydrology to the park would require construction of culverts through the Mississippi River Mainline Levee System, water control structures at the park, and a canal. This action would restore historic vegetation and prevent additional damages to existing vegetation.
- Reforest 1,293 acres of cropland within the St. Johns Bayou Basin. There are currently 2,210 acres of forested wetlands below an elevation of 300 feet NGVD (300 feet NGVD is the approximate 70-year event) in the St. Johns Bayou Basin. Reforesting 1,293 acres of cropland would increase forested wetlands by 59% in areas below 300 feet NGVD.
- Reforest 4,126 acres of cropland within the New Madrid Floodway, including 1,800 acres of cropland surrounding Big Oak Tree State Park. There are currently 3,854 acres of forested wetlands below an elevation of 300 feet NGVD (300 feet NGVD has been determined to be the upper limit of backwater inundation, which is greater than the 30-year flood event) in the New Madrid Floodway. Reforesting 4,126 acres of cropland would increase forested wetlands by 107% in areas below 300 feet NGVD. Additionally, reforesting 1,800 acres of cropland surrounding Big Oak Tree State Park would triple the size of existing bottomland hardwoods within the park.
- Construct 765 acres of moist soil units. There are currently 1,391 acres of herbaceous wetlands within the St. Johns Bayou Basin and the New Madrid Floodway below an

elevation of 300 feet NGVD. Constructing 765 acres of moist soil units would increase herbaceous wetlands by 55% and moist soil units can be managed to maximize benefits to shorebirds and waterfowl.

- Provide vegetated buffer strips along 64 miles of New Madrid Floodway channels. Intense agricultural production to top bank of existing channels is a common occurrence throughout the New Madrid Floodway. These intense farming practices result in a lack of available habitat for local fish and wildlife populations and decreases in water quality. Decreases in water quality are attributed to increases in suspended sediments and nutrient loads. Providing buffer strips along 64 miles of channels would provide additional fish and wildlife habitat, improve existing runoff water quality, would benefit detrital input (leaves, twigs, branches), and provide shading in the littoral zone of streams and ditches.
- Create a wildlife corridor that connects Big Oak Tree State Park to the Ten Mile Pond Conservation Area. Due to intense farming in the area, local wildlife populations are isolated to relatively small tracts of bottomland hardwoods. There is little to no movement of wildlife between tracts. Creation of a wildlife corridor would connect two of the most significant isolated tracts of forested areas in the New Madrid Floodway. Over time, this action would enhance populations of game animals such as white-tailed deer and wild turkey, as well as populations of migratory songbirds.
- Construct 387 acres of borrow pits that would benefit floodplain fish. There are currently 721 acres of open water habitat below elevation 300 feet NGVD within the St. Johns Bayou Basin and New Madrid Floodway. Constructing 387 acres of borrow pits would result in an increase to open water habitat by 54% and would also provide additional hunting and fishing opportunities to the local area.

The basic mitigation feature fully compensates impacts to all significant resource categories except for impacts to mid-season fish rearing habitat within the New Madrid Floodway. Therefore, additional techniques would be implemented to compensate for the remaining losses. This RSEIS 2 is not recommending one particular technique over another. Additional techniques that supplement the basic mitigation feature are as follows:

- Additional reforestation within the St. Johns Bayou Basin, New Madrid Floodway, or batture areas. This action would provide additional mid-season fish rearing credit by restoring bottomland hardwoods (higher habitat value for fish) on cropland (low habitat value for fish).
- Increase flood durations on reforested areas during the period April 1 to May 15. This action would result in greater benefits to mid-season fish rearing habitat by providing higher habitat due to reforestation and increasing ADFAs.
- Creation, restoration, or enhancement of large waterbodies. This would be accomplished by taking advantage of the numerous opportunities to restore floodplain lakes in the project area. Riley Lake is used as an example throughout this RSEIS 2. Restoring floodplain lakes would benefit mid-season fish rearing habitat by increasing habitat value (large permanent waterbodies offer the highest value to

floodplain fish) and maximizing ADFAs (permanent waterbodies remain inundated during April 1 to May 15 and beyond).

- Restoration of small waterbodies. Small waterbodies would be restored by removing existing drainages and/or plugging existing ditches. This action would benefit mid-season fish rearing habitat by increasing habitat value and maximizing ADFA.
- Creation of a spawning and rearing pool. Modifications could be made to the operation of the outlet gates in the St. Johns Bayou and the New Madrid Floodway to hold water during the period of April 1 to May 15. This action would result in benefits to mid-season fish rearing habitat by increasing habitat value (permanent waterbody) and maximizing ADFAs.

It is anticipated that implementation of the basic mitigation feature and additional techniques that supplement it would entail a minimum of 8,375 acres acquired in fee.

With the exception of the basic mitigation feature, this RSEIS 2 does not recommend one specific technique that compensates for the remaining impacts to mid-season fish rearing habitat. However, this RSEIS 2 evaluates and recommends implementing a whole host of additional mitigation techniques that demonstrate that impacts to significant fish and wildlife resources are fully mitigated and that the project remains economically justified.

Mitigation credits would be calculated during the development of site-specific detailed mitigation plans. These plans would be fully coordinated with the interagency mitigation team (made up of USACE, MDNR, MDC, EPA, and the USFWS), and the local sponsor. Cultural resources surveys would also be conducted on mitigation lands during the development of the site-specific plans. These surveys would be coordinated with the Missouri State Historic Preservation Officer (SHPO) and Federally Recognized Indian Tribes. The mitigation goal would ultimately be reached when habitat values are appropriately replaced, not when a certain quantity of acres is procured and mitigation features implemented. Compensatory mitigation would occur concurrently with construction of flood damage reduction features. The New Madrid portion of the project or the St. Johns Bayou portion of the project shall not be operated until all mitigation lands for the respective portion of the project are acquired and all detailed mitigation plans approved by MDNR. Mitigation sites would be monitored after the project is operating to ensure success. Mitigation would be revised based on monitoring results.

S.4 CONCLUSIONS

Conclusions of this RSEIS 2 are provided in Table S.2.

Table S.2. Conclusions

Topic	Conclusion
National Economic Development (NED)	The 2002 recommended plan is the NED plan.
Section 404 of the Clean Water Act and Section 404 (b)(1) Guidelines	The project has been evaluated in accordance with Section 404 of the Clean Water Act and the Section 404(b)(1) Guidelines. The project is in full compliance.
Section 10 of the Rivers and Harbor Act of 1899	The proposed work would not obstruct navigable waters of the United States. The proposed action has been subject to a public notice, a public hearing, and other evaluations normally conducted for activities subject to the Act. The project is in full compliance.
Section 401 of the Clean Water Act – (Water Quality Certification)	WQ Certification was issued via letter dated June 9, 2003. MDNR updated the WQ Certification via letter dated March 9, 2006 (Appendix G).
Executive Order 11988, Floodplain Management Findings	The proposed project is responsive to the planning objectives and is consistent with the requirements of Executive Order 11988
Executive Order 11990, Protection of Wetlands Findings	Direct impacts to wetlands are avoided and/or minimized and unavoidable impacts to jurisdictional wetland status are compensated.
Cultural Resources	No impacts to cultural resources are anticipated from construction of the flood damage reduction features. Additional cultural resources surveys would be required as compensatory mitigation lands are acquired and developed.
Freshwater Mussels	The Corps will continue to work closely with MDC and the USFWS to determine avoid and minimize measures and long term monitoring of freshwater mussel resources.
Endangered Species	No impacts to Federally endangered or threatened species are anticipated.
Significant Fish and Wildlife Resources	Impacts to significant fish and wildlife resources are fully compensated.
Operation of the New Madrid Floodway	No impacts to the operation of the New Madrid Floodway during major flood events are anticipated.
Food Security Act of 1985 (Swampbuster Provisions)	Construction of the project would not impact eligibility of farmland that is currently enrolled in the farm program. Swampbuster provisions do not impact the overall project economics.

ACRONYMS

2000 FSEIS	September, 2000 Final Supplemental Environmental Impact Statement
2002 RSEIS	June, 2002 Revised Supplemental Environmental Impact Statement
AAHU	Average Annual Habitat Unit
ADFA	Average Daily Flooded Acre
BLH	Bottomland Hardwood
BMP	Best Management Practices
BOD	biological oxygen demand
CA	Conservation Area
CAR	Coordination Act Report (U.S. Fish and Wildlife Service)
CEQ	Council on Environmental Quality
cfs	cubic feet per second
CWA	Clean Water Act
DSEIS	Draft Supplemental Environmental Impact Statement
DUDs	duck-use days
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Orders
EPA	Environmental Protection Agency
ERDC	Engineer Research and Development Center
FCU	Functional Capacity Unit
FCA	Flood Control Act
FSA	Food Security Act
FSEIS	Final Supplemental Environmental Impact Statement
FONSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
GDM	General Design Memorandum
GEC	Gulf Engineers and Consultants, Inc.
GIS	Geographic Information System
HEP	Habitat Evaluation Procedures
HGM	Hydrogeomorphic
HSI	Habitat Suitability Index
HU	Habitat Unit
LIDAR	Light Detection and Ranging
LMRCC	Lower Mississippi River Conservation Committee
LRR	Limited Reevaluation Report
MDC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
MOA	Memorandum of Agreement
MR&T	Mississippi River and Tributaries
MRL	Mississippi River Levees
NAIP	USDA National Agricultural Imagery Program
NED	National Economic Development
NEPA	National Environmental Policy Act

NFSAM	National Food Security Act Manual
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
RGL	Regulatory Guidance Letter
ROD	Record of Decision
ROW	Rights of way
RPM	Root Production Method
RSEIS 2	Revised Supplemental Environmental Impact Statement #2
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Officer
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WAM	Waterfowl Assessment Methodology
WES	Waterways Experiment Station
WRDA	Water Resources Development Act
WQ	Water Quality

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1.0 PURPOSE OF AND NEED FOR ACTION

1.1 Study Purpose

This Revised Supplemental Environmental Impact Statement 2 (RSEIS 2) supplements the June 2002 Final Revised Supplemental Environmental Impact Statement (2002 RSEIS). This RSEIS 2 clarifies, both quantitatively and qualitatively, how the Corps intends to compensate for significant unavoidable impacts to fish and wildlife resources from the construction of the St. Johns Bayou-New Madrid Floodway Project. Additionally, this RSEIS 2 clarifies other issues of concern that are listed in Section 1.4.3.

The 2002 RSEIS recommended reforesting a total of 8,375 acres of cropland to compensate for mid-season fish rearing losses. Reforesting 8,375 acres of cropland would have resulted in the overcompensation to wetlands, terrestrial wildlife, and waterfowl. The 2002 RSEIS also recommended compensating shorebird losses by the construction of 765 acres of moist soil units.

Reforesting 8,375 acres of cropland without additional consideration for flood frequency does not necessarily fully mitigate impacts to mid-season fish rearing habitat due to the difference in flood frequency between the period of analysis calculated using Average Daily Flooded Acres (ADFAs) and the 2-year flood frequency on mitigated tracts of land. This issue is further described in Sections 2.3.3 and 2.3.4. Therefore, this RSEIS 2 analyzes other options that compensate for mid-season fish rearing habitat. These methods include but are not limited to creation or restoration of permanent waterbodies or other methods that increase flood durations on mitigation tracts.

Creation or restoration of permanent waterbodies does not necessarily compensate for impacts to other significant resources (*e.g.*, wetlands, terrestrial wildlife, waterfowl, and shorebirds). Therefore, a basic mitigation feature is proposed that fully mitigates for these significant resources.

The basic mitigation feature would include the acquisition of a minimum of 7,121 actual acres of land from willing sellers through fee title real estate purchases or restrictive real estate easements. It is anticipated that the 7,121 acres would be jurisdictional wetlands following mitigation implementation.

Additionally, the basic mitigation feature includes the construction of 387 acres of modified borrow pits that mitigates losses to mid-season fish rearing habitat. The 2002 RSEIS included costs of borrow pits but did not quantify the potential benefits to mid-season fish rearing habitat. Rationale for why these benefits to the resource were not calculated is provided in Section 2.6.1.7. This RSEIS 2 quantifies these benefits.

The implementation of the basic mitigation feature does not fully mitigate for losses to mid-season fish rearing habitat in the New Madrid Floodway. Therefore, additional techniques are analyzed in this RSEIS 2 that supplement the basic feature and fully

compensate for mid-season fish rearing habitat impacts. It is estimated that these additional techniques would entail additional real property acquisition through fee title for a total of 8,375 acres of land.

All sections of the 2002 RSEIS with the exceptions of compensatory mitigation and updated economics are incorporated in this RSEIS 2 by reference. Therefore, this RSEIS 2 will not address additional/new alternatives relating to the operation and construction of flood damage reduction features in the St. Johns Basin and the New Madrid Floodway project. It has been determined that changes in mitigation would not affect alternative plan selection. This RSEIS 2 shall be limited to aspects of the mitigation planning, clarification to issues of concern, and updates to overall project economics due to the additional compensatory mitigation.

This RSEIS 2, in conjunction with the 2002 RSEIS, shall be the basis for a new Record of Decision (ROD). This future ROD will include or reference additional mitigation measures that were not detailed extensively in the August 25, 2003 ROD, as well as consider the clarifications and additional information provided in the RSEIS 2.

1.2 Authority and Project History

1.2.1 Study Authority

The Flood Control Act of 1954 (FCA 1954) authorized the closure of a 1,500-foot gap and construction of a gated outlet in the Mississippi River levee at the lower end of the New Madrid Floodway. The Water Resources Development Act of 1986 (WRDA 1986) authorized channel modifications and pumping stations for the St. Johns Bayou Basin and the New Madrid Floodway.

The First Phase of the St. Johns Bayou and New Madrid Floodway Project (Alternative 2, Authorized Project, 2002 RSEIS) includes channel enlargement and improvement in the St. Johns Bayou Basin along the lower 4.5 miles of St. Johns Bayou, then continuing 8.1 miles along the Birds Point New Madrid Setback Levee Ditch and ending with 10.8 miles along the St. James Ditch. The St. James Ditch work was reduced in the 2002 RSEIS to 7.1 miles due to presence of the golden topminnow in the upper reach of the ditch. The first item of work, consisting of selective clearing and snagging, has already been completed along a 4.3-mile reach of the Setback Levee Ditch beginning at the confluence with St. James Ditch. The impacts of this particular item of work were evaluated in the Limited Reevaluation Report (LRR) and Finding of No Significant Impact (FONSI)/Environmental Assessment (EA) completed in 1997.

The Authorized Project also includes a 1,000 cubic feet per second (cfs) pumping station that would be located a few hundred feet east of the existing gravity outlet at the lower end of St. Johns Bayou. The 1,500-foot gap in the Mississippi River levee at the lower end of the New Madrid Floodway would be closed. A 1,500 cfs pumping station and gravity outlet structure would be built in the levee closure at the lower end of the New Madrid Floodway. The channel enlargement work and both pumping stations are

features of the St. Johns Bayou and New Madrid Floodway Project, and the levee closure is a Mississippi River Levees Project feature.

1.2.2 Project History

A final Environmental Impact Statement (EIS), entitled *Mississippi Rivers and Tributaries, Mississippi River Levees (MRL) and Channel Improvement*, was prepared by the U.S. Army Corps of Engineers (USACE), Vicksburg District, in February 1976. This document was filed with the Council on Environmental Quality (CEQ) in April 1976. A final EIS, entitled *St. Johns Bayou/New Madrid Floodway Project Final Supplemental Environmental Impact Statement,* was filed in 1982. A Draft Supplemental Environmental Impact Statement (DSEIS) was prepared to supplement both of these previous documents. The DSEIS was submitted for public review and comment in April 1999. The Final Supplemental Environmental Impact Statement (2000 FSEIS) was filed in September 2000.

The 2002 RSEIS documented the formulation and evaluation of additional alternatives to address concerns expressed by various resource agencies and environmental advocacy groups. The 2002 RSEIS included alternative levee closure locations for the New Madrid Floodway; an array of pump and gate operation alternatives that increase connectivity of the floodway with the Mississippi River to minimize impacts to fish habitat; significant avoid and minimize measures to benefit fish and wildlife resources; and mitigation measures that compensate for unavoidable impacts to wildlife habitat (bottomland hardwoods and agricultural areas), shorebird habitat, waterfowl habitat during February – March, and mid-season (April 1 to May 15) fish rearing habitat. The final 2002 RSEIS was filed in August 2002.

The mitigation plans described in the 2000 SEIS and the 2002 RSEIS were developed to compensate for impacts to mid-season fish rearing habitat, the resource assessed to experience the largest impact due to project implementation. Fish spawning habitat was originally assessed as the basis for mitigation. Total mitigation, based on fish spawning habitat, would have required reforestation of 3,300 acres. However, during negotiations between the USFWS and the Corps, an agreement was made to mitigate for mid-season fish rearing acres rather than spawning acres, which resulted in almost tripling mitigation requirements. Since that agreement, the mitigation for mid-season fish rearing habitat has served as the basis for all fishery impact calculations. The result of these calculations was the plan described in the 2002 RSEIS.

The 2002 RSEIS expressed the Corps' analysis of unavoidable impacts to mid-season fish rearing habitat in Habitat Units (HUs). In the 2002 RSEIS, those HUs were used to calculate the required acres of compensatory mitigation. The compensatory approach set out in the 2002 RSEIS was reforestation of frequently flooded agricultural areas. Therefore, the 2002 RSEIS stated that reforestation of 8,375 frequently flooded acres (1,317 acres in the St. Johns Bayou Basin and 7,058 in the New Madrid Floodway) would mitigate for the unavoidable impacts to 4,213 mid-season fish rearing HUs (1,884 HUs in the St. Johns Basin and 2,329 HUs in the New Madrid Floodway). Impacts were

calculated based upon HUs, which is the product of habitat suitability and ADFAs, while mitigation was expressed in terms of frequently flooded acres and habitat suitability. This inconsistency was recognized subsequent to the execution of August 25, 2003, ROD.

MDNR issued (Water Quality) WQ Certification on June 9, 2003, with the Settlement Agreement and Memorandum of Understanding for the Protection of Big Oak Tree State Park. This WQ Certification was appealed shortly thereafter. As outlined in the 2002 RSEIS, and consistent with the WQ Certification, an interagency mitigation team was formed to discuss potential mitigation tracts of land that could be used to compensate unavoidable impacts to fish and wildlife resources. The interagency team was made up of representatives from the Memphis District, Engineer Research and Development Center (ERDC), USFWS, MDC, MDNR, and local interests. The first three tracts of land, totaling 1,657 acres, were purchased on July 28, 2004.

Concerns have been expressed and legal challenges were filed over the amount of mitigation acreage required in terms of ADFAs. An inconsistency was identified among the ROD, the WQ Certification, and the Administrative Record. The ROD was withdrawn on June 23, 2005.

1.3 Decisions Needed

This RSEIS 2 serves to clarify the acreage and types of compensatory mitigation required in terms of HU and ADFA equivalents. The purpose is not to re-evaluate the calculation of the impacts for the fishery resource. In fact, the calculation of impacts to this resource was stipulated as being appropriate during the Missouri State Water Quality Appeal Hearing in December 2003. This RSEIS 2 also clarifies and further details certain assumptions related to the impact analyses, such as the use of the 2-year floodplain. Mitigation features that were not fully developed and quantified in the 2002 RSEIS are developed and quantified, ensuring that both compensatory mitigation requirements for the unavoidable impacts to fishery resource are met, as well as unavoidable impacts to other resources, including wetlands, wildlife, shorebird, waterfowl, and mid-season fish rearing. Finally, all issues listed in Section 1.4.3 of this RSEIS 2 are addressed.

The decision to sign a new ROD for this project will be based on the evaluation of compensatory mitigation features, and an evaluation of the probable impact, including cumulative impacts, of the activities on the public interest. That decision would reflect the national concern for both protection and utilization of important resources. The potential benefits of the activity must be balanced against its reasonably foreseeable detriments. The ROD will consider all reasonably foreseeable direct, indirect, and cumulative effects of the activity discussed in this RSEIS 2 and/or elsewhere in earlier National Environmental Policy Act (NEPA) documents for this project.

1.4 Scoping Process

The scoping process for this RSEIS 2 included filing a Notice of Intent in the Federal Register; preparing and sending scoping letters to applicable resource and regulatory agencies, government officials, Federally Recognized Indian Tribes, non-governmental organizations, and the general public; and interagency meetings, teleconferences, and correspondence. A summary of the scoping process is found in Appendix B.

1.4.1 Notice of Intent

A Notice of Intent to Prepare the RSEIS 2 appeared in the Federal Register on July 22, 2005. The purpose of this notice was to inform project stakeholders of the intent to prepare supplemental NEPA documentation to clarify the record and address concerns that have developed since the signing of the ROD.

1.4.2 Interagency Meetings

An interagency meeting was held on July 15, 2005, to discuss remaining environmental concerns. Resource agencies in attendance included, the Memphis District, USFWS, MDC, and MDNR.

Additional interagency meetings, teleconferences, and correspondence were made throughout the formulation of this RSEIS 2.

1.4.3 Relevant Environmental Issues

Table 1.1 provides the relevant environmental issues that have been expressed since the signing of the ROD and the sections(s) of this RSEIS 2 where a discussion can be found.

Table 1.1. Environmental Issues and References

Issue	Section(s)
Calculation of compensatory mitigation	2.3.4
Calculation of mitigation credit	2.6.1
Mid-season fish rearing HUs and how they relate to ADFAs	2.3.3, 2.3.4 & 4.3.1
Hypoxia/Water quality	4.2.2, 5.3
Fish passage through culverts and timing access requirements	4.3.2.1
3 – 5 year floodplain impact analysis	4.3.1.1
Bottomland Hardwoods and 70% survivorship of red oaks on mitigated tracts	2.3.3, 2.6.1.1 & 5.5.2
Waterfowl benefits for diving versus dabbling ducks	4.3.4
Waterfowl units	4.3.4
Shorebird units	2.6.1.2
Selection of mitigation tracts	6.2
Monitoring of mitigation tracts	6.5

Issue	Section(s)
Long term management of mitigation tracts	6.6
Additional mitigation techniques that compensate for mid-season fish rearing habitat impacts	2.6.2
Project benefit to cost ratio	5.8
Interest rates	4.4.2
Cost sharing provisions	4.4.1
Farmed wetlands and 'Swampbuster' provisions	4.4.3 & 4.5.1
Transition period when calculating benefits of reforesting agricultural lands	2.3.2
Appropriate use of the Mississippi River batture as mitigation lands	4.3.2.3

1.4.4 Draft Revised Supplemental Environmental Impact Statement 2

Federal, state, and local resource agencies; elected officials; Federally recognized Indian Tribes; non-governmental organizations; the general public; and any other interested parties were invited to review and comment on the Draft RSEIS 2. The public review period of the draft document provided an opportunity to determine if the issues that have been raised since the completion of the 2002 ROD had been adequately addressed. The public review period also invited comments on any aspect of the process.

1.4.5 Final Revised Supplemental Environmental Impact Statement 2

This Final RSEIS 2 responds to comments that were raised during the public review of the Draft RSEIS 2. This document discusses any responsible opposing views that were not adequately addressed in the draft statement or earlier NEPA documents for this project. A copy of the comments and the Corps' response is provided in Appendix F.

1.4.6 Mitigation Purchased to Date

To date, the Corps has acquired 1,657 acres of land for mitigation purposes from willing sellers. With the exception of the Bogle Woods tract, acquired lands are remaining in agriculture production to control black willow and other invasive species.

1.4.7 New Record of Decision

A concise public Record of Decision will be prepared following the issuance of this final RSEIS 2. If the decision is to proceed with the project, the new ROD will prescribe a recommended plan for the flood control project as well as the recommended mitigation plan. The recommended mitigation plan will be adaptable and maintain flexibility to ensure that all unavoidable impacts to significant fish and wildlife resources are compensated to the extent justified. The new ROD will be based on this RSEIS 2, the 2002 RSEIS, the WQ Certification, and any other documents pertinent to this action.

2.0 OPTIONS CONSIDERED

2.1 Introduction

This RSEIS 2 does not reexamine the flood damage reduction features outlined in the 2002 RSEIS, except where additional compensatory mitigation affects the overall economics of the project or minimizes the overall impacts of the flood damage reduction features. No additional flood damage reduction alternatives are analyzed for the St. Johns Bayou Basin or the New Madrid Floodway. Changes in mitigation features would not affect alternative flood damage reduction project selection except the overall benefit to cost ratio of the project. In addition to clarifying the inconsistency concerning the required amount of mitigation and the other issues listed in Section 1.4.3, this RSEIS 2 will also address mitigation techniques that could be used to compensate for the unavoidable impacts to fish and wildlife resources and examines the restoration of Big Oak Tree State Park.

Corps mitigation policy is to ensure that significant impacts to fish and wildlife resources have been avoided or minimized to the extent practical, and that remaining unavoidable significant impacts have been compensated to the extent justified by incorporating reasonable measures. One goal of mitigation is to compensate for unavoidable impacts to significant fish and wildlife resources from project construction. The planning objectives to accomplish this goal are as follows:

- Ensure "no-net-loss" of jurisdictional wetlands that may be impacted by backwater flooding
- Offset 100 percent of the terrestrial wildlife Average Annual Habitat Units (AAHUs) lost
- Offset 100 percent of the shorebird AAHUs impacted
- Offset 100 percent of the waterfowl Duck-Use Days (DUDs) impacted during spring migration
- Offset 100 percent of the mid-season fish rearing habitat impacted (ADFA equivalent)
- Compensate for as many resource categories as possible on acquired mitigation lands

Reforestation of frequently flooded cropland was selected as the recommended mitigation strategy to compensate for multiple resources during the 2002 RSEIS. Impacts to mid-season fish rearing habitat would require the greatest amount of reforestation acreage. With the exception of shorebirds, all other resource categories would be compensated by reforesting 8,375 acres. Impacts to shorebird habitat would be mitigated by flooding 765 acres of herbaceous wetlands. Most resource categories would be overcompensated. This RSEIS 2 has analyzed different mitigation techniques, in addition to reforestation, to compensate impacts to mid-season fish rearing habitat. Permanent waterbody creation/enhancement or methods that increase durations of flooding offer the highest habitat value to the mid-season fish rearing resource. When ADFAs are factored and compared to reforestation that was calculated in the 2002 RSEIS, creation or

enhancement of permanent waterbodies would reduce the overall actual acres of mitigation required to compensate for mid-season fish rearing habitat because permanent waterbodies are of a higher habitat value than bottomland hardwoods due to a higher HSI value. Permanent waterbodies remain flooded for the entire mid-season fish rearing period, providing maximum ADFAs.

Creation or enhancement of permanent waterbodies does not necessarily compensate for the other resource categories. Therefore, to ensure that these resource categories are compensated, a basic mitigation feature is proposed. The basic mitigation feature would include bottomland hardwood restoration, creation of herbaceous wetlands (shorebird areas), creation of vegetated buffer strips, creation of a wildlife corridor, and construction of borrow pits. The basic mitigation feature compensates for all resource categories except for mid-season fish rearing habitat losses in the New Madrid Floodway. Additional mitigation techniques are proposed that would supplement the basic mitigation feature and fully compensate for mid-season fish rearing habitat in the New Madrid Floodway.

Impacts from project construction are analyzed in detail in Section 5 of the 2002 RSEIS. The following paragraphs summarize the impacts and mitigation recommendations that were made during the formulation of the 2002 RSEIS.

2.1.1 Wetlands

Permanent direct impacts to wetlands are discussed in Section 5.3 of the 2002 RSEIS and Section 4.2.1 of this RSEIS 2. The 2002 RSEIS did not specifically recommend any type of wetland mitigation because compensating for mid-season fish rearing habitat would overcompensate all direct, indirect, and potential impacts to jurisdictional wetlands and farmed wetlands. Temporary impacts to forested wetlands were quantified as impacts to terrestrial wildlife.

No additional forested wetland determinations were made for the purpose of this RSEIS 2. However, the Natural Resources Conservation Service (NRCS) updated farmed wetland determinations. Additionally, a Hydogeomorphic (HGM) approach was used to quantify direct impacts to forested wetlands and indirect impacts to farmed wetlands from the construction of the project. Construction of flood damage reduction features would permanently impact jurisdictional status on 92 acres of forested wetlands at a total functional value of 622 Functional Capacity Units (FCU) *[based on the cumulative losses to the seven functional categories presented in Table 4, Appendix D]*. Additionally, 10 acres of farmed wetlands would be directly impacted and up to 520 acres of farmed wetlands would be indirectly impacted at a total functional value of 342 FCU [*based on the cumulative losses of 530 acres to the seven functional categories presented in Table 3, Appendix D*]. The basic mitigation feature would mitigate the total wetland impact functional losses of 964 FCUs. The acquisition of 7,121 acres and implementation of mitigation listed in Table 5.2 provide more than 28,000 FCUs, indicating overcompensation for all seven functional categories. Mitigation would include planting

appropriate vegetation, constructing microtopography, and restoring hydrology to the extent practical.

Following a thorough review of soil surveys, Mississippi River seepage information, and precipitation data, a determination has been made that the project would not induce clearing to forested wetlands due to a reduction of hydrology. These areas would retain jurisdictional status due to factors other than backwater flooding. Therefore, these areas would be regulated under the Clean Water Act and any permitted clearing would be subject to compensatory mitigation. As stated in the WQ Certification, jurisdictional forested wetlands below an elevation of 300 feet NGVD would be monitored.

During the formulation of the 2002 RSEIS, the Corps stated that the project would reduce backwater flooding on 6,713 acres of agricultural lands that had the potential to be classified as farmed wetlands. Using the NRCS estimate of 0.4% farmed wetlands; the Corps computed 520 farmed wetland acres (Section 4.2.1.2). Regarding the use of 530 acres of farmed wetlands for impact calculations, 10 acres of direct impact to farmed wetlands may be included in the 520 farmed wetland acres, but the Corps is counting them separately since the NRCS has not provided certified determinations on this land. The remainder of the 6,713 acres of agricultural lands is mostly prior converted cropland. Based upon the functional category with the highest mitigation ratio (Appendix D, Table 2 - removal of compounds and elements, 1.53:1 for farmed wetlands and 2.9:1 for forested wetlands), all impacts to forested and farmed wetlands could be mitigated by restoring wetlands on 1,078 acres of cropland. However, direct impacts to wetlands would be mitigated at a ratio of 4 acres of mitigation to every acre of impact (4:1) and indirect impacts to agricultural lands, regardless of jurisdictional status, would be mitigated at a ratio of 1:1. Therefore, 7,121 acres of mitigation would be required.

2.1.2 Terrestrial Wildlife

A discussion of the Habitat Evaluation Procedures (HEP) methodology that was used to quantify impacts to terrestrial wildlife resources is found in Section 5.4 of the 2002 RSEIS, Appendix C of the USFWS Coordination Act Report (CAR) (2000), and Section 4.3.3 of this RSEIS 2. Construction of flood damage reduction features in the St. Johns Bayou Basin would directly impact 536 acres of forested areas at a habitat value of 1,993 AAHUs. Closure of the New Madrid Floodway would directly impact seven acres of forested areas at a habitat value of 66 AAHUs. Impacts are attributed to clearing vegetation in project rights of way (ROW).

The 2002 RSEIS recommended three potential methods of reforestation to mitigate for terrestrial impacts. Planting acorns, seedlings, or root production method (RPM) trees would yield an increase of 133.17, 116.73, or 197.26 terrestrial wildlife AAHUs per 100 acres, respectively.

Concerns have been raised regarding the potential indirect impact to forested areas that may be cleared due to the construction of the flood damage reduction project. As previously stated, the Corps maintains that these forested areas are jurisdictional wetlands

and these areas would retain jurisdictional status following completion of the project. Further discussion is found in Section 4.2.1.3.

2.1.3 Shorebird Habitat

An interagency team developed a HEP model to analyze impacts to shorebirds in the project area. A description of the impacts to shorebird habitat is found in section 5.4 of the 2002 RSEIS and Appendix D of the USFWS CAR (2000). Constructing flood damage reduction features in the St. Johns Bayou Basin would impact a total of 761.2 shorebird AAHUs. Recommended mitigation includes flooding 1,523 acres of cropland that is shallowly flooded at a depth less than or equal to 18 inches during April and May or 765 acres of herbaceous areas (moist soil areas).

2.1.4 Waterfowl Habitat

The Waterfowl Assessment Methodology (WAM) developed by the USFWS and the National Biological Service was used to quantify waterfowl impacts associated with the project. A description of the impacts to waterfowl resources is found in Section 5.5 of the 2002 RSEIS, Appendix B of the USFWS CAR (2000), and Sections 3.3.2 and 4.3.4 of this RSEIS 2. Constructing the flood damage reduction project would result in an increase of 545,856 and 53,374 DUDs in the St. Johns Bayou Basin and New Madrid Floodway, respectively. However, there would be a decrease in waterfowl habitat of 204,039 DUDs during February and March in the New Madrid Floodway. There are a variety of methods that compensate for the impacts to waterfowl during February and March. These methods include but are not limited to flooding fallow fields/moist soil units, flooding agricultural fields (corn, soybeans), or replanting bottomland hardwoods on cropland with a variety of red oaks.

2.1.5 Fisheries

Impacts to fisheries are found in Section 5.6 and Appendix G (Killgore and Hoover, 2001) of the 2002 RSEIS, Appendix E of the USFWS CAR (2000), and Section 4.3.1 of this RSEIS 2. The HEP was used to quantify impacts to fisheries. Constructing flood damage reduction features in the St. Johns Bayou Basin and closure of the New Madrid Floodway would impact 145 HUs of riverine habitat (in-stream habitat due to channel modifications) and 4,213 HUs of floodplain habitat (reduction in floodplain habitat that is utilized for spawning and rearing).

Mitigation measures that compensate for losses to riverine habitat remain unchanged from what was discussed in Sections 6.1.3 and Section 9.1 (3) of Appendix L of the 2002 RSEIS. In-stream impacts would be mitigated by the avoidance of channel work where the state endangered golden topminnow exists, reducing channel enlargement bottom widths to as much as 60% of what was originally authorized, reducing channel enlargement reaches to less than 20% of the 144 miles that were originally authorized, avoidance of bottomland hardwoods within the ROW (66 acres) by conducting work on one side, placement of riprap at channel intersections, installation of in-stream habitat

improvement structures, and the avoidance of a 9-foot strip along the right descending bank in the Setback Levee Ditch.

Construction of the flood damage reduction project would result in the greatest impact to mid-season fish rearing habitat. Therefore, the 2002 RSEIS recommended reforesting 8,375 acres of frequently flooded cropland as mitigation for the unavoidable impacts to floodplain habitat.

2.2 Summary of the 2002 RSEIS Mitigation Methodology

The overall strategy recommended in the 2002 RSEIS to compensate for unavoidable impacts to fish and wildlife resources was reforestation of frequently flooded agricultural areas. This would have been accomplished by the acquisition in fee or in easement of a total of 9,140 acres of land for mitigation. Compensatory mitigation for unavoidable environmental impacts would have been accomplished by reforestation of approximately 8,375 acres, acquired in fee, with 1,317 acres (Section 6.1, 2002 RSEIS) required for St. Johns Bayou Basin impacts and 7,058 acres (Section 6.2, 2002 RSEIS) required for New Madrid Floodway impacts. The ROD stated that the primary goal for this alternative was the reforestation of frequently flooded cleared lands with bottomland hardwoods. Most of the compensation would involve planting prior converted croplands with bottomland hardwoods. Therefore, mitigation activities would have resulted in a net gain to jurisdictional wetlands and taken a significant amount of cropland out of production. The creation of bottomland hardwoods would also have offset the potential project impacts to farmed wetlands. Mitigation lands would have been obtained from willing sellers as described in Appendix L of the 2002 RSEIS. Frequently flooded lands are the most desirable lands to provide this compensation and would be the focus of the mitigation lands acquisition efforts. Other desirable mitigation lands that are not within the 2-year floodplain would have been pursued for acquisition, in particular, portions of the approximate 1,800 acres immediately surrounding Big Oak Tree State Park. Resource agencies may also desire acquisition of lands adjacent to Ten Mile Pond Conservation Area (CA) or other areas where connectivity to the Mississippi River may be limited, but overall enhancement for fish and wildlife resources could have been achieved.

Following the 2002 RSEIS methodology, reforestation of frequently flooded agricultural lands would have been accomplished by planting high habitat valued tree species in a mix of 85% acorns and 15% RPM trees. Actual species of trees to be planted would have depended on site-specific land use, soils, and post-project hydrology. Acorns would have been hand or machine planted at a rate of 1,200 acorns/acre in rows to allow two seasons of mowing. Additionally, 15% of the area would have been planted utilizing RPM trees. At each site planted, there would have been a minimum of four tree species planted, none of which would exceed 30% of the total. Plantings would have been monitored to ensure a 70% survival of planted species after five years. Replanting would have occurred as needed. Potential species would have included but were not limited to the following:

Cherrybark Oak	Overcup Oak	Sugarberry
Cypress	Pecan	Tupelo
Green Ash	Pin Oak	Water Oak
Hackberry	Southern Red Oak	Willow Oak
Nuttall Oak		

In addition to the acquisition of 8,375 acres, the 2002 RSEIS recommended the acquisition of restrictive real estate easements or fee acquisition of 765 acres of herbaceous lands that could be managed to benefit shorebirds. The flooding of 765 acres of herbaceous wetlands (*i.e.,* moist soil units) would have fully mitigated unavoidable impacts to shorebirds per the USFWS CAR (2000).

The 2002 RSEIS incorporated vegetated buffer strips along 64 miles (671 acres) of New Madrid Floodway channels. Buffer strips would have been planted along various large, medium, and small channels throughout the Floodway. Another feature incorporated into the 2002 RSEIS was the establishment of a 300-foot (per side) riparian corridor between Big Oak Tree State Park and Ten Mile Pond CA (266 acres). The total area that would have been reforested with these two features was approximately 937 acres.

Mitigation measures were to be implemented prior to and concurrent with construction in accordance with Section 906 of the WRDA of 1986 (Public Law 99-662) as referenced in Section 6.3 of the 2002 RSEIS. Neither the New Madrid portion of the project nor the St. Johns Bayou Basin portion of the project would have been operated until all mitigation lands for each respective portion of the project were acquired and MDNR, MDC, and the USFWS had an opportunity to review their suitability.

Detailed mitigation plans would have been submitted for each tract of land purchased for mitigation. Prior to and/or concurrent with construction of the recommended plan, the Corps, in coordination with appropriate Federal and Missouri resource agencies and the local sponsor, would have prepared these detailed mitigation plans to address site-specific implementation details. The participating agencies would include MDC, MDNR, and the USFWS, as well as the local sponsor.

To assure and document the effectiveness of the mitigation, the Corps would have developed and implemented a monitoring plan as stated in the 2002 RSEIS (Appendix L, Section 11.1.2). As appropriate, adaptive adjustments to the mitigation measures would have been made, if necessary, based on results of these monitoring efforts. However, these adaptive adjustments would not have applied to the outlet gates or pumping stations at either the New Madrid Floodway or the St. Johns Pump Stations unless such adjustments could have been made without incurring additional impacts in the project area and without increased costs for project operation and maintenance.

A plan to monitor the effects of project implementation on existing jurisdictional wetlands and waterway biological communities also would have been developed. This is a requirement of the WQ Certification and is separate from mitigation monitoring. The wetland monitoring plan would continue for five years after project operation begins. If

it were determined that project implementation impacted jurisdictional wetlands beyond that described in the 2002 RSEIS, the Corps would have made every effort to mitigate or otherwise ameliorate those impacts.

In addition to acquiring a portion of the mitigation lands in the vicinity of Big Oak Tree State Park, water supply would have been made available from the Mississippi River and water level management capability would be provided to the park complex. These measures are detailed in the June 9, 2003, Memorandum of Understanding between MDNR and the Corps for the Protection of Big Oak Tree State Park. This plan would have increased the size of and management opportunities for Big Oak Tree State Park. This plan would have been developed in coordination with MDNR, and the specific details would, at a minimum, have included a mechanism to supply the park with a supplemental source of surface water, control structures, and berms.

The 2002 RSEIS recommended mitigation would have fully mitigated for the unavoidable impacts to wildlife, waterfowl, and shorebird resources from project construction. Additionally, the 2002 RSEIS recommended mitigation would have fully mitigated for impacts to jurisdictional wetlands and the potential impacts to farmed wetlands that are currently classified as prior converted cropland. However, the 2002 RSEIS recommended mitigation may not have compensated for all impacts to mid-season fish rearing habitat. Therefore, additional methods are needed to offset the impacts to mid-season fish rearing habitat.

2.3 Quantification of Mid-Season Fish Rearing Benefits from Mitigation Measures

The HEP was used to quantify impacts to mid-season fish rearing habitat. Appendix G of the 2002 RSEIS and Section 4.3.1 of this RSEIS 2 provide a discussion of the HEP procedures and quantifies impacts of the flood damage reduction project. For the purpose of this RSEIS 2, expected benefits to mid-season fish rearing habitat from mitigation measures are also calculated by the same HEP methodology that was used to describe impacts. However, to accurately quantify mitigation measures, methodologies were slightly modified from what was developed during the 2002 RSEIS. The modifications that were made include the following:

- Utilizing other mitigation techniques, in addition to reforestation
- Transition periods for bottomland hardwoods
- Average daily flooded acres

The following paragraphs provide a summary on the techniques used to quantify benefits to mid-season fish rearing habitat from mitigation measures.

2.3.1 Other Mitigation Techniques, in Addition to Reforestation

Reforestation of agricultural areas was selected as the overall compensatory mitigation strategy in previous NEPA documents. One major difference between this RSEIS 2 and

the previous NEPA documents is that additional mitigation techniques are being analyzed in addition to reforestation. Benefits to mid-season fish rearing habitat can be achieved by converting existing habitat to a higher-valued habitat (*e.g.,* agriculture to bottomland hardwoods, agriculture to permanent waterbody). The difference in habitat value is reflected in the HSI values.

2.3.2 Transition Period

As previously stated, mitigation measures usually involve the alteration of one habitat type to a different habitat type that is of higher value to the resource. This is reflected in the different Habitat Suitability Index (HSI) values for each respective habitat type. For instance, bottomland hardwoods are of higher HSI value for selected floodplain fishes as compared to cropland. The 2002 RSEIS did not account for the transition period needed to change from one habitat type to another for mitigation purposes. However, this RSEIS 2 accounts for this transition period.

The HEP methodology usually involves calculating transition periods over the life of the project to account for growth and other factors that provide gains to habitat suitability. The 2002 RSEIS did not account for this growth period. It would take many years for reforested bottomland hardwoods to grow to a point that they reach maximum benefit for floodplain fishes (bottomland hardwoods HSI value). Bottomland hardwoods provide additional cover (trunk, leaves, twigs, etc.) to rearing fishes that are not found in agricultural and fallow areas. Forest maturation is not a necessary precursor for the provision of some benefits for floodplain fishes. Transition periods were broken into two different types of bottomland hardwood reforestation (*i.e.,* fast growing species and slow growing species).

Black willow and cottonwood are representative of fast growing species. The Corps estimated that it would take 10 years to achieve the maximum benefit for floodplain fishes from planting fast growing species on agricultural areas.

Bald cypress and red oaks are representative of slow growing species. The Corps estimated that it would take 20 years to achieve maximum benefit for floodplain fishes from planting slow growing species on agricultural areas. Results from the WAM and the terrestrial HEP indicate that red oaks provide the greatest benefits to waterfowl and terrestrial wildlife.

Impacts from construction and gains from compensatory mitigation were calculated as HUs, but the 2002 RSEIS did not account for transition periods. However, this RSEIS 2 accounts for the transition period. By utilizing the HEP methodology (USFWS, 1980), HUs are annualized over the 50-year project life. Therefore, for the purpose of this RSEIS 2, impacts and gains to mid-season fish rearing habitat are now expressed as AAHUs.

HEP requires assumptions about future without project conditions to annualize habitat over the life of the project. These assumptions include the amount of habitat (acreage)

and the quality of habitat (HSI). Habitat unit gains and losses are annualized by summing HUs across all years in the period of analysis and dividing the cumulative HUs by the number of years in the life of the project. No major change to land use acreage and value is expected under future without project conditions (see Sections 5.2.1, 5.3.1, 5.4.1, 5.5.1, and 5.6.1 of the 2002 RSEIS). Therefore, the values of the projected impacts of the flood damage reduction project are the same after annualization (*i.e.,* 1,884 and 2,329 AAHUs in the St. Johns Bayou Basin and the New Madrid Floodway, respectively).

Additionally, there is no transition period from converting agricultural areas to fallow and any habitat type to large or small waterbodies because the change in habitat would be immediate. The only transition periods necessary to calculate are the conversion of agricultural areas and/or fallow areas to bottomland hardwoods. Transition calculations are available in Appendix C of this RSEIS 2.

In summary the 2002 RSEIS did not account for the transition period that it would take bottomland hardwoods to grow. The 2002 RSEIS concluded that reforestation of frequently flooded cropland would yield 1.43 HUs and 0.33 HUs per ADFA in the St. Johns Bayou Basin and the New Madrid Floodway, respectively. However, gains to mid-season fish rearing habitat from reforestation are of lesser value when transition periods are accounted for. This RSEIS 2 concludes that reforesting agricultural areas with 20-year transition species would yield 1.21 and 0.27 AAHUs per ADFA in the St. Johns Bayou Basin and the New Madrid Floodway, respectively. Reforesting areas within batture area or the New Madrid Floodway with 10-year transition species would yield 0.30 AAHUs per ADFA.

2.3.3 Average Daily Flooded Acres

Area of impacts to mid-season fish rearing habitat from project construction was expressed in terms of ADFA. Therefore, area of mitigation lands for mid-season fish rearing habitat must also be expressed in terms of ADFA. A description of ADFAs is found in Section 4.3.1.1 of this RSEIS 2.

Since mitigation lands may not be flooded continuously during the mid-season period, a duration correction factor must be used to determine the fraction of AAHUs gained relative to ADFA. For example, if reforestation were selected as the compensatory mitigation technique and continuous duration of flooding on a particular tract of land is 15 days (33% of the 45 days during the mid- season period), then the HUs calculated would be equivalent to 0.33 (duration) multiplied by acreage (area) multiplied by HSI (value). Actual duration will vary depending on site-specific hydrologic conditions. By way of contrast, mitigating with permanent waterbodies will usually provide 1 ADFA times the permanent waterbody HSI gained for every acre of mitigation, since lands are inundated throughout the April 1 to May 15 timeframe (*i.e.*, duration equals 100%).

Comments received by the Corps since the 2002 RSEIS express the opinion that the proposed reforested mitigation tracts will generally be flooded only about a third (33%) of the mid-season period, or for 15 days. However, it is clear that site-specific analyses

once tracts are acquired and on-site mitigation techniques are employed are needed to determine actual inundation duration. However, if that general assumption of 33% duration were used for planning purposes and mitigation was based solely on reforestation, three times the amount of mitigation proposed in the 2002 RSEIS would be required, plus the additional mitigation necessary to account for the transition period.

Reforesting cropland with bottomland hardwoods, in particular with 70% red oaks, is not always feasible if the land is flooded for long periods during the growing season. The flooding could cause excessive mortality of the trees. Tree species for specific mitigation sites would be selected during the development of site-specific mitigation plans with input from the interagency mitigation team.

2.3.4 Compensatory Mitigation Calculation

Determining unavoidable fish and wildlife habitat impacts is based on HUs, as originally calculated in the 2002 RSEIS, and refined to AAHUs in this RSEIS 2. The goal of HEP is to determine the functional value of landscapes expressed as AAHUs. Impacts and mitigation are enumerated as AAHUs, and the difference between pre- and post-project AAHUs is defined as the impact of the project. Therefore, mitigation must compensate for lost AAHUs, and the amount of mitigation required to fully compensate impacts depends on the techniques used and their associated habitat value (*i.e.*, HSI value) in the mitigation plan. AAHUs, not ADFAs, are the key unit used to determine mitigation requirements. Benefits to mid-season fish rearing habitat from mitigation measures would be calculated by the following equations:

Habitat Gains = AAHUs per tract with mitigation – AAHUs per tract without mitigation

Where AAHUs are calculated by (50-year project life),

AAHUs = Cumulative HUs/50 years

and Cumulative HUs are calculated by,

$$\text{Cumulative HUs} = \sum_{n=1}^{3} \left[(T_{n+1} - T_n) * (\text{ADFA}) * \left[\frac{HSI_{n+1} + HSI_n}{2} \right] \right]$$

For n from 1 (existing conditions at initial time) to 3 (condition at end of project life)

where

T_n = first target year of time interval
T_{n+1} = last target year of time interval
ADFA = acres * % average duration of post project flooding from April 1 to May 15.
HSI_n = HSI at beginning of time interval
HSI_{n+1} = HSI at end of time interval

Compensatory mitigation measures involve the altering of one habitat type to another higher valued habitat type. This RSEIS 2 analyzes several mitigation techniques that compensate impacts to mid-season fish rearing habitat. Creation of large permanent waterbodies provides the greatest habitat value per acre.

To reiterate, there are several differences regarding the methodology used to quantify mid-season fish rearing habitat impacts from construction and benefits from compensatory mitigation between the 2002 RSEIS and that used in this RSEIS 2. First, the 2002 RSEIS utilized reforestation of frequently flooded cropland as the primary means to compensate for the impact to 4,213 mid-season fish rearing HUs. This RSEIS 2 is utilizing several techniques in addition to reforestation that compensate for impacts to mid-season fish rearing habitat. Second, the 2002 RSEIS expressed impacts and benefits to mid-season fish rearing habitat as HUs because it did not account for the transition period for reforestation. This RSEIS 2 accounts for the transition period. To account for the transition period, impacts from construction and benefits from compensatory mitigation to mid-season fish rearing habitat are expressed as AAHUs. Third, the 2002 RSEIS did not utilize ADFAs in calculating overall compensatory mitigation acres required to compensate for the impact to mid-season fish rearing habitat. This RSEIS 2 accounts for ADFA in the calculation of mid-season fish rearing habitat mitigation benefits.

2.4 Preliminary Mitigation Features

Reforestation of frequently flooded agricultural land remains one means of providing the required compensatory mitigation. Mitigation is calculated in terms of habitat value, expressed as AAHU. However, the Corps acknowledges that AAHU calculations must utilize ADFA equivalence since the resource being used to establish requirements, the fishery resource, is calculated using ADFAs. If reforestation of frequently flooded agricultural lands was the only compensatory mitigation method employed, then the actual acres required would be no less than 8,375 acres, and could conceivably be many more to assure that the ADFA equivalent requirement is also met. Additionally, reforesting 8,375 ADFAs does not account for the transition period.

In addition to reforestation of agricultural areas, other compensatory mitigation techniques are formulated in the following sections. Techniques that provide the longest duration of flooding during the mid-season fish-rearing period (April 1 to May 15) offer the highest potential benefits to mid-season fish rearing habitat.

Table 2.1 lists the preliminary techniques that were analyzed for providing mid-season fish rearing habitat. Preliminary techniques were formulated by the Corps as well as the

interagency mitigation team. A brief description of techniques that were not retained is provided in Section 2.5. Techniques that were retained for detailed analysis are provided in Section 2.6.

Table 2.1. Preliminary Techniques for Providing Mid-Season Fish Rearing Habitat

Techniques	Retain for Analysis (Y/N)	Reason
Shorebird Areas	Y	Already a compensatory mitigation feature, no additional costs would be associated.
Borrow Pits	Y	Already a project feature, additional costs would be associated with increased footprint.
Measures that Increase Duration on Mitigation Tracts	Y	Increased flood durations maximize habitat output.
Permanent Waterbody Creation/Enhancement	Y	Creation and/or enhancement of permanent waterbodies produce the highest habitat output.
Permanent Waterbodies in Upper Floodway	N	Benefits to mid-season fish rearing habitat would be difficult to justify in the upper part of the floodway.
Levee Realignment	N	Construction costs of new levee system are excessive.
Lower Mississippi River Conservation Committee (LMRCC) Identified Areas	Y	Implementation of features identified by the LMRCC would significantly benefit Lower Mississippi River populations and communities.
Reconnection of historical waterways through the levee	N[1]	Construction costs for additional culverts and gates through the Mississippi River Frontline Levee are excessive.
Modified Gate Operation	Y	Modifying the gate operation during the mid-season fish rearing period has the potential to significantly increase fish spawning and rearing habitat.
Modified Closure Location	N	The recommended flood damage reduction plan as outlined in the 2002 RSEIS maximizes national economic development benefits and minimizes environmental impacts.

[1]The Corps is analyzing the feasibility of reconnecting the historical channel of St. James Bayou as part of the restoration of hydrology to Big Oak Tree State Park. Additionally, the Corps is analyzing modifying the outlet gates to St. Johns Bayou to increase connectivity with the Mississippi River to allow for backwater flooding.

2.5 Techniques Not Retained for Detailed Analysis

The following paragraphs provide a description of compensatory mitigation techniques not retained for detailed analysis. A rationale for exclusion from detailed analysis is also provided.

2.5.1 Permanent Waterbodies in Upper Floodway

Creation of permanent waterbodies provides maximum gains to mid-season fish rearing habitat. To claim benefits for mid-season fish rearing habitat, fish access would be required for any type of permanent waterbodies created. The Mississippi River inundates the lower portion of the New Madrid Floodway at a frequency that is beneficial at maintaining overall floodplain fish populations (2-year event). Currently, fish have access to the inundated lower portion of the New Madrid Floodway during flood events. Fish would continue to have access to the lower portion of the New Madrid Floodway through the box culverts once the proposed closure is constructed and the gates are operated. Further information concerning fish access through the New Madrid closure levee is found in Section 4.3.2.1 of this RSEIS 2.

Mississippi River backwater does not inundate areas in the upper part of the New Madrid Floodway at a frequency that is beneficial to maintaining overall floodplain fish populations (frequency is less than the 2-year event). Creation of permanent waterbodies in the upper section of the floodway would require more frequent Mississippi River flooding to these areas through a culvert or some other similar device through the Mississippi River Mainline Levees System. It is likely that the culvert would not be as large as the four 10-foot by 10-foot box culverts proposed for the New Madrid Floodway closure. Therefore, the culvert would have to be designed to provide fish access. Construction of additional culverts can be costly. There are additional costs to ensure that floodplain fish would have access to the sites. Therefore, permanent waterbodies in the upper part of the floodway were not considered as a viable mitigation technique due to the high costs to provide regular fish access to the Mississippi River.

In contrast, creation of permanent waterbodies in the lower portion of the St. Johns Bayou Basin, the lower portion of the New Madrid Floodway, and throughout the Mississippi River batture area provide significant mid-season fish rearing habitat because fish would have access to some or all of these areas during high Mississippi River stages. Accordingly, these techniques have been retained for detailed analysis.

2.5.2 Levee Realignment

Within the project area, the Mississippi Mainline Levee System protects thousands of acres of land from flooding. Removing existing levees and constructing new levees at greater distances from the Mississippi River would create additional floodplain habitat and thus provide fisheries benefits.

It has been estimated, based on current construction costs, that new levee construction within the project area would cost approximately $2.4 million per mile. It has also been estimated that 12.8 miles of new levee construction would be required to create 16,750 acres (assuming 50% duration) of additional floodplain that could be reforested. Based on this assumed length, the estimated construction costs would be approximately $30.7 million. There would also be additional real estate costs (acquisition or easements) of approximately $33.5 million.

Realigning the Mississippi River Frontline Levee was deemed unfeasible due to the expected cost of new levee construction.

2.5.3 Reconnection of Historical Waterways Through the Levee

Reconnection of historical waterways through the Mississippi Mainline Levee would require the construction of a culvert or some other similar device. Based upon preliminary planning and cost estimates developed for Big Oak Tree State Park, reconnection of additional historical waterways through the levee is cost prohibitive. Additionally, this technique would require the provision of fish access, which is not assured depending on the nature of the water reconnection (see below). Therefore, reconnection of historical waterways through the levee system was not considered in detail.

There are two exceptions to not considering reconnection of historical waterways. The first is the Big Oak Tree State Park hydrologic restoration feature that may reconnect the historical channel of St. James Bayou through the levee. The Corps is evaluating this feature in detail. The Corps plans to provide fish access into the park and 1,800 acres of surrounding lands. One additional location other than through St. James Bayou has also been considered and is located southwest of the park near the Mississippi and New Madrid County line. The water delivery system has not been designed to date. Therefore, benefits to mid-season fish rearing habitat cannot be quantified at this time. Fish passage would be considered throughout the design of the hydrologic restoration feature. The site would be monitored and appropriate mitigation credits would be calculated if fish can obtain access to the park and the surrounding 1,800 acres of lands acquired and reforested for compensatory mitigation.

The second exception is allowing Mississippi River backwater flooding to inundate portions of the St. Johns Bayou Basin. Under existing conditions, the outlet gates are closed during periods of high water. Flooding is caused by interior events. The construction of a pump will prevent some flood damages due to interior events. However, the operation of the gate closure and operation of the pump could be modified to allow Mississippi River backwater flooding to occur up to a particular elevation. This action would result in the reconnection of Mississippi River backwater flooding to an area in which it currently does not exist. Further discussion is found in this RSEIS 2, Section 2.6.2.5.2.

There is no evidence to support the assumption that the New Madrid Floodway box culverts would impede fish access. Further information concerning fish access through the New Madrid closure levee is found in Section 4.3.2.1 of this RSEIS 2.

2.5.4 Modified Closure Location

The 2002 RSEIS analyzed several closure locations to minimize damages to floodplain fish habitat. The current location was selected because, unlike other locations analyzed in that document, it maximizes economic benefits, compensates for all significant impacts to fish and wildlife resources, and has a positive cost of construction to benefit ratio. The recommended closure location, as outlined in the 2002 RSEIS, is the National Economic Development (NED) Plan.

2.6 Compensatory Mitigation Options Considered in Detail for this RSEIS 2

During the formulation of the 2002 RSEIS, the interagency team agreed that reestablishing forested wetlands would be an effective measure to compensate impacts of floodplain fisheries habitat, provided the site had significant access for riverine fish from March through June. Therefore, the 2002 RSEIS focused on the reforestation of 8,375 acres of frequently flooded cropland to compensate these impacts.

Reforesting cropland in the project area is not the most efficient means available in the project area to mitigate fishery impacts. This is due to the expected low durations of flooding on many of the mitigation tracts currently identified from potential willing sellers. Therefore, other practical methods for compensating impacts to floodplain fishes are desirable and are analyzed in this document. Options that create permanent water habitat provide the most mid-season fish rearing AAHUs.

Creation or enhancement of permanent waterbodies would reduce the overall amount of acreage required for compensatory mitigation purposes. However, creation or enhancement of permanent waterbodies does not compensate direct impacts to wetlands and indirect impacts to farmed wetlands. Furthermore, creation or enhancement of permanent waterbodies may not fully compensate for impacts to terrestrial wildlife habitat, shorebird habitat, and waterfowl habitat. Compensatory mitigation methods must also account for these resources.

Direct impacts to wetlands and indirect impacts to farmed wetlands are discussed in Section 5.3 of the 2002 RSEIS and Sections 4.2.1 and 5.2 of this RSEIS 2. In summary, all direct impacts to forested wetlands, indirect impacts to farmed wetlands, and potential impacts to agricultural lands that are classified as prior converted cropland would be compensated by restoring or creating wetlands on 7,121 acres of land. Mitigation would include reforestation of cropland (including 1,800 acres surrounding Big Oak Tree State Park), constructing moist soil units, planting vegetative buffer strips, and the creation of a wildlife corridor.

The 2002 RSEIS recommended several avoid, minimize, and compensatory mitigation measures in which potential benefits to mid-season fish rearing were not quantified. These measures consist of creation of shorebird areas, vegetated buffer strips, and a wildlife corridor. Costs were determined for all of these measures for the purpose of calculating the overall project benefit to cost ratio.

Due to the inconsistency concerning compensatory mitigation calculations in the 2002 RSEIS, the Corps reexamined all of its mitigation methodologies for the purposes of this RSEIS 2. Overall mitigation calculations are revised in this RSEIS 2 to ensure that all potential benefits to mid-season fish rearing habitat are accounted for, including all of the avoid and minimize measures.

Additionally, the Corps did not calculate benefits to mid-season fish rearing habitat from the construction of borrow pits required for the Setback Levee grade raise in the 2002 RSEIS (refer to Section 2.6.1.7 of this RSEIS 2). In this RSEIS 2, the Corps has quantified benefits to mid-season fish rearing habitat by the construction of 387 acres of modified borrow pits.

For the purpose of this RSEIS 2, compensatory mitigation is divided into two categories:

(1) Basic Mitigation Feature – Entails most of the compensatory mitigation features that were developed during the 2002 RSEIS. Additionally, the basic mitigation feature entails the construction of modified borrow pits. The basic mitigation feature fully compensates all significant resource categories except the New Madrid Floodway mid-season fish rearing habitat.

(2) Additional Techniques – Options that compensate for impacts to New Madrid Floodway mid-season fish rearing habitat that are not compensated by the basic mitigation feature.

2.6.1 Basic Mitigation Feature

The basic mitigation feature incorporates most of the mitigation features that were described in the 2002 RSEIS, stipulated in the WQ Certification, and summarized in Section 2.2 (See RSEIS 2 Figure 1). The 2002 RSEIS recommended several additional measures for which benefits to mid-season fish rearing habitat were not quantified. Costs were calculated for these additional measures. The benefits to mid-season fish rearing habitat from these additional measures are included and quantified in the basic mitigation feature in this RSEIS 2.

The basic mitigation feature entails acquisition of real property interests through purchase of fee title or restrictive easements from willing sellers on a minimum of 7,121 actual acres of land to fully compensate the unavoidable impacts to terrestrial wildlife, waterfowl, shorebirds, the direct losses to wetlands, indirect losses to farmed wetlands, and a reduction of backwater flooding to prior converted cropland. The 7,121 actual

acres of lands are included as part of the following measures that have been retained from the 2002 RSEIS:

- Reforest 3,619 acres of cropland (this measure would result in gains to terrestrial wildlife, waterfowl, and mid-season fish rearing habitat).
- Construct 765 acres of modified moist soil units on farmland (this measure would result in gains to shorebirds, waterfowl, and potentially to mid-season fish rearing habitat).
- Plant vegetative buffer strips on 671 acres of New Madrid Floodway channels (this measure would result in gains to terrestrial wildlife, waterfowl, and mid-season fish rearing habitat).
- Create a 266-acre wildlife corridor between Big Oak Tree State Park and Ten Mile Pond CA (this measure would result in gains to terrestrial wildlife, waterfowl, and mid-season fish rearing habitat).
- Reforest 1,800 acres of cropland surrounding Big Oak Tree State Park (this measure would result in gains to terrestrial wildlife, waterfowl, and mid-season fish rearing habitat).

The basic mitigation feature also includes the following:

- Construct 387 acres of modified borrow pits. The modifications made to the borrow pits would ensure fish usage and access.
- Provide Mississippi River surface water to Big Oak Tree State Park that would mimic natural flooding conditions.

In reforested areas, species to be planted and survivorship rates would depend on site-specific conditions (hydrology, soils, etc.) and determined during the development of site-specific mitigation plans with input from the interagency mitigation team. Mitigation sites would be monitored to verify success. Preservation of large tracts of existing bottomland hardwoods may also be used to fulfill reforestation requirements. Notably, the Corps has acquired the Bogle Woods tract that consists of approximately 1,000 acres of bottomland hardwoods. The interagency mitigation team requested the acquisition of this tract because of its high habitat value to multiple resources and the threat of it being cleared for timber purposes.

Table 2.2 provides gains to significant resource categories by implementing the basic mitigation feature. Since site-specific areas are required to accurately quantify gains in each resource category, conservative estimates have been made throughout this RSEIS 2 to verify economic viability. There would be coordination with the interagency mitigation team throughout the planning, acquisition, and monitoring of compensatory mitigation. Site-specific gains to significant resource categories would be quantified during the development of the detailed site-specific plans. Compensatory mitigation would be achieved when all significant resource categories are fully compensated. Overall acreages of required lands may change during the mitigation process.

The basic mitigation feature also entails an extensive monitoring plan to ensure that project impacts were adequately modeled and that expected gains to resource categories from compensatory mitigation are achieved. Monitoring is discussed in Section 7 of this RSEIS 2.

The paragraphs in Section 2.6.1 describe mitigation techniques and summarize benefits to fish and wildlife resources with respect to the basic mitigation feature. Subsequent paragraphs in Section 2.6.2 describe additional mitigation techniques that supplement the basic mitigation feature and fully compensate remaining impacts to mid-season fish rearing habitat. Detailed descriptions concerning benefits to fish and wildlife resources are found in Section 5 and specific calculations are found in Appendix C.

Table 2.2. Expected Benefits of Basic Mitigation Feature

Mitigation Measure	Habitat						
	Wetlands*		Wildlife	Waterfowl	Shorebird	SJB Fish	NM Fish
	Acres	FCUs[1]	AAHUs	DUDs	AAHUs	AAHUs	AAHUs
Project Impacts	-622	-964	-2,059	-204,039	-761	-1,884	-2,329
Reforestation SJB – 1,293 acres (fee)	1,293	5,701	1,846	296,097	0	313	0
Reforestation NM – 2,326 acres (fee)	2,326	10,255	3,321	532,654	0	0	38
Modified Moist Soil Unit – 765 acres (fee)	765	494	0	793,305	761	0 – 75[2]	0 - 238[2]
Vegetated Buffers – 671 acres (easement)	671	2,958	958	104,005	0	0	9
Wildlife Corridor – 266 acres (easement)	266	1,173	380	60,914	0	0	4
BOTSP Hydrologic Restoration	0	TBD	0	0	0	0	0 – 442[2]
BOTSP Perimeter Land Acquisition – 1,800 acres (fee)	1,800	7,936	2,570	162,000	0	0	0 – 504[2]
Borrow Pits – 387 acres (fee)	0	0	0	0	0	1,571	0
TOTAL Basic Mitigation	7,121	28,517	9,075	1,948,975	761	1,884	51
NET CHANGE	6,499	27,553	7,016	1,744,936	0	0	-2,278

*Impacts to jurisdictional status only

[1]Represents the sum of all functional categories

[2]The minimum value (zero) has been used in determining the total basic mitigation credits and the net change in value.

SJB – St. Johns Bayou Basin

NM – New Madrid Floodway

BOTSP – Big Oak Tree State Park

TBD – To be determined during the development of site-specific mitigation plans

2.6.1.1 Reforestation

Approximately 1,293 and 2,326 acres of cropland would be reforested within the St. Johns Bayou Basin and the New Madrid Floodway, respectively. This is in addition to 1,800 acres of land that would be reforested in the vicinity of Big Oak Tree State Park. Reforesting this amount of land would yield an increase of 313 and 38 mid-season fish rearing AAHUs in the St. Johns Bayou Basin and the New Madrid Floodway, respectively. Specific calculations are found in Section 5.4.2.1 of this RSEIS 2. It is anticipated that lands would be acquired in fee.

Reforestation would include, preparing the site (deep disking, sub-soiler), restoring hydrology, restoring microtopography, planting trees, annual maintenance (mowing, weed control, etc.), and monitoring to ensure survival. These activities would be described in site-specific detailed mitigation plans that would be fully coordinated with the interagency mitigation team. Specific species of trees to be planted, seeding/seedling rates, and survivorship rates would also be addressed in the site-specific plans. If suitable, each tract would be planted with at least 15% RPM trees.

2.6.1.2 Shorebird Areas

The USFWS CAR (2000) stated that flooding cropland (209 acres in the St. Johns Bayou Basin and 1,314 in the New Madrid Floodway) or flooding herbaceous wetlands (105 acres in the St. Johns Bayou Basin, 660 acres in the New Madrid Floodway) would fully compensate for impacts to shorebird habitat from project construction. The 2002 RSEIS recommended flooding herbaceous wetlands to compensate for the impacts to shorebird habitat (104 Shorebird AAHUs in the St. Johns Bayou Basin and 657 Shorebird AAHUs in the New Madrid Floodway) from project construction. These areas could be used to offset a small portion of the habitat impacts to fisheries and waterfowl, depending on water depth and access to the area (USFWS CAR, 2000). It is anticipated that lands would be acquired in fee.

Moist soil units (flooded herbaceous wetlands) are typically used to manage shorebird and waterfowl resources in the project area. Moist soil unit construction basically involves building s around the site, installing a water control device to precisely manage water levels (*e.g.,* stop log structure), and providing a source of water usually through the use of groundwater pumps. This method of moist soil unit construction would largely reduce or eliminate fisheries access to the site.

Construction of moist soil units can be modified to allow fish access to the site. These modifications include locating potential areas adjacent to existing channels that support aquatic life (*e.g.,* ditch, bayou, stream, etc.) and degrading portions of the perimeter levee to allow surface water (and fish) to enter during flood events.

Moist soil units would remain flooded during portions of the year. It is highly likely that portions of these areas would remain flooded during all or part of the April 1 to May 15 timeframe. Therefore, it is likely that these areas would provide mid-season fish rearing

habitat. However, benefits to mid-season fish rearing habitat are not quantified for the purpose of this RSEIS 2 because of uncertainties. These uncertainties include but are not limited to the amount of flooding on tracts, fish usage, and dissolved oxygen concentration. The Corps intends to monitor the sites for fish usage. Benefits to mid-season fish rearing habitat would be quantified if monitoring reveals evidence of fish usage. Creation of modified moist soil units have the potential to yield an increase of 75 and 238 mid-season fish rearing AAHUs in the St. Johns Bayou Basin and the New Madrid Floodway, respectively.

Further discussion on the potential benefits to mid-season fish rearing habitat from the construction of shorebird areas is found in Section 5.4.2.2 of this RSEIS 2.

2.6.1.3 Vegetated Buffer Strips

The 2002 RSEIS incorporated vegetated buffer strips along 64 miles of New Madrid Floodway channels. The 2002 RSEIS calculated habitat gains of buffer strips for in-stream fish habitat. However, no calculations were made for the potential benefit to mid-season fish rearing habitat when riparian zones are flooded. Forested riparian zones provide habitat for floodplain-spawning fishes similar to larger tracts of bottomland hardwoods, but also contribute to in-stream habitat quality by shading, sediment retention and filtering during run-off from agricultural fields, and adding woody debris to the stream that is utilized as cover by fish and attachment sites by invertebrates. Other benefits of buffer strips include decreased stream nutrient loading and the removal of cropland from production.

Buffer strips would be planted on 671 acres (260 acres of large streams, 233 acres of medium streams, and 178 acres of small streams). These areas are currently in agricultural production. Precise locations of buffer areas are not known at this time. A 5% duration of flooding is a reasonable estimate based on calculations that have been made on tracts of land near Big Oak Tree State Park and Ten Mile Pond CA. Therefore, assuming that the 671 acres would be inundated for 5% of the mid-season fish-rearing period, 9 mid-season fish rearing AAHUs can be expected from the establishment of vegetated buffers in the New Madrid Floodway. Vegetated buffer strips would be monitored to ensure success of the sites and ensure that expected gains are achieved. It is anticipated that lands would be acquired through a conservation easement.

It is important to note that a single day of flooding, regardless of depth, is suitable rearing habitat, as opposed to spawning habitat that requires one foot of depth and eight consecutive days of inundation. Further discussion on hydrologic requirements for fish rearing habitat is found in Section 4.3.1.1.

Further discussion on the benefits to mid-season fish rearing habitat from the creation of buffer strips is found in Section 5.4.2.3 of this RSEIS 2.

2.6.1.4 Wildlife Corridor

Another feature incorporated into the 2002 RSEIS was the establishment of a 300-foot riparian corridor on each side of a waterway connecting Big Oak Tree State Park and Ten Mile Pond CA. The total area to be reforested is approximately 266 acres. Existing habitat is farmland. Therefore, assuming that the 266 acres would be inundated for 5% of the mid-season fish-rearing period, 4 mid-season fish-rearing AAHUs can be expected by the establishment of a wildlife corridor in the New Madrid Floodway. The wildlife corridor would be monitored to ensure success and ensure that expected gains are achieved. It is anticipated that lands would be acquired through a conservation easement.

Further discussion on the benefits to mid-season fish rearing habitat from the creation of the wildlife corridor is found in Section 5.4.2.4 of this RSEIS 2.

2.6.1.5 Big Oak Tree State Park Hydrologic Restoration

Under existing conditions, Big Oak Tree State Park is experiencing drier conditions than historical conditions due to adjacent flood control practices in the area (*i.e.,* Mississippi Mainline Levee, channelization, farm drains and ditches). Historic vegetation consisted of wetland species adapted to long durations of flooding. Historic vegetation is being replaced with drier species of vegetation.

The Corps is designing a water delivery system that would allow Mississippi River water to flood the park and mimic a natural flooding regime. Depending on Mississippi River stages, the system would provide water to the park to an elevation of 291 feet National Geodetic Vertical Datum (NGVD) and drain the park to an elevation of 288 feet NGVD.

A water delivery system to bring Mississippi River water into the park was not initially included in the 2002 RSEIS. However, as part of the WQ Certification, MDNR requested that the Corps design the system and implement it as a feature of the project. A Memorandum of Understanding was signed between the Corps and MDNR to implement this feature and is included as Exhibit A to the June 9, 2003, WQ Certification and its update on March9, 2006 (Appendix G).

Supplying Big Oak Tree State Park with Mississippi River water would require a gated culvert in the Mississippi Mainline Levee to allow for water to enter the park. The Corps has identified two potential locations for a gated culvert. The first is located at the historic mouth of St. James Bayou. The average Mississippi River elevation at that point from 1943 to 1974 for April 1 through May 15 is 294.3 feet NGVD. The river at this elevation would back into St. James Bayou if the frontline levee had not isolated the rest of the Bayou from the river. Therefore, a gravity flow system can be designed to allow river water to inundate the park in an average year. The second location for a gated culvert is southwest of the park through an existing shallow ditch. MDNR maintains a drainage easement on this ditch to drain the park.

Under existing conditions, Big Oak Tree State Park offers limited mid-season fish-rearing habitat due to the infrequent flooding in the area. Existing Corps and local flood control measures prevent or restrict backwater entrance into the park until the river stage at New Madrid is approximately 297 feet NGVD. Depending on fish access, construction of a water delivery system has the potential to yield an increase of 446 mid-season fish rearing AAHUs in the existing park.

Due to the complex nature of the water system, the detailed design will not be completed until after a new ROD is signed and resource agencies, particularly MDNR, participate in the design process with the Corps. Fish access would be considered throughout the design and construction of the system. Potential benefits to mid-season fish rearing habitat, as well as detailed plans for the system, would be furnished in a detailed site-specific mitigation plan. The park would be monitored for fish usage and overall mitigation would be modified, if necessary. The two potential locations for river water supply vary in estimated construction costs from $2.8 million to about $5.3 million.

Further discussion of the benefits from supplying Big Oak Tree State Park with Mississippi River water is found in Section 5.4.2.5 of this RSEIS 2.

2.6.1.6 Big Oak Tree State Park Perimeter Land Acquisition

As part of the WQ Certification and Memorandum of Agreement, the Corps has agreed to acquire in fee approximately 1,800 acres of farmland from willing sellers surrounding Big Oak Tree State Park and plant bottomland hardwoods to mimic the natural diversity of the park. It was anticipated that the 1,800 acres of land would be included in the overall 8,375 acres of mitigation land during the formulation of the 2002 RSEIS. Therefore, the potential benefits of acquiring and reforesting cropland around Big Oak Tree State Park for mid-season fish rearing habitat were already accounted for in the 2002 RSEIS. However, the 2002 RSEIS did not account for ADFAs in mitigation calculations or the supply to Big Oak Tree State Park of Mississippi River surface water. Therefore, new analysis is required for this technique.

The cropland around Big Oak Tree State Park ranges in elevation from 285 feet NGVD to 295 feet NGVD, and most falls below 292 feet NGVD. Due to the infrequency of flooding in the area, limited mid-season fish rearing habitat exists. Fish access must be established to quantify benefits to mid-season fish rearing habitat. Portions of the existing levee surrounding the park would be degraded to allow for connectivity between the park and newly acquired lands. Where necessary, a new perimeter levee would be constructed around these newly acquired areas adjacent to the existing park to avoid causing flood damages to surrounding croplands.

In the event that the water supply feature provides fish access to the park and the newly acquired and reforested 1,800 acres of land, 504 mid-season fish rearing AAHUs (at lands below 291 feet NGVD) may be gained. If applicable, mitigation credits would be quantified during the development of detailed mitigation plans and verified through monitoring.

Further discussion on the potential benefits to mid-season fish rearing habitat from acquiring and reforesting 1,800 acres of cropland surrounding Big Oak Tree State Park and supplying Mississippi River water is found in Section 5.4.2.6 of this RSEIS 2.

2.6.1.7 Borrow Pits

The closure of the New Madrid Floodway and associated levee raises would require fill material. It is assumed that material obtained from channel enlargement activities would be used for closure of the levee gap. Levee grade raises would require an additional 2.4 million cubic yards of material. Impacts to mid-season fish rearing habitat from project construction can be mitigated by the proper construction of borrow pits.

The Corps and the USFWS agreed that construction of borrow pits that are accessible to river and floodplain fishes during the spawning/rearing season was an appropriate measure for compensating impacts of seasonally-connected permanent waterbodies in the floodplain during the formulation of the 2002 RSEIS. In the 2000 SEIS, it was acknowledged that construction of borrow pits is expensive (2000 SEIS, Page 86), and mitigation planners did not realize an additional source of material was required for the Setback Levee grade raise (2.4 million cubic yards). Therefore, borrow pits were not quantified in the 2000 SEIS as a mitigation feature. Due to the costs, the 2002 RSEIS did not specifically recommend construction of new borrow pits to compensate impacts to fish. However, the Corps and the USFWS agreed to pursue opportunities for permanent waterbody creation (2002 RSEIS, Section 6.2.3). The Corps still intends to use material obtained from enlargement of St. Johns Bayou for material to construct the levee closure for the Floodway. However, there is a need for an additional 2.4 million cubic yards of material to raise the Setback Levee (2002 RSEIS, various locations). The cost of new borrow areas to provide this material was factored into the overall project benefit to cost ratio during the 2002 RSEIS. The mitigation planners did not consider the use of these areas as compensatory mitigation. This RSEIS 2 quantifies the potential benefits to mid-season fish rearing habitat from borrow pit construction. Additional costs have been added to the initial cost due to a change in borrow pit designs to maximize benefits to fish.

Construction of borrow pits would follow the guidelines established by Aggus and Ploskey (1986), which recommend some areas of deep water (*e.g.*, 6-10 feet), a sinuous shoreline, establishment of islands, and a variable bottom topography. Average depth of borrow pits influences the fish assemblage. Shallow areas are suitable for characteristic wetland fishes such as fliers, pirate perch, taillight shiners, and young-of-year fishes. Deeper areas are more conducive for sport and commercial fishes. Therefore, borrow pit construction will recognize the importance of providing shallow and deep water to benefit the maximum number of species and life stages. Borrow pits would be located in areas that would allow access for floodplain fishes during flood events.

The pit(s) would be designed so that half the material would be taken from areas dug to an average depth of 6 feet and half taken from areas averaging 3 feet deep. The total

borrow pit area would be approximately 387 acres. It is anticipated that it would take several different pits to total 387 acres. Site-specific areas would be identified in detailed mitigation plans. Due to a desire to minimize the hauling distance of the borrow material to the Setback Levee, it would be most desirable to locate the borrow pit(s) in the downstream end of the St. Johns Bayou Basin. Construction of 387 acres of borrow pits in the lower end of St. Johns Bayou Basin would yield a net increase of 1,571 AAHUs. It is anticipated that lands would be acquired in fee.

The lower end of the St. Johns Bayou Basin is the most desirable area to locate the borrow pits for planning and construction purposes. However, it may be desirable to locate pits in the New Madrid Floodway during construction. Benefits to mid-season fish rearing habitat from borrow pits located in the Floodway would be calculated utilizing New Madrid Floodway HSI values. Site-specific locations and overall designs would be addressed in the detailed mitigation plans.

The estimated costs of creating uniform 8-foot deep borrow pits and constructing the Setback Levee grade raise were included in the recommended plan's construction cost in the 2002 RSEIS. The additional cost is the incremental cost to change from a uniform 8-foot deep borrow pit to the modified design that provides fishery habitat that is described in Section 5.4.2.7.

2.6.2 Additional Techniques That Supplement the Basic Feature and Compensate for Remaining Impacts to Mid-Season Fish Rearing Habitat

These additional techniques are formulated to demonstrate that significant impacts to fish and wildlife resources can be mitigated and demonstrate that the overall project is economically justified (See RSEIS 2 Figure 2). The compensatory mitigation features described in the following paragraphs are techniques that may be utilized, but one technique is not recommended to the exclusion of another. Mitigation plans typically incorporate a variety of techniques to benefit different groups of organisms, improve the function and value of the landscape and provide flexibility to address requirements of resource agencies.

Additionally, other potential mitigation techniques that are not specifically mentioned in this document may be explored as new lands and information become available. The adequacy of these techniques would be coordinated with the interagency mitigation team. There may be additional cases in which the interagency mitigation team would consider trade-offs. Trade-offs would consist of mitigation techniques benefiting different resource at the expense of the mid-season fish rearing habitat. An example would be restoring Mississippi River side channel habitat. This action would significantly benefit Mississippi River fishes, including adults that may eventually spawn in the floodplain. However, it might not benefit floodplain mid-season rearing habitat of larval fish. Another example of trade-offs would be to acquire/preserve high valued habitat that would benefit the overall ecosystem. Bottomland hardwoods are critical to a wide variety of fishes, amphibians, reptiles, mammals, and birds. However, these tracts may be situated in higher elevation lands where mid-season floodplain fishes cannot access.

Lack of access precludes benefits to mid-season fish rearing habitat, but there may be indirect benefits associated with large, contiguous forests (*e.g.*, improvement in water quality, transport of organic carbon, and sediment retention). All additional mitigation techniques would be fully coordinated with the interagency mitigation team. NEPA documentation would be provided for these additional techniques, if required.

2.6.2.1 Technique 1: Additional Reforestation

Remaining impacts to mid-season fish rearing habitat that were not compensated by the basic mitigation feature would be mitigated by additional reforestation of agricultural areas. Additional reforested areas could be located within the St. Johns Bayou Basin, the New Madrid Floodway, or the batture land. Gains to mid-season fish rearing habitat would be achieved by replacing cropland (low HSI value) with bottomland hardwoods (higher HSI value). It is anticipated that lands would be acquired in fee.

2.6.2.2 Technique 2: Mitigation Measures That Increase Flood Duration

Reforestation was the basic mitigation strategy developed during the formulation of the 2002 RSEIS. Increasing flood duration on reforested areas during the period of April 1 to May 15 would provide additional mid-season fish rearing habitat. Increased flood durations can be achieved by holding water for longer durations on mitigation tracts.

Increased flood durations would be possible due to the high clay content in existing soil and the high water table within the project area. Flood duration in mitigation sites would be increased by excavating deeper areas within the tract including connection channels, constructing perimeter berms, and installing water control devices (stop log structures, screw gates). Floodplain fishes would enter the sites through natural flooding events (mitigation sites would be located in areas that offer fish access through natural flooding). Floodwaters could conceivably be held for the entire 45-day mid-season fish rearing period. Species (*i.e.,* bald cypress, tupelo, black willow) that are capable of withstanding this type of flood duration would be planted on the sites. A 2-week period (31% duration) could be desired on tracts that are predominantly planted with red oaks. Fish would return as floods recede naturally or through the water control device.

Trees that can tolerate site-specific flooding would be planted on the tract. Species would be selected during the development of the site-specific mitigation plan with input from the interagency mitigation team. Species to be used could include but are not limited to bald cypress, tupelo, green ash, Nuttall oak, water oak, pin oak, and water hickory.

As an example, a 100-acre tract of farmland with flood duration of 5% is reforested in the vicinity of Ten Mile Pond CA. This action would yield a net increase of 1.33 AAHUs due to duration of 5%. However, that same tract of land would yield a net increase of 17.9 AAHUs if duration were increased to 31% by the use of perimeter levees and other water control devices. These calculations are provided in Appendix C, Calculations 1 and 2. Fish clearly must have access to the site during flood events.

In addition to efforts to increase tract-specific flood duration, prioritizing acquisition of frequently flooded tracts will also improve fish habitat quality. This would include reforesting low-lying areas that are frequently flooded, especially in the sump areas of the flood damage reduction project. The Eagles Nest area (New Madrid Floodway sump area) is one example. Reforesting these areas would increase gains to mid-season fish rearing habitat compared to lands located at higher elevations. As an example, duration of inundation in the Eagles Nest Area during April 1 to May 15 is approximately 37%, as opposed to inundation of areas around Ten Mile Pond CA that is only 5%. Therefore, a 100-acre tract of farmland that is reforested in the Eagles Nest Area would yield a net increase of 9.87 AAHUs, as opposed to a 100-acre tract in the vicinity of Ten Mile Pond CA that would only yield a net increase of 1.33 AAHUs. These calculations are provided in Appendix C, Calculations 1 and 2.

Further discussion on increasing flood durations on mitigated tracts of land is provided in Section 5.4.3.2 of this RSEIS 2.

2.6.2.3 Technique 3: Creation, Restoration, or Enhancement of Large Permanent Waterbodies

Riley Lake is a 36-acre lake located on Donaldson Point. Numerous floodplain lakes, such as Riley Lake, exist in the batture. Due to anthropogenic impacts, many of these lakes are degraded due to past drainage projects and high sediment loads of the Mississippi River. Additionally, there are now fewer of these oxbows lakes and chutes due to the restriction of the Mississippi River floodplain by extensive levees and training dikes (RSEIS 2 Appendix G, USFWS Supplemental CAR). Normally, these lakes become very shallow or completely dewatered after floods recede. Larval fish abundance can be high in floodplain lakes because many species concentrate in permanent waterbodies for feeding and reproductive purposes. Maintaining suitable water depths after disconnection will improve survival rate and contribute to overall recruitment of fish once the lakes become reconnected to the Mississippi River during flood pulses. A weir could be designed to create increased permanent water area. Riley Lake is only one example of an opportunity to reconnect or manage water levels of permanent waterbodies to enhance survival of early life history stages of fish. A list of potential lakes and increases to surface areas is provided in Table 2.3. The mitigation team may consider restoring some of these permanent waterbodies as mitigation for the flood control project in addition to or instead of the Riley Lake feature. It is anticipated that lands would be acquired through a flowage easement or fee title.

Table 2.3. Potential Floodplain Lakes

Description	Mississippi River Mile	Existing Surface Acres	Restored/Enhanced Surface Acres
No. 3 Chute	930	133	201
Wolf Island Bend	930	149	270
Pecan Chute	880	24	78
Point Pleasant Chute	880	205	265
Williams Chute	870	23	176
Stewart Bar Chute	865	47	197
Robinson Lake	853	3	218

An outlet channel was dug at Riley Lake in an attempt to drain it for agricultural purposes. Mid-season fish rearing benefits to Riley Lake would be calculated by the conversion of existing conditions (agricultural areas and bottomland hardwoods) to a permanent waterbody (historical condition). Table 2.4 provides expected benefits to mid-season fish rearing habitat by increasing the size of Riley Lake at various weir heights. Discussions of the benefits to fisheries from the creation/restoration of floodplain lakes are found in Sections 4.3.2.2 and 5.4.3.3 of this document.

Table 2.4. Expected Surface acres of Riley Lake and mid-season fish rearing habitat value

	Existing Conditions (acres)			Mitigated Conditions	
Elevation	Permanent Water	Bottomland Hardwood (BLH)	Farmland	Permanent Water (acres)	AAHU Gain
285	36	112	97	245	399
286	36	150	145	333	577
287	36	180	216	432	774
288	36	228	274	538	992
289	36	295	349	680	1290

Restoration usually involves replacing the existing degraded habitat with a habitat appropriate to the site that is of greater benefit to the target community. In this case, permanent water is of greater value to mid-season spawning and rearing fishes than bottomland hardwoods and agricultural areas. No additional compensatory mitigation would be required from the mortality of existing vegetation due to permanent inundation because this action would result in a net increase to mid-season fish rearing habitat.

The LMRCC, made up of Federal and state resource agencies, has published a list of backwaters in the Mississippi River floodplain that state and federal resource agencies have identified as restoration sites. Benefits to mid-season fish rearing habitat can be calculated for these features as well.

Restoration of Chute # 7 is used as another example. Chute #7 is a 75-acre floodplain lake located along the right descending bank of the Mississippi River just outside of the New Madrid Floodway within the batture area. Concerns have been expressed regarding the sedimentation rates in the lake because it is slowly filling in. Restoration of Chute #7 would consist of excavating/dredging out the historical channel to improve the 75-acre lake. The existing habitat consists of a shallow (less than 3 feet) waterbody. The restoration of Chute #7 would result in the expected gain of 126 mid-season fish rearing AAHUs.

Prior to restoration of any floodplain lake the Corps will conduct further analysis including geotechnical investigations, vegetative surveys, and engineering and design to determine if potential restoration sites will function as perceived. These additional investigations will be conducted during the formulation of site-specific detailed mitigation plans.

2.6.2.4 Technique 4: Restoration or Enhancement of Small Permanent Waterbodies

Within the project area, historic stream conditions consisted of slow-moving meandering streams, bayous, and small oxbows. Most of these natural conditions have been altered by ditching, channelization, and leveling. Remnants of these historic channels remain throughout the study area. These areas flood frequently but have brief durations due to drainage features that have been constructed. Opportunities exist to restore hydrology to these areas. Wetland fishes, amphibians, and other species that are adapted to smaller waterbodies, and are relatively rare in the study area typically inhabit these habitats. Techniques for restoring hydrology to areas can include but are not limited to, plugging drains and ditches, excavating channels to reconnect historical oxbows, restoring historical meanders, and removing small levees. Benefits to mid-season fish rearing habitat would be calculated on a case-by-case basis.

2.6.2.5 Technique 5: Modified Gate Operation

The operation of gates in the New Madrid Floodway or St. Johns Bayou could be modified to create a spawning and rearing pool during the mid-season period. Gates could remain open to the extent practical to allow fish access. During the mid-season the gates would be closed to pool water and create a spawning and rearing pool. The gates would be reopened following the mid-season, thus allowing fish return access to the Mississippi River.

The modified gate operation could occur in either the New Madrid Floodway or St. Johns Bayou outlet structure, or both. The operation could be adjusted to operate at a range of elevations that would vary the size of the spawning and rearing pool. Benefits to mid-season fish rearing habitat from the modified gate operation in one particular basin could be counted towards mitigation credit for either or both basins. Respective HSI values must be used. As an example, benefits to the New Madrid Floodway may be credited if the St. Johns Bayou gate operation was modified. The New Madrid Floodway HSI values would be used to calculate credit.

2.6.2.5.1 Technique 5a: New Madrid Floodway Modified Gate Operation

The recommended flood damage reduction plan as outlined in Section 2.3.2.1 of the 2002 RSEIS would allow flooding from the Mississippi River in the New Madrid Floodway up to an elevation of 284.4 feet NGVD and a stop pump elevation of 283.4 feet NGVD during the period April 1 to May 15. As the river elevation dropped below 284.4 feet NGVD, the gravity gates could be opened allowing the interior stages to drop, as the river stages fall. This avoid and minimize alternative was recommended because it reduced impacts to fish spawning and rearing habitat.

The New Madrid Floodway gravity structure would remain open to allow water to reach an elevation of 284.4 feet NGVD. At this point, the gates would be used to maintain a maximum spawning and rearing pool elevation of 284.4 feet NGVD until May 15 even when the Mississippi River stages drop well below elevation 284.4 feet NGVD. Different spawning and rearing pool elevations can be maintained depending on overall mitigation needs. Maintaining an elevation of 284.4 feet NGVD is used as an example.

Mississippi River stages would dictate how the spawning and rearing pool elevation is maintained. The gates would remain open up to 284.4 feet NGVD, allowing Mississippi River backwater to enter the spawning and rearing pool. The gates would be regulated to allow interior events to drain when the Mississippi River is below an elevation of 284.4 feet NGVD. Pumps would be used to drain interior events when the Mississippi River is above an elevation of 284.4 feet NGVD. This action would create a permanent waterbody that would provide habitat for spawning and rearing fishes (See RSEIS 2 Section 4.3.2.4).

Table 2.5 provides different scenarios of spawning and rearing pool elevations, ADFAs, and gains in mid-season fish rearing AAHUs. It is anticipated that real estate would be purchased in fee for all lands at and below the spawning and rearing pool elevation. Suitable vegetation that is tolerant to the flooding regime would be planted or would be allowed to grow naturally. On any lands within or adjacent to the pooling area that are not otherwise purchased in fee, flowage easements would be required due to soil saturation and/or seepage.

Table 2.5. Fish AAHU gains for alternative modified gate operations, New Madrid Floodway

Gate Operation	Spawning and Rearing Pool Acres	Additional Purchase/Easement Acres	ADFAs	AAHUs	AAHU Gain
Recommended Plan (2002 RSEIS)	N/A	N/A	1,036	669[1]	-
284.4 feet NGVD (April 1 – May 15)	2,000	850/664	1,531	3,368	2,699
283.4 feet NGVD (April 1 – May 15)	1,420	580/0	1,131	2,488	1,819

Gate Operation	Spawning and Rearing Pool Acres	Additional Purchase/Easement Acres	ADFAs	AAHUs	AAHU Gain
284.4 feet NGVD (April 1 – April 30) 283.4 feet NGVD (May 1 – May 15)	2,000	850/664	1,384	3,045	2,376
282 feet NGVD [2] (April 1 – May 15)	853	362/0	707	1,555	1,145

N/A – not applicable

[1]This gain was already captured in the 2002 RSEIS as a reduction in impact.

[2]This elevation is below the stop pump elevation during high Mississippi River stages. Water would recede below this elevation as the Mississippi River drops. Gains to mid-season fish rearing habitat would be achieved by holding water at 282 feet NGVD until May 15 as opposed to allowing the water to recede. Additionally, the existing condition of elevation 282 feet NGVD provides 410 AAHUs. Benefits to a spawning and rearing pool held at elevation 282 feet NGVD was calculated by subtracting the existing condition (410 AAHUs) from the mitigated condition (1,555 AAHUs).

In the period of record years 1943 to 1974, the existing conditions ponding elevation in the New Madrid Floodway stayed above 284.4 feet NGVD in only 3 of the 32 years (1944, 1951, and 1973) from April 1 to May 15 (See 2002 RSEIS, Appendix C, Plates 56-87). In many of the remaining years, the Mississippi River rose above an elevation of 284.4 feet NGVD for a portion of the April 1 to May 15 period but did not remain at that elevation. The proposed gate operation, if it were utilized during the period from 1943 to 1974, would have allowed interior ponding to remain at elevation 284.4 feet NGVD in those years. Additionally, the gates could have been operated to achieve a lower ponding level in the years that 284.4 feet NGVD was not reached from April 1 to May 15.

2.6.2.5.2 Technique 5b: St. Johns Bayou Modified Gate Operation

The closure gates in the St. Johns Bayou could also be managed in a similar fashion as proposed in the New Madrid Floodway. Table 2.6 provides one scenario of spawning and rearing pool elevation, total acreage, flowage easement acreages, ADFAs, and gains in mid-season fish rearing habitat. The table is divided into two sections based upon respective basins that mitigation is intended to compensate.

Table 2.6. AAHU gains for alternative modified gate operation, St. Johns Bayou

	Gate Operation	Spawning and Rearing Pool Acres	Additional Purchase/Easement Acres	ADFAs	AAHUs	AAHU Gain
St. Johns Bayou[1]	Recommended Plan (2002 RSEIS)	N/A	N/A	427	667	-
	283 feet NGVD (1 April – 15 May)	986	168/1046	726	3,049	2,380
New Madrid Floodway[2]	Recommended Plan (2002 RSEIS)	N/A	N/A	427	288	-
	283 feet NGVD (1 April – 15 May)2	986	168/1046	726	1,597	1,309

N/A – not applicable
[1]This utilizes St. Johns Basin HSI values
[2]This utilizes New Madrid Floodway HSI values

In the period of record years 1943 to 1974, the existing conditions interior ponding elevation in St. Johns Bayou stayed above an elevation of 283 feet NGVD in only 5 of the 32 years (1944, 1945, 1951, 1961, and 1973) from April 1 to May 15 (See 2002 RSEIS, Appendix C, Plates 3-34). In many of the remaining years, the St. Johns interior water surface elevation rose above an elevation of 283 feet NGVD for a portion of the April 1 to May 15 period but did not remain at that elevation. The proposed gate operation, if it were utilized during the period from 1943 to 1974, would have allowed interior ponding to remain at 283 feet NGVD in those years. Additionally, the gates could have been operated to maintain a lower ponding level in the years that 283 feet NGVD was not reached from April 1 to May 15.

2.7 Mitigation Scenarios

Two objectives of this RSEIS 2 are to demonstrate that compensatory mitigation is attainable and that the project is still economically justified. The techniques discussed within Section 2.6 above are a variety of options that may be used to overcome the deficit in mid-season fish rearing habitat. The basic mitigation feature would fully compensate direct impacts to jurisdictional wetlands, indirect impacts to farmland regardless of jurisdictional status, terrestrial wildlife, waterfowl, and shorebirds. The basic mitigation would also fully mitigate impacts to mid-season fish rearing habitat in the St. Johns

Bayou Basin and partially mitigate impacts to mid-season fish rearing habitat in the New Madrid Floodway. There are numerous potential scenarios that could be implemented that mitigate for the remaining impacts.

This RSEIS 2 is not recommending one specific scenario. However, this RSEIS 2 is recommending a whole host of mitigation techniques that could be used to mitigate impacts and provide for flexibility in mitigation development. Site-specific techniques would be determined and formulated in the site-specific mitigation plans. Flexibility is needed due to the following reasons:

- The provisions of WRDA 1986, 906(b)(1) state that the Corps of Engineers can not condemn land for the purpose of compensatory mitigation. Mitigation must be accomplished through willing sellers. Site-specific areas are required to calculate precise mitigation benefits. Site-specific areas are not known at this time.

- Owners of tracts of land that have currently been identified as willing sellers may not still be willing to sell at the time the Corps or local sponsor is ready to purchase or the asking price of the land may be unreasonable. The mitigation plan must be flexible to account for these potential issues.

- Owners of additional tracts of land may be identified as willing sellers in the future. These tracts may be highly desirable for compensating fish rearing impacts. The mitigation plan must be flexible to include these additional areas.

- Many of the additional techniques would require detailed analysis during the development of the site-specific mitigation plan. For instance, it may be determined during the development of a site-specific shorebird mitigation tract that the site cannot hold water at durations suitable for shorebirds due to a sand lens or other geological formation. Mitigation must be flexible to allow for a site-specific appropriate plan.

Mitigation credits would be calculated during the development of site-specific detailed mitigation plans. These plans would be fully coordinated with the interagency mitigation team, the local sponsor, and adjacent landowners. The mitigation goal would ultimately be reached when habitat values (AAHUs, DUDs, etc.) are appropriately replaced, not when a certain quantity of acres is procured and mitigation features implemented. Compensatory mitigation would occur concurrently with construction of flood damage reduction features. The New Madrid portion of the project or the St. Johns Bayou portion of the project shall not be operated until all mitigation lands for the respective portion of the project are acquired and all detailed mitigation plans approved by MDNR. Conservative estimates regarding likely gains to habitat have been made for the purpose of this RSEIS 2. Mitigation sites would be monitored after the project is operating to ensure success. Mitigation needs would be revised accordingly based on monitoring results. Revisions could include increases or decreases in overall acreages. However,

increases in mitigation acreages are not anticipated because conservative estimates have been made throughout this RSEIS 2.

Table 2.7 provides four conceptual scenarios for illustrative purposes that demonstrate that mitigation fully compensates for impacts to all significant resource categories. Table 2.8 provides a summary of real estate requirements for each scenario. As stated above, these are only conceptual scenarios. Table 2.9 provides the cost to implement the different mitigation scenarios.

2.7.1 No Federal Action

The St. Johns Bayou and New Madrid Floodway would not be constructed under the No Federal Action option. Existing conditions (land use, flood frequency, etc.) would remain the same. The recently acquired real estate for compensatory mitigation purposes would most likely be transferred out of public ownership and would most likely revert to without project conditions, primarily consisting of current agricultural uses.

2.7.2 Scenario A

Scenario A incorporates the basic mitigation feature, modifies the New Madrid Floodway gate operation to create a spawning and rearing pool at an elevation of 283.4 feet NGVD from April 1 to May 15, restores Riley Lake to an elevation of 286 feet NGVD, and reforests an additional 200 acres of cropland in the batture area. Scenario A would fully compensate the impacts to shorebird and mid-season fish rearing habitat in the St. Johns Bayou Basin, and over-compensate for impacts to wetlands, wildlife, waterfowl, and mid-season fish rearing habitat in the New Madrid Floodway. The associated costs of Scenario A (including flood control features) is approximately $107,097,000. The overall project benefit to cost ratio at the current interest rate of 5.125% is 1.03:1. Scenario A mitigates impacts to all significant resource categories and is economically justified.

2.7.3 Scenario B

Scenario B incorporates the basic mitigation feature and modifies the New Madrid Floodway gate operation to create a spawning and rearing pool at an elevation of 284.4 feet NGVD from April 1 to April 30 and decreases to 283.4 feet NGVD from May 1 to May 15. Scenario B would fully compensate the impacts to shorebird and mid-season fish rearing habitat in the St. Johns Bayou Basin, and over-compensate for impacts to wetlands, wildlife, waterfowl, and mid-season fish rearing habitat in the New Madrid Floodway. The associated costs of Scenario B (including flood control features) are approximately $106,363,000. The overall project benefit to cost ratio at the current interest rate of 5.125% is 1.04:1. Scenario B mitigates impacts to all significant resource categories and is economically justified.

2.7.4 Scenario C

Scenario C incorporates the basic mitigation feature, modifies the St. Johns Bayou gate to create a spawning and rearing pool at an elevation of 283 feet NGVD, restores Riley Lake to an elevation of 288 feet NGVD, and reforests an additional 1,050 acres of cropland in the batture area. Mid-season fish rearing credit would be taken for the New Madrid Floodway by modifying the operation of the St. Johns Bayou gate. New Madrid HSI values were used to calculate benefits. Scenario C would fully compensate the impacts to shorebird and mid-season fish rearing habitat in the St. Johns Bayou Basin and over-compensates for impacts to wetlands, terrestrial wildlife, waterfowl, and mid-season fish rearing impacts in the New Madrid Floodway. The associated cost of Scenario C (including flood control features) is approximately $109,869,000. The overall project benefit to cost ratio at the current interest rate of 5.125% is 1.01:1. Scenario C mitigates impacts to all significant resource categories and is economically justified.

2.7.5 Scenario D

Scenario D incorporates the basic mitigation feature, modifies operation of the St. Johns Bayou gate to create a spawning and rearing pool at 283 feet NGVD from April 1 to May 15, and modifies operation of the New Madrid Floodway gate to create a spawning and rearing pool at an elevation of 282 feet NGVD from April 1 to May 15. Mid-season fish rearing credit would be taken for the New Madrid Floodway by modifying the St. Johns Bayou gate. New Madrid HSI values were used to calculate benefits. Scenario D would fully compensate the impacts to shorebird and mid-season fish rearing habitat in the St. Johns Bayou Basin and over-compensate for impacts to wetlands, terrestrial wildlife, waterfowl, and mid-season fish rearing impacts in the New Madrid Floodway. The associated costs of Scenario D (including flood control features) are approximately $105,953,000. The overall project benefit to cost ratio at the current interest rate of 5.125% is 1.04:1. Scenario D mitigates impacts to all significant resource categories and is economically justified.

2.8 Mitigation Summary

As shown in Tables 2.7 and 2.9 there are several different scenarios that achieve compensatory mitigation requirements and still show a positive benefit to cost ratio. Actual mitigation credit would be determined during the development of site-specific detailed mitigation plans. It is important to reiterate that the New Madrid portion of the project or the St. Johns Bayou portion of the project shall not be operated until all mitigation lands for the respective portion of the project are acquired and all detailed mitigation plans are approved by MDNR. The Corps intends to construct the flood damage reduction features concurrently with mitigation. However, operation of the project (closing the new gates and operating the pumps) would not occur until all detailed mitigation plans are approved. Monitoring would ensure that expected gains to resource categories are achieved.

Table 2.7. Conceptual Mitigation Scenarios

Scenario							
	Wetlands*		Wildlife	Waterfowl	Shorebird	SJB Fish	NMF Fish
	acres	FCUs[1]	AAHUs	DUDs	AAHUs	AAHUs	AAHUs
Project Impacts	-622	-964	-2,059	-204,039	-761	-1,884	-2,329
Basic Mitigation Feature							
Reforestation SJB – 1,293 acres (fee)	1,293	5,701	1,846	296,097	0	313	0
Reforestation NM – 2,326 acres (fee)	2,326	10,255	3,321	532,654	0	0	38
Modified Moist Soil Unit – 765 acres (fee)	765	494	0	793,305	761	0 – 75[2]	0 - 238[2]
Vegetated Buffers – 671 acres (easement)	671	2,958	958	104,005	0	0	9
Wildlife Corridor – 266 acres (easement)	266	1,173	380	60,914	0	0	4
BOTSP Hydrologic Restoration	0	TBD	0	0	0	0	0 - 442[2]
BOTSP Perimeter Land Acquisition – 1,800 acres (fee)	1,800	7,936	2,570	162,000	0	0	0 - 504[2]
Borrow Pits – 387 acres (fee)	0	0	0	0	0	1,571	0
TOTAL Basic Mitigation	7,121	28,517	9,075	1,948,975	761	1,884[2]	51[2]
NET CHANGE	6,499	27,553	7,016	1,744,936	0	0[2]	-2,278[2]
Scenario A							
Additional Reforestation – 200 acres batture (fee)	200	882	159	18,000	0	0	19
Modified Gate – NMF 283.4 feet NGVD – 2,000 acres (fee)	0 – 2,000	TBD	0 – 2,856	TBD	TBD	0	1,819
Riley Lake – 286 feet NGVD – 432 acres (fee)	0	0	0	0	0	0	577
TOTAL Basic Mitigation and Scenario A	7,321	28,904	9,234	1,966,975	761	1,884	2,466
NET CHANGE	6,699	27,940	7,175	1,762,936	0	0	137

Scenario B							
Modified Gate – NMF 284.4 to 283.4 feet NGVD Combination – 2,850 acres (fee)	0 – 2,850	TBD	0 – 4,069	TBD	TBD	0	2,376
TOTAL Basic Mitigation and Scenario B	7,121	28,023	9,075	1,948,975	761	1,884	2,427
NET CHANGE	6,499	27,059	7,016	1,744,936	0	0	98
Scenario C							
Additional Reforestation – 1,050 acres batture (fee)	1,050	4,629	1,500	94,500	0	0	117
Modified Gate – SJB[3] 283 feet NGVD – 1,154 acres (fee)	0 – 1,154	TBD	0 – 1,647	TBD	TBD	0	1,309
Riley Lake - 288 feet NGVD – 680 acres (fee)	0	0	0	0	0	0	992
TOTAL Basic Mitigation and Scenario C	8,171	32,651	10,575	2,043,475	761	1,884	2,469
NET CHANGE	7,549	31,687	8,516	1,839,436	0	0	140
Scenario D							
Modified Gate SJB[3] 283 feet NGVD – 1,154 acres (fee)	0 – 1,154	TBD	0 – 1,647	TBD	TBD	0	1,309
Modified Gate NMF 282 feet NGVD – 1,215 acres (fee)	0 – 1,215	TBD	0 – 1,735	TBD	TBD	0	1,145
TOTAL Basic Mitigation and Scenario D	7,121	28,023	9,075	1,948,975	761	1,884	2,505
NET CHANGE	6,499	27,059	7,016	1,744,936	0	0	176

* Impacts to jurisdictional status only

TBD – To be determined during the development of site-specific detailed mitigation plans

[1]Represents the sum of all functional categories

[2]The minimum value has been used in determining the total basic mitigation credits and the net change in value.

[3]Credits would be taken for fish rearing impacts in the New Madrid Floodway. New Madrid Floodway HSI values were used.

Table 2.8. Real estate requirements for alternative mitigation scenarios

Scenario	Lands Acquired (Fee)	Lands Acquired (Easement)[1]	Borrow Pits and Floodplain Lakes (fee)	Total Area Acquired
A	8,384	937	819	10,140
B	9,034	937	387	10,358
C	8,388	937	1,087	10,412
D	8,553	937	387	9,877

[1]Includes the acreage required for the vegetated buffer strips and wildlife corridor only. This figure does not include additional acreages required for flowage easements or winter waterfowl ponding easements.

Table 2.9. Mitigation costs and overall benefit to cost ratios for alternative mitigation scenarios

Scenario	Total First Cost	Benefit:Cost[1]
A	$35,126,000	1.03:1
B	$34,392,000	1.04:1
C	$37,898,000	1.01:1
D	$33,982,000	1.04:1

[1]Interest rate of 5.125%

2.9 Mitigation Contingencies

The mitigation scenarios analyzed above are dependent on fish being able to pass through the four 10-foot by 10-foot box culverts in Mud Ditch. The Corps remains confident that fish will pass through the New Madrid Floodway box culverts, if open, as designed (refer to Section 4.3.2.1). However, the Corps acknowledges that there is a concern over fish passage. These concerns are based on studies that have been conducted in other geographical areas of the country, on other species of fish that are not common to the study area, and on culverts that were typically much smaller and involved a hydraulic drop and extreme velocities. The Corps is proposing to monitor fish passage through the culverts.

2.9.1 Mid-Season Fish Rearing Habitat Conservative Estimates

Conservative estimates were used in determining flood duration between April 1 and May 15 on potential mitigation lands. As an example, most of the mitigation measures in the New Madrid Floodway have used a flood duration of 5%. Existing farmlands in the area have extensive features that facilitate drainage. Compensatory mitigation on reforested areas will involve removal of farm drains, plugging existing drainage ditches, and creation of microtopography. These hydrologic improvements and the high clay content of the existing soil would most likely result in flood durations greater than 5%. Furthermore, precipitation combined with planned microtopography improvements could

conceivably keep portions of mitigated tracts of land saturated with surface water for the entire 45-day mid-season fish rearing period.

Additional conservative estimates that have been made in this RSEIS relate to the hydrologic restoration of Big Oak Tree State Park. No mid-season fish rearing habitat credit was taken in this RSEIS 2 for the water delivery system to Big Oak Tree State Park. The conceived water delivery system will entail two five-foot diameter culverts through the Mississippi Mainline Levee. This has the potential to yield significant gains to mid-season fish rearing habitat.

Lastly, conservative estimates regarding mid-season fish rearing habitat were made in this RSEIS 2 concerning fish use in shorebird areas. No mid-season fish rearing habitat credit was taken for the proposed modifications to moist soil units. It is highly likely that fish will utilize these areas. The moist soil units will primarily be managed for shorebirds. However, adaptations to the management of these areas may result in gains to fish habitat. These adaptations will be investigated during the development of the site-specific detailed mitigation plans.

2.9.2 Over Compensation of Other Resources

With the exception of shorebirds and mid-season fish rearing habitat, the basic mitigation feature significantly over compensates for all of the remaining resource categories (Table 2.2). As an example, the basic mitigation feature over compensates impacts to waterfowl by 1,744,937 DUDs and impacts to terrestrial wildlife by 7,016 AAHUs. Obviously, no additional contingencies are required for these resource categories.

2.9.3 Adaptive Management

Adaptive management opportunities will be explored based on monitoring results and best available science. Compensatory mitigation may involve trial and error in order to maximize restored habitat. As an example, modifications are proposed in moist soil units to benefit fish. Experience may show that degrading a perimeter levee will result in detriments to the management of shorebirds. These perimeter levees could be re-graded to construct a traditional moist soil unit.

An additional adaptive management technique may require the alteration of a moist soil unit into bottomland hardwood restoration. Monitoring may reveal that tracts are not holding water as designed due to sand lenses or other geological formations. These areas may be suitable for bottomland hardwood restoration.

Management of reforested areas in which hydrology is increased by the use of a water control device would also undergo adaptive management. Flood durations could conceivably be held on mitigated area the entire 45-day mid-season fish rearing period. However, only certain species of trees may be able to tolerate this flood regime. The flood durations could be adjusted based on monitoring fish usage and the health of the newly planted forest.

There are several adaptive management opportunities that could be explored in the development of creating the spawning and rearing pool by modifying the outlet gate. A rule curve could be developed based on elevation of the spawning and rearing pool, water temperature, elevation of the Mississippi River, river forecast, and climatic conditions (*e.g.,* unseasonably warm/cold, unseasonably wet/dry, floods/droughts, etc.). Additionally, monitoring may allow refinement of the timing of the gate operation to maximize benefits to the fish while maintaining the project's economic benefits.

2.9.4 Additional Mitigation Opportunities Outside of the New Madrid Floodway

There are additional mitigation opportunities that could be explored outside of the floodway. These opportunities include restoring floodplain lakes such as Riley Lake, additional areas listed in Table 2.3, or areas that may be desirable to the LMRCC. Reforesting cropland in the batture area is another opportunity (Figure 3**)**. There are also numerous other Mississippi River backwater areas that could be used for mitigation (Table 2.10). Reforesting farmland or restoring permanent waterbodies could be pursued in these areas as well.

Table 2.10. Mississippi River backwater areas within 120 miles of the project area

Basin	Distance from Project Area	Acres Flooded[1]
Little River Headwater Diversion (MO)	**118 miles**	**6,400**
Cache River (IL)	**71 miles**	**12,200**
Mayfield Creek (KY)	**61 miles**	**26,300**
Bayou DuChien/Obion Creek (TN)	**33 miles**	**157,400**
Forked Deer/Obion River (TN)	**70 miles**	**50,900**
Hatchie River (TN)	**116 miles**	**66,800**

[1]Acres flooded based on 1997 satellite imagery corresponding to a 25-year flood event. Values shown do not include batture land.

It is important to reiterate, that the Corps maintains that fish will freely pass through the New Madrid Floodway box culverts, if open. The Corps has every intention to mitigate for project impacts within the project area. However, it may be necessary to move the majority of the mitigation out of the project area if fish cannot access the New Madrid Floodway.

3.0 AFFECTED ENVIRONMENT

This chapter describes the conditions in the project area. The overall project area can be described as an intense agricultural area with limited and isolated tracts of bottomland hardwoods (Figure 4). Chapter 4.0 describes the environmental resources associated with the issues of concern.

3.1 Physical Environment

3.1.1 Location, Climate, Land Use, Topography, Hydrology, Geology, Minerals, and Soils

There is no change to the description of the physical environment from the 2002 RSEIS (Figures 5 through 17). The images used in Figures 5 through 17 are 2005 USDA National Agricultural Imagery Program (NAIP) with a release date of August 2005. In summary, land use in the area is predominantly agriculture (Table 3.1, Table 3.2, and Figure 3). Table 3.4 and Table 3.5 provide a description of land use by elevation in each respective basin.

Table 3.1. Landcover Types in St. Johns Bayou Basin and New Madrid Floodway

St. Johns Bayou Basin Total Landcover			**New Madrid Floodway Total Landcover**		
Land Use	**Total Acres**	**Percent Landcover**	**Land Use**	**Total Acres**	**Percent Landcover**
Forested	20,096	6.2	Forested	10,369	7.8
Scrub-shrub/Marsh	270	0.1	Scrub-shrub/Marsh	878	0.7
Cropland	280,290	86.5	Cropland	113,007	85.2
Pasture	1,277	0.3	Pasture	922	0.7
Herbaceous	21,121	6.5	Herbaceous	6,625	5.0
Open Water	944	0.3	Open Water	797	0.6
Sandbar	167	0.1	Sandbar	7	0.0
Urban	8	0.0	Urban	0	0.0
TOTAL	**324,173**	**100**	**Total**	**132,605**	**100**

Table 3.2. Landcover Types in Project Batture Lands

Project Batture lands		
Land Use	**Total Acres**	**Percent Landcover**
Forested	23,796	50.6
Scrub-shrub/Marsh	1,083	2.3
Cropland	18,816	40.0
Pasture/Herbaceous	14	0.0
Open Water	2,123	4.5
Sandbar	1,027	2.2
Urban	188	0.4
TOTAL	**47,047**	**100**

Table 3.3. Land Cover Type-Stage Area - New Madrid Floodway

Elevation Feet (NGVD)	Cropland	Fallow	BLH	Large Waterbody	Small Waterbody
281 and below	143	40	215	69	72
282 and below	329	60	250	122	92
283 and below	603	76	289	134	113
284 and below	1,018	98	328	143	140
285 and below	1,541	139	386	171	179
286 and below	2,327	207	544	204	231
287 and below	3,423	310	850	235	295
288 and below	5,320	472	1,642	388	372
289 and below	8,206	729	2,506	572	453
290 and below	11,843	1,023	3,354	592	503
291 and below	16,160	1,347	4,067	603	549
292 and below	21,251	1,680	4,487	608	573
293 and below	27,205	2,134	4,863	614	592
294 and below	32,716	2,473	5,249	628	608
295 and below	38,185	2,878	5,655	643	626
296 and below	43,032	3,226	5,996	648	643
297 and below	47,690	3,589	6,295	652	663
298 and below	52,866	3,955	6,642	663	688
299 and below	57,485	4,297	6,979	670	713
300 and below	61,814	4,635	7,232	687	744

Table 3.4. Land Cover Type-Stage Area – St. Johns Bayou

Elevation Feet (NGVD)	Cropland	Fallow	BLH	Large Waterbody	Small Waterbody
281 and below	229	53	258	39	93
282 and below	310	64	306	45	101
283 and below	398	78	352	48	110
284 and below	494	92	400	50	118
285 and below	1,811	247	811	113	250
286 and below	2,143	317	1,086	120	305
287 and below	2,597	362	1,320	122	322
288 and below	3,056	416	1,556	123	340
289 and below	3,570	481	1,778	125	353
290 and below	6,067	693	2,464	144	486
291 and below	7,413	834	2,676	155	526
292 and below	8,764	910	2,807	163	540
293 and below	10,942	991	2,946	168	552
294 and below	13,401	1,143	3,089	203	566
295 and below	23,389	1,941	3,797	267	639
296 and below	26,851	2,255	4,107	269	673
297 and below	29,092	2,488	4,374	272	697
298 and below	31,700	2,746	4,648	273	707
299 and below	34,562	3,073	4,872	273	714
300 and below	44,546	3,960	5,478	274	741

Table 3.5. Land Cover Type-Stage Area – Batture Land

Elevation Feet (NGVD)	Cropland	Fallow	BLH	Large Waterbody	Small Waterbody
281 and below	12	343	255	636	0
282 and below	22	382	338	740	0
283 and below	37	429	424	820	0
284 and below	68	472	557	900	0
285 and below	131	527	724	967	1
286 and below	235	594	999	1,063	7
287 and below	361	658	1,340	1,131	9
288 and below	496	719	1,816	1,246	11
289 and below	687	765	2,464	1,311	13
290 and below	924	810	3,261	1,375	17
291 and below	1,253	855	4,131	1,445	20
292 and below	1,748	905	5,090	1,595	22
293 and below	2,243	955	6,005	1,637	23
294 and below	2,747	1,014	6,956	1,658	24
295 and below	3,291	1,079	7,966	1,679	25
296 and below	3,872	1,170	9,098	1,730	26
297 and below	4,542	1,267	10,324	1,803	26
298 and below	5,303	1,375	11,460	1,876	27
299 and below	5,959	1,475	12,450	1,900	27
300 and below	6,478	1,573	13,332	1,913	27
301 and below	6,895	1,659	14,193	1,927	27
302 and below	7,327	1,726	15,069	1,944	27
303 and below	7,931	1,795	15,957	1,972	27
304 and below	8,645	1,870	16,894	2,001	27
305 and below	9,685	1,933	17,873	2,024	27
306 and below	11,141	1,994	18,837	2,044	27
307 and below	12,803	2,047	19,772	2,060	27
308 and below	14,271	2,089	20,602	2,080	27
309 and below	15,356	2,122	21,262	2,104	27
310 and below	16,044	2,153	21,824	2,110	27
311 and below	16,611	2,186	22,322	2,114	27
312 and below	17,249	2,203	22,765	2,118	27
313 and below	17,773	2,218	23,125	2,120	27
314 and below	18,145	2,236	23,400	2,122	27
315 and below	18,392	2,251	23,571	2,123	27
316 and below	18,543	2,263	23,660	2,123	27
317 and below	18,684	2,270	23,711	2,123	27
318 and below	18,767	2,275	23,748	2,123	27
319 and below	18,800	2,281	23,775	2,123	27
320 and below	18,816	2,285	23,796	2,123	27

3.1.2 Water Resources

3.1.2.1 Wetlands

There is no change to the description of wetlands from the 2002 RSEIS. However impacts have been revised for the purpose of this RSEIS 2. Further discussion on wetlands is found in Section 4.2.1 of this RSEIS 2.

3.1.2.2 Hypoxia

Hypoxia in the Gulf of Mexico has been attributed to excess nutrient loading from the Mississippi River drainage system. Several factors contribute to the development of hypoxia including the timing and magnitude of the nutrient load and the concentrations of nitrogen, phosphorus, and other nutrients. The interactions among these factors and the development of hypoxia are still being studied. Several proposed methods of reducing the extent of hypoxia (reduced input from terrestrial sources, wetland restoration, establishment of riparian zones, etc.) are all designed to reduce the movement of nutrients from the land to river conduits or to reduce concentrations once in the river conduits.

Two methods (transport from land cover or reduced runoff and retained by the land cover/removed from the floodwater *i.e.*, "river filtering") were considered in the Supplemental Water Quality Analysis - St. Johns Bayou and New Madrid Floodway, Ashby, Ruiz, and Deliman (2000) (page 4, paragraph 1 also in Appendix I Water Quality of the 2002 RSEIS page I-4, paragraph 1). Environmental consequences of mitigation features and techniques are discussed in Section 5.3.

3.1.2.3 Water Quality

There is no change from the description of the Affected Environment with respect to water quality from Section 3.10 in the 2002 RSEIS. A discussion regarding the phenomenon of hypoxia in the Gulf of Mexico has been addressed above and additional information can be found in Section 5.3.

3.2 Socioeconomic Profile

The Corps is aware of no significant changes to the socioeconomic profile of the project area. The socioeconomic profile is located in Section 3.11 of the 2002 RSEIS. A detailed socioeconomic analysis is contained in Appendix B of the 2002 RSEIS.

Executive Order 12898 requires the Federal government to achieve environmental justice by identifying and addressing disproportionately high adverse effects of its activities on minority and low-income populations, and by involving potentially affected minorities in the public coordination process. It also requires the analysis of information such as race, national origin, and income level for areas expected to be impacted by environmental actions. Table 3.6 provides a description of the current socioeconomic profile of New Madrid and Mississippi counties, Missouri.

Table 3.6. Socioeconomic Profile, New Madrid and Mississippi Counties, Missouri[1]

People QuickFacts	New Madrid County	Mississippi County	State of Missouri
Population, 2004 estimate	18,969	13,697	5,754,618
Population, percent change, April 1, 2000 to July 1, 2004	-4.0	2.0	2.8
Population, 2000	19,760	13,427	5,595,211
Population, percent change, 1990 to 2000	-5.6	-7.0	9.3
Persons under 5 years old, percent, 2000	6.6	7.2	6.6
Persons under 18 years old, percent, 2000	26.4	26.3	25.5
Persons 65 years old and over, percent, 2000	15.5	15.9	13.5
Female persons, percent, 2000	52.0	53.3	51.4
White persons, percent, 2000 (a)	83.2	77.9	84.9
Black or African American persons, percent, 2000 (a)	15.4	20.5	11.2
American Indian and Alaska Native persons, percent, 2000 (a)	0.2	0.2	0.4
Asian persons, percent, 2000 (a)	0.1	0.1	1.1
Native Hawaiian and Other Pacific Islander, percent, 2000 (a)	Z	Z	0.1
Persons reporting some other race, percent, 2000 (a)	0.3	0.3	0.8
Persons reporting two or more races, percent, 2000	0.8	0.9	1.5
White persons, not of Hispanic/Latino origin, percent, 2000	82.7	77.5	83.8
Persons of Hispanic or Latino origin, percent, 2000 (b)	0.9	1.0	2.1
Living in same house in 1995 and 2000', pct age 5+, 2000	58.8	60.1	53.6
Foreign born persons, percent, 2000	0.3	0.5	2.7
Language other than English spoken at home, pct age 5+, 2000	1.4	0.9	5.1
High school graduates, percent of persons age 25+, 2000	63.6	61.1	81.3
Bachelor's degree or higher, pct of persons age 25+, 2000	9.6	9.6	21.6
Persons with a disability, age 5+, 2000	4,431	3,449	973,637
Mean travel time to work (minutes), workers age 16+, 2000	18.1	19.7	23.8
Housing units, 2002	8,765	5,923	2,503,187
Homeownership rate, 2000	66.0	63.6	70.3
Housing units in multi-unit structures, percent, 2000	11.9	10.7	20.0
Median value of owner-occupied housing units, 2000	$48,100	$47,000	$89,900
Households, 2000	7,824	5,383	2,194,594
Persons per household, 2000	2.48	2.44	2.48
Median household income, 1999	$26,826	$23,012	$37,934
Per capita money income, 1999	$14,204	$13,038	$19,936
Persons below poverty, percent, 1999	22.1	23.7	11.7

Business QuickFacts	New Madrid County	Mississippi County	State of Missouri
Private nonfarm establishments with paid employees, 2001	344	283	144,071
Private nonfarm employment, 2001	6,022	2,871	2,404,489
Private nonfarm employment, percent change 2000-2001	-5.3	4.8	0.2
Nonemployer establishments, 2000	762	596	311,786
Manufacturers shipments, 1997 ($1000)	529,847	66,405	93,115,478
Retail sales, 1997 ($1000)	145,035	94,710	51,269,881
Retail sales per capita, 1997	$7,072	$7,021	$9,482
Minority-owned firms, percent of total, 1997	F	F	6.5
Women-owned firms, percent of total, 1997	38.0	25.3	25.2
Housing units authorized by building permits, 2002	41	8	28,255
Federal funds and grants, 2002 ($1000)	215,040	138,616	42,346,515
Geography QuickFacts	New Madrid County	Mississippi County	State of Missouri
Land area, 2000 (square miles)	678	413	68,886
Persons per square mile, 2000	29.1	32.5	81.2
FIPS Code	143	133	29
Metropolitan or Micropolitan Statistical Area	None	None	

(a) Includes persons reporting only one race.
(b) Hispanics may be of any race, so also are included in applicable race categories.
FN: Footnote on this item for this area in place of data
NA: Not available
D: Suppressed to avoid disclosure of confidential information
X: Not applicable
S: Suppressed; does not meet publication standards
Z: Value greater than zero but less than half unit of measure shown
F: Fewer than 100 firms
[1]Source: US Census Bureau State & County QuickFacts Data derived from Population Estimates, 2000 Census of Population and Housing, 1990 Census of Population and Housing, Small Area Income and Poverty Estimates, County Business Patterns, 1997 Economic Census, Minority- and Women-Owned Business, Building Permits, Consolidated Federal Funds Report, 1997 Census of Governments

The rural communities within the project area may be characterized by low income and relatively high unemployment status. These populations are vulnerable to the effects of the flooding on their communities such as closed roads which preclude the provision of emergency services to isolated rural areas in anything other than by tractor or by boat. Other effects of flooding include interruptions in water and sewage services, inundation of roads and houses, toxic mold, and flooding of land and fields.

As noted by the National Association for the Advancement of Colored People, Charleston Missouri Chapter of the effects of this project on Pinhook, Missouri:

> "The residents of this small African-American community have been forced to endure the regular flooding of the Mississippi River, adversely affecting their economic livelihood. … To take no action means continued suffering and

inconvenience for community residents. The proposal to build a levee around East Prairie would increase the isolation of Pinhook residents.

The Bootheel suffers with the problem of poverty, and one of the main causes of that poverty is the lack of economic development. Economic development is hampered when there is a lack of economic stability, and that stability is threatened each time thousands of acres of farmland stand under water and delay planting. Pinhook is an agricultural community, and the farmers of the community cannot sustain themselves into the future without the completion of the St. Johns Bayou-New Madrid Floodway Project by the Corps of Engineers."

Construction of the project is expected to generate additional employment for the area and no adverse effects are expected on the area. Implementation of the project is expected to greatly benefit the area as described in Appendix B of the 2002 RSEIS. Furthermore, compensatory mitigation will provide quality of life improvements by providing increased wildlife activity, aesthetics, and recreation areas.

3.3 Biological Factors

3.3.1 Wildlife Resources

There is no change to the description of existing wildlife resource from the 2002 RSEIS.

3.3.2 Waterfowl Resources

Much of the information concerning waterfowl in this RSEIS 2 (including Sections 4.3.4 and 5.6) is based on personal communications with Dr. Mickey Heitmeyer of the University of Missouri Gaylord Laboratory and Mr. Rob Vinson of MDC Ten Mile Pond CA. Much of their input is based on the general habitat and foraging depths studies of Bellrose (1980), Heitmeyer (2002), and Heitmeyer (2005); and nutrition and food availability studies of Neely (1956), Davis *et al.* (1961), Shearer *et al.* (1969), Mayeaux *et al.* (1980), Fredrickson and Taylor (1982), Fredrickson and Reid (1988), and McAbee (1994).

Waterfowl are present throughout the year in the project area. Wood duck and, to a lesser extent, mallard, hooded merganser, and blue-winged teal breed in the project area. During migration and winter the St. Johns Bayou Basin and the New Madrid Floodway are important areas for thousands of dabbling ducks (*i.e.,* mallard, gadwall, green and blue-winged teal, pintail, widgeon, shoveler, and black duck), coots and geese. A large part of the waterfowl use occurs in and near the Ten Mile Pond Wildlife CA. Diving ducks, such as lesser scaup, ring-necked duck and canvasback use deeper waters of the project area, primarily backwaters and the mainstem of the Mississippi River. Diving ducks tend to use the project area more during spring migration than during fall and winter. Ring-necked ducks are adapted to shallower depths than other diving ducks and are more likely to use flooded backwater areas and occasionally are seen with mallards and other dabbling ducks.

Fall migration of waterfowl begins in mid-August when the first flocks of blue-winged teal arrive, and continues through late December and early January as more winter-hardy species continue south. Fall/winter migration has barely concluded before early spring migrants fly north. Wintering may occur at various latitudes and is dictated by habitat availability and freezeup. Spring migration through the project area generally concludes by mid-March as the last of the shovelers and blue-winged teal depart.

Wetland habitat in the project area is very limited and is primarily restricted to the remaining bottomland hardwoods, the Mississippi River and back channels, water courses of the basins, and two significant state-owned and managed areas: Ten Mile Pond CA, and Big Oak Tree State Park. Smaller wetland areas such as those around the Eagle's Nest Area exist in a limited degree, but the preponderance of habitat in the project area is prior converted croplands. These croplands, primarily in soybeans, provide waterfowl feeding areas when they are flooded by backwaters of the Mississippi River or from headwater flooding. Because of the importance of wetlands to waterfowl, restoring wetlands, especially bottomland hardwoods, is a key objective of the Lower Mississippi Valley Joint Venture, a subset of the North American Waterfowl Management Plan. A primary focus of the Joint Venture is reforestation of croplands into bottomland hardwoods, an extremely valuable wetland complex for waterfowl.

The waterfowl season in the project area, as analyzed in the USFWS Waterfowl Assessment Methodology, extends for 151 days from November 1 to March 31. In most years, lands at the lower ends of both basins are not normally flooded during fall and early winter. During February through mid-March, high Mississippi River stages can cause backwater flooding in the lower New Madrid Floodway and also cause the inability to drain interior floodwaters from the St. Johns Bayou Basin. These spring flood events create temporary feeding and resting areas for migrating and pre-migrating waterfowl. At this time, waterfowl seek important invertebrate protein, particularly associated with flooded bottomland hardwoods, for proper late winter molt, muscle mass, and pre-egg laying conditions.

Waterfowl populations depend on a variety of habitat types. Wetlands of the project area, particularly bottomland hardwoods, are important to wintering and migrating waterfowl. Forested wetlands provide nutritious food for waterfowl, secure roosting areas, cover in inclement weather, loafing sites, protection from predators, and isolation for pair formation.

3.3.3 Shorebird Resources

There is no change to the description of shorebird resources from the 2002 RSEIS.

3.3.4 Fishery Resources

There is no change to the description of existing fishery resource from the 2002 RSEIS.

3.3.5 Threatened and Endangered Species

There is no change to the description of threatened and endangered species from the 2002 RSEIS. The USFWS has been consulted concerning Federally threatened and endangered species. This specifically included the Ivory-billed Woodpecker, and the USFWS did not deem that this document needed to address that issue.

3.3.6 Freshwater Mussels

Freshwater mussels are described in Section 4.7 of the 2002 RSEIS. Impacts are discussed in Section 5.7 of the 2002 RSEIS. Additional investigations for the purpose of monitoring and relocation efforts were conducted by the Corps and the USFWS during the summer of 2005.

3.4 Cultural Resources

A literature search was conducted in the late 1970's on 170 miles of St. Johns Bayou and New Madrid Floodway ditches and 2,500 acres of mitigation area in Scott, New Madrid, and Mississippi counties, Missouri. The literature search concluded that all lands above the 290 feet NGVD should be considered as high sensitivity zones for cultural resources. In 1986, an intensive cultural survey of approximately 140 miles of drainage ditches in this same area was conducted (Klinger *et al.*, 1988). The survey resulted in the discovery of 21 previously unrecorded archeological sites, nine of which were considered potentially eligible for inclusion in the National Register of Historic Places. In 1997, the right bank of St. James Ditch in the St. Johns Bayou area was surveyed for cultural resources. Eleven non-significant prehistoric artifact loci and five low-density late nineteenth- and/or twentieth-century historic scatters were discovered (Albertson and Buchner, 1997). All construction sites within the St. Johns portion of the project have been surveyed for cultural resources. The results of all surveys were coordinated with the Missouri State Historic Preservation Officer (SHPO). The project was then designed to avoid all potentially significant archeological sites.

In response to the SHPO's concerns related to the St. John's Bayou and the New Madrid Floodway, in the DSEIS issued in 1999 the District agreed to conduct a cultural history of the entire project area. A Memorandum of Agreement (MOA) was developed and signed between the SHPO and the Memphis District in 1999. The study was to contain a brief prehistory section and the remainder of the report would concentrate on the historic aspects of the area. The report was completed in 2003, focusing mainly on the New Madrid Floodway and its affects on the local history. A video presentation focusing on the history of the area is currently being developed.

An inventory of *historic properties* (36 CFR §800) is not available at present for the existing acquired mitigation lands (1,600 acres) and the area(s) where additional mitigation land acreage may be acquired. An inventory of these areas would be made concurrent with land acquisition. A number of significant cultural resources, predominantly archeological sites, may exist in the Area of Potential Effect. The Corps is

committed to continued implementation of the National Historic Preservation Act (NHPA) planning process, seeking protection for this category of physical resources (see discussion under Environmental Consequences).

4.0 SIGNIFICANT RESOURCES RELATED TO ISSUES OF CONCERN

4.1 Introduction

This chapter describes the significant resources related to issues of concern. This chapter is written to supplement the 2002 RSEIS and does not replace it. This chapter relates only to the clarification of mitigation calculations, issues related to mitigation, the addition of mitigation techniques that compensate for the unavoidable impacts to fish and wildlife resources, and clarification of the remaining issues listed in Section 1.4.3. In general, significant resources in the project area remain as described in Chapter 4 of the 2002 RSEIS. In some cases, language from the 2002 RSEIS is provided if the previous document's language is part of the clarification. The Corps is not aware of any significant change in the project area since the 2002 RSEIS. However, significant resources within the batture area are discussed, in addition to the aforementioned clarifications. This chapter is intended to state and describe the issues of concern. If only clarification is required, the issue may be resolved in this chapter. However, if there are questions about the results or outcome of mitigation techniques with regard to particular issues, those are discussed in Chapter 5. This chapter is divided by relevant physical, biological, socioeconomic, and other factors.

4.2 Physical Factors

4.2.1 Wetlands

Revisions to the wetland analysis have been made in this RSEIS 2. The revisions include determinations of farmed wetlands that may be indirectly impacted by the project and a functional assessment. The functional assessment is located in Appendix D of this RSEIS 2.

The 2000 SEIS estimated there were a total of 36,000 acres of wetlands in the project area (2000 SEIS, Appendix D Tables 2 and 4). This estimate was derived by a two step process including an inundation analysis and a "wetland scene." See 2000 SEIS Appendix D, pages D-2 to D-4. The first step utilized an inundation analysis that was based on the Corps 1987 Wetland Delineation Manual Guidelines of 12 consecutive days of continuous inundation in 50% of years. The elevations that met the 12-day consecutive inundation criterion were 290 feet NGVD for the New Madrid Floodway and 289.4 feet NGVD in St. Johns Bayou Basin.

A wetland scene was used in the second step. A satellite image taken on April 22, 1993, was used to further define the "wet" area within the 300-foot NGVD contour (See 2000 SEIS Appendix A Plate 4). The acres presented in the 2000 SEIS, Appendix D Tables 2

and 4 are a measure of all areas, including farmland and non-farmland, that could be subject to a reduction in inundation from backwater flooding (or impounded headwater in the case of St. Johns Basin) when the River was at 290.5 feet NGVD.

The 2000 SEIS over estimated the potential impacts to project area wetlands for three reasons. First, the wetland scene used was when the river stage was higher than the inundation analysis indicated in the New Madrid Floodway. The river was 0.5 feet higher than the 12-day inundation criterion for the New Madrid Floodway. Therefore, the scene showed more wet area than the inundation criterion required. Second, the wetland scene showed areas wet that were well above 290 or 290.5 feet NGVD due to other hydrologic processes (e.g., rainfall, topography, soils, seepage). Third, the use of the 1987 Wetland Delineation Manual inundation criterion of 12-day consecutive days was inappropriate to use for agricultural lands.

The 2002 RSEIS used the appropriate hydrological criterion of 15 consecutive day inundation for farmed lands. The elevation that met the 15 consecutive day inundation was determined to be 289 feet NGVD for St. Johns Basin and 288.3 for the New Madrid Floodway (see 2002 RSEIS Appendix C Tables 3 and 6 and page C-5 and Appendix D pages D-4 through 6). The 2002 RSEIS corrected the estimated acres of wetlands within the project area, resulting in Table 4-1 and 4-2 and Appendix D Tables 3 and 4.

A total of 18,120 acres of both agricultural and non-agricultural lands was estimated in the project area that meets hydrologic criteria to be classified as wetlands or farmed wetlands. This determination was based only on the effects of backwater flooding in the project area at or below 300 feet NGVD (6,461 acres in the St. Johns Bayou Basin and 11,659 acres in the New Madrid Floodway). Approximately 54% of the area is in agricultural production (9,700 acres), 33% are forested areas (6,064 acres), and 13% are herbaceous lands, scrub/shrub/marsh, pasture, or open water (2,356 acres). The non-agricultural areas were classified as wetlands.

4.2.1.1 Forested Areas

Section 4.3.1 of the 2002 RSEIS describes methodologies used to assess impacts to vegetated wetlands. Wetlands are those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that, under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions.

There is no change to the description of forested wetlands from the 2002 RSEIS.

4.2.1.2 Agricultural Areas

Section 4.3.2 of the 2002 RSEIS describes methodologies used to assess impacts to agricultural lands that have the potential to be classified as farmed wetlands. According to an attachment to the NRCS letter dated April 7, 1998 (specifically at Administrative Record Volume 43, pages 276, 277, and 279), farmed wetlands are lands that were

manipulated and used to produce an agricultural commodity prior to December 23, 1985, but were not completely converted; that are not abandoned; and that would otherwise be considered a wetland. According to this reference, farmed wetlands 1) have a predominance of hydric soils; 2) have a 50 percent chance of being inundated or flooded for at least 15 consecutive days or 10 percent the growing season (whichever is less). For an area to be classified as a farmed wetland, it must meet both requirements.

No attempt has been made in this RSEIS 2 or any prior document to delineate farmed wetlands in the project area. The determination whether the hydric soils criterion was actually met for any particular site was also not made for this RSEIS 2. The NRCS is the responsible agency for making farmed wetland determinations per the Food Security Act of 1985 (FSA).

Previous NRCS wetland inventory classified 0.4 percent, or about 520 acres, of the cropland in the project area (in both basins and affected by the project, *i.e.*, at or below elevation 300 feet NGVD) as farmed wetlands (NRCS letter dated May 29, 1998). However, the NRCS did state that, "Use of current mapping conventions for agricultural wetlands would result in an increase in the area designated as farmed wetlands" (NRCS letter dated May 17, 1999).

The Corps conducted analyses to determine the hydrologic impact of project implementation on agricultural lands in the project area. The reduction of backwater flooding is the primary impact. Therefore, impact assessment and mitigation planning were based upon an inundation analysis, rather than the 0.4 percent estimate from NRCS. This analysis is discussed in Appendix D of the 2002 RSEIS and the results are presented in Tables 4.1 and 4.2 of the 2002 RSEIS.

The growing season used for the analysis presented in the 2002 RSEIS was March 20 to November 12, or 238 days. Cropland that has the potential to be classified as farmed wetlands was based on the analysis of continuous flooding for 15 consecutive days duration, which is the governing hydrological criterion for the project area. The hydrological analysis using this 15 consecutive day criterion indicated that project implementation would result in a reduction in backwater inundation on up to 1,296 and 5,417 acres of agricultural lands in the St. Johns Bayou Basin and the New Madrid Floodway, respectively.

The Corps took into account that the reduction in backwater inundation is expected in the project area with project implementation. This does not mean that these lands will lose their wetland character. As stated in the 2002 RSEIS, there are factors other than backwater inundation that support maintenance of wetlands in the project area. These other factors include headwater flooding, interior precipitation, seepage, topography, and soil conditions.

NRCS previously concurred with the basis of that analysis, stating "We feel that the information you developed on agricultural wetlands in the project area is good for project planning and impacts analysis." (NRCS letter dated May 17, 1999). To ensure that

agency's continued concurrence with the validity of that statement, the Corps requested NRCS to reexamine that analytical basis.

Toward that end, NRCS has recently reviewed the project area utilizing current mapping conventions to determine if application of these conventions would cause a significant change in the amount of non-certified farmed wetlands in the project area due to the backwater effect from the Mississippi River (NRCS letter dated October 5, 2005 – Appendix G). NRCS has verified that the 1998 estimate of 0.4 percent of the project area being farmed wetland is still adequate for planning purposes. Therefore, there are about 520 acres of farmed wetlands in the project area that have the potential to be impacted by the flood damage reduction project. The remaining land is mostly prior converted cropland.

4.2.1.3 Wetland Impacts

Wetland impacts are described in Section 5.3.3 in the 2002 RSEIS. Direct impacts to jurisdictional wetlands from project construction in the St. Johns Bayou Basin for channel and pump station construction would be 90 acres of wetlands (78 acres of forested, seven acres of cropland, five acres of herbaceous vegetation, and less than one acre of pasture). An additional 65 acres of wetlands would be temporarily impacted by the temporary placement of dredged material from channel modifications. Approximately 12 acres of wetlands (seven acres of forested, three acres of croplands, and two acres of herbaceous) would be directly impacted by levee closure within the New Madrid Floodway. Construction of flood damage reduction features in the St. Johns Bayou Basin and closure of the New Madrid Floodway would indirectly impact 520 acres of farmed wetlands. The Setback Levee raise would not impact any wetlands. Borrow pits would be located in non-jurisdictional areas.

Construction of flood damage reduction features in the St. Johns Bayou Basin would temporarily impact forested wetlands. Temporary impacts include clearing vegetation for St. Johns Bayou Basin construction rights of way. Some of these areas have been classified as forested wetlands. Furthermore, dredged material from channel modifications would be temporarily stored in 65 acres of this area. Material would be used for the closure levee. Therefore, these areas would be graded to pre-construction conditions. No permanent impacts to jurisdictional wetland status are anticipated. Temporary impacts to forested wetlands were quantified as impacts to terrestrial wildlife. Further discussion on these impacts and compensatory mitigation is found throughout this RSEIS 2 as impacts and mitigation to terrestrial wildlife.

For the purpose of this RSEIS 2, an HGM functional assessment was used to quantify direct impacts to wetlands and indirect impacts to farmed wetlands. The HGM assessment is found in Appendix D. Table 4.1 provides a summary of the HGM analysis.

The proposed flood damage reduction project would also decrease backwater flooding on 554 and 3,426 acres of forested wetlands in the St. Johns Bayou Basin and New Madrid Floodway, respectively. The Corps maintains that these areas would remain

Table 4.1. Wetland impacts and loss of functional capacity units, St. Johns Bayou Basin and New Madrid Floodway

	Direct (acres)	Indirect (acres)	Detain Floodwater	Detain Precipitation	Cycle Nutrients	Export Organic Carbon	Remove Elements And Compounds	Maintain Plant Communities	Provide Wildlife Habitat	**Total**
Farmed Wetlands	10	520	0	13	40	7	282	0	0	**342**
Forested Wetlands	92	-	92	92	92	92	92	92	70	**622**
Total	**102**	**520**	**92**	**105**	**132**	**99**	**374**	**92**	**70**	**964**

jurisdictional wetlands after project construction due to factors other than backwater flooding such as headwater events, rainfall, and the high water table (see 2002 RSEIS, Appendix D, Pages D-9 and D-10). The Corps will monitor these areas to ensure that jurisdictional status remains.

4.2.2 Water Quality

Section 4.10 of the 2002 RSEIS describes existing water quality conditions. In summary, water quality of streams and channels in the project area is characteristic of an intensively farmed area. Surface waters contain elevated levels of agrichemicals, turbidity, suspended solids, and nutrients.

Section 5.10 and Appendix I of the 2002 RSEIS describe impacts to water quality from constructing flood damage reduction features in the St. Johns Bayou Basin and closure of the New Madrid Floodway. Headwater inundation during winter months would result in a benefit to water quality by increased retention of materials that would normally be available for transport as runoff prior to the spring flooding seasons. The project would potentially impact water quality by increased material loading during an extended growing season.

Three distinct water quality issues have been identified since the 2002 RSEIS. They are: 1) the opinion that wetlands losses in the Mississippi River Basin have negatively affected water quality; 2) significance of the project related to the amount of nutrients that enter the Gulf of Mexico; and 3) the general recommendation published by the National Science and Technology Council Committee that millions of acres of wetlands be restored.

4.2.2.1 Wetlands Loss Affects on Water Quality in the Mississippi River

The generally accepted opinion is that historical wetlands losses in the Mississippi River Basin have negatively affected water quality. Most of the land in the project area is now, and has been for decades, in agricultural production. Typically, wetland functions are quite diminished on lands that have been cleared, drained, and put into crop production. This is particularly true for water quality functions since much of the microbiological and chemical processes change. The flood damage reduction project would directly impact jurisdictional status on 102 acres of wetlands (9 acres farmed, 7 acres herbaceous, 85 acres forested, and 1 acre pasture-See Tables 4-1, 4-2, 2002 RSEIS) and indirectly impact jurisdictional status on 520 acres of farmed wetlands (Refer to Section 4.2.1.2).

4.2.2.2 Nutrient Loading to the Gulf of Mexico

There is a concern that the project will cause a loss of wetland functions resulting in an increase in the amount of nitrogen that enters the Gulf of Mexico. Conclusions in the Supplemental Water Quality Analysis – St. Johns Bayou and New Madrid Floodway indicated that less than 1% of the annual load of the Mississippi River was available to

the project area. The total load of nitrogen to the Gulf of Mexico from the Mississippi River has been estimated at 1.6 million metric tons in a year (National Science and Technology Council Committee on Environment and Natural Resources, 2000), while the calculated loads from the project area range from less than 1 to 974 metric tons in a year (Table 5.3).

4.2.2.3 Restoration of Millions of Acres of Wetlands

The last issue identified is the general recommendation that millions of acres of wetlands be restored (National Science and Technology Council Committee on Environment and Natural Resources, 2000). This report also describes multiple approaches to reducing nutrient loads to the Gulf and decreasing the extent of hypoxia. Some of the very recommendations made in this report, such as removing croplands from production and reforesting them, adding buffer strips, and expanding riparian zones, are in fact measures included in this project's mitigation. In addition, the Committee advocates a diversified mitigation approach. Such a diversified approach is recommended in this RSEIS 2.

4.3 Biological Factors

4.3.1 Fishery Resource Impact Analysis (HEP)

The USFWS (1980) developed HEP to document the non-monetary value of fish and wildlife resources. HEP is a habitat-based approach for assessing environmental impacts of proposed projects. HEP documents the quality and the quantity of available habitat for selected species. To quantify impacts or benefits of a project, the following information is required:

- Determine the area of impact
- Select evaluation species
- Assign HSI values
- Quantify impacts
- Determine mitigation needs

4.3.1.1 Area of Impact

Loss of rearing habitat is the primary target for mitigation. The rearing period for fishes includes yolk-sac and post yolk-sac larval phases. Larval fish can potentially use any area of the inundated floodplain regardless of flood duration or depth, so no hydrologic restrictions were used to delineate rearing habitat. This maximizes both the area of impact and the required mitigation without regard to the relative importance of this phase of fish reproduction. Therefore, rearing habitat consists of any flooded habitat regardless of depth or duration. Floodplain rearing acres were determined by defining the upper limit of the floodplain, incorporating variation in the hydroperiod during the rearing

season within the defined floodplain, and calculating ADFAs for each distinct floodplain habitat. This is described in the following paragraphs.

A 2-year frequency flood was used to evaluate hydrology of land use of the floodplain. In regard to flood frequency, the logic and justification for using a 2-year flood event was provided in the 2002 RSEIS and appendices (See Page G-8, 2002 RSEIS) but reiterated here. For any impact assessment, baseline conditions must be determined for the project life, which is 50 years in this case. Therefore, analysis must consider elevations that reflect regular flood regimes meaningful to fish reproduction over long periods. The 2-year flood event is equivalent to the median (50%) value of a cumulative frequency distribution of all stages during a defined season. Therefore, the 2-year floodplain is an average condition. Life span and recruitment of fishes were also considered in the decision to use 2-year flood frequencies rather than 3-5 year frequencies. The life span of small-sized species is 2-3 years and some may only reproduce once. Thus, a flood frequency less than 2-years may result in successive reproductive failures by species with short life spans. Larger-sized species can live up to 10 years or greater, and also depend on regular flooding regimes (*e.g.*, 2-year flood) rather than more infrequent events to maintain long-term population integrity.

Generally, flooding that occurs every 1-2 years regulates long-term population trends. Thus, the HEP team agreed that frequent floods were more important than infrequent events when evaluating baseline population levels over a 50-year period. The 2-year flood was based on a flood-peak analysis. In addition to life span of fishes, selection of the appropriate flood frequency in the analysis considered flooding patterns in the lower Mississippi River Basin. High water years result in expansive flooding in the basin, and the entire batture is often inundated for long periods. Therefore, spawning and rearing habitat is not a limiting factor to reproductive success basin-wide, but can be a factor at lower flood elevations. While an argument has been presented that the baseline populations are maintained by larger floodplains (such as ephemeral increases observed in populations utilizing the 3-5 year floodplain events), both the Corps and the HEP team concluded that the 2-year floodplain is the appropriate basis of evaluation as explained in the previous paragraph.

The upper limit of the 2-year floodplain was determined by compiling the maximum flow in each of a consecutive period of years, regardless of the time of year the maximum flow occurred. These values were ranked in descending order of magnitude. The stage that corresponded to the median flow (50^{th} percentile) of the ranked data is the upper limit of the 2-year frequency flood and the corresponding elevation was used as a maximum flood stage in subsequent analyses.

A Geographical Information System (GIS) and satellite imagery were used by Gulf Environmental Consultants, Incorporated (GEC) and the Corps to delineate floodplain habitats based on their position, land use, vegetation, and elevation. The following habitats were delineated:

- Agricultural Land
- Fallow Land
- Bottomland Hardwoods
- Large Permanent Waterbodies
- Small Permanent Waterbodies

ADFAs were computed within the 2-year floodplain for each habitat type for the mid-season fish-rearing period. ADFA is a unit of measure of inundation. Average inundation acreage values were calculated from daily stage elevations for the mid-season rearing period (April 1 to May 15) over the period of record from 1943 to 1974. The results of these analyses are discussed from Appendix C pages C-19 through C-22 in the 2002 RSEIS.

Since the expected 2-year flood was calculated from annual maximums, and not from the maximums from the period of April 1 to May 15, the 2-year peak flood value is conservative. Many of the peak flood values occurred prior to April 1 (January, February, and March). Regardless, the calculated annual 2-year peak flood was used as the basis of evaluation.

An "average daily flooded acre" is an area equivalent to one acre that is flooded on average every day of a defined season of a year for a specified number of years. For example, if that acre and an adjoining acre (two real-on the ground acres) were flooded for every day but in only half the specified number of years, the result would still be one ADFA.

Impacts were calculated in the 2002 RSEIS based upon both qualitative and quantitative elements for the St. Johns Bayou Basin and the New Madrid Floodway. The qualitative aspects are discussed in Section 4.3.1.3 below. The quantitative aspect consists of the difference in ADFAs for each particular land cover type (defined above) between the existing condition and the with-project condition. These hydrologic analyses were performed with the software program EnviroFish. The methodology of EnviroFish is described in Appendix C, page C-6 of the 2002 RSEIS, and an explanation, process flowchart, and example calculation are provided in Appendix A of this document. This explanation not only describes how EnviroFish works, but also presents the assumptions that were used during the development of the 2002 RSEIS and provides an illustration of the mitigation acreage required if all mitigation was obtained through conversion of lands from agricultural to other singular land use types.

Although rearing has the highest measure of impacts, it does not necessarily follow that it is the most significant impact. Duration of flooding must be considered in the calculation of suitable fish spawning habitat to ensure adequate time for nest preparation and egg incubation. Eggs will become desiccated if water levels drop suddenly. However, duration is not a primary limitation to successful rearing assuming that movement and survival of larval fish are not sensitive to daily fluctuations in flood stage elevation. For

calculation purposes, spawning habitat requires 1 foot of depth and 8 consecutive days of inundation whereas there are no restrictions for rearing habitat (Appendix G, 2002 RSEIS). Because only a single day of flooding at any depth is needed for an acre to "count" as rearing habitat, while 8 consecutive days of flooding of at least 1 foot deep is needed for an acre to "count" as spawning habitat, rearing habitat acreage is much higher.

The Corps maintains spawning is the most appropriate habitat impact to measure. However, the Corps agreed to provide the additional mitigation predicated upon mid-season rearing impacts. To this end, flood duration over the 45-day fishery mid-season rearing period is important, even though the inundation does not necessarily have to be continuous. Any acre where water inundates that acre for a day at any depth is counted as rearing habitat.

4.3.1.2 Evaluation Species

Ninety-three species of fish have been collected in the project area. They are dominated taxonomically by minnows (19 species), sunfishes (14 species), suckers (13 species), and darters (13 species). Fish communities vary between the St. Johns Bayou Basin and the New Madrid Floodway. Therefore, separate evaluation species are warranted for each respective basin. Potential evaluation species were grouped into guilds based on characteristic habitat used by larvae (Appendix C, Table 2, 2002 RSEIS). Twelve evaluation species were selected representing over 91% of the fish species in the project area. These species were further grouped into early, mid, and late rearing periods. Table 4.2 provides a list of selected fish evaluation species for the mid-season rearing period.

Table 4.2. Mid-Season Rearing Fish Evaluation Species

Evaluation Species	St. Johns Basin	New Madrid Floodway
Smallmouth Buffalo	X	X
Pirate Perch	X	
White Crappie	X	X
Largemouth Bass	X	
Freshwater Drum	X	X

X – denotes use as evaluation species

4.3.1.3 Habitat Suitability Indices

The qualitative aspect of the analyses consisted of valuing the ADFAs of agricultural land, fallow land, bottomland hardwoods, large waterbodies, and small waterbodies for each of a set of representative fish species using a HSI. This was done for both the existing condition and the with-project condition. The methodology for these analyses is presented in Appendix G of the 2002 RSEIS from page G-10 to G-15.

HSI values range from 0 (unsuitable habitat) to 1 (optimal habitat). HSI values were assigned to each species for each respective habitat type (Table 4.3). HSI values were developed for each evaluation species by consensus of an interagency team comprised of biologists from the USFWS, MDC, and the Corps by utilizing the Delphi technique and supplemented by field data from tributaries of the lower Mississippi River. The HSI value for each species was summed to develop a cumulative HSI value for each respective habitat type.

Table 4.3. Mid-Season Rearing HSI Values for Respective Habitat Types

Species	Agriculture		Fallow		BLH		Large Water		Small Water	
	SJ	NM	SJ	NM	SJ	NM	SJ	NM	SJ	NM
Smallmouth Buffalo	0.17	0.17	0.10	0.10	0.10	0.10	1.00	1.00	0.50	0.50
Pirate Perch	0.00	N/A	0.25	N/A	1.00	N/A	1.00	N/A	1.00	N/A
White Crappie	0.10	0.10	0.10	0.10	0.10	0.10	1.00	1.00	0.50	0.50
Largemouth Bass	0.15	N/A	0.25	N/A	0.25	N/A	1.00	N/A	1.00	N/A
Freshwater Drum	0.10	0.10	0.20	0.20	0.50	0.50	0.20	0.20	0.20	0.20
Cumulative HSI	**0.52**	**0.37**	**0.90**	**0.40**	**1.95**	**0.70**	**4.20**	**2.20**	**3.20**	**1.20**

SJ – St. Johns Bayou Basin
NM – New Madrid Floodway
N/A – Not applicable

4.3.1.4 Impact Quantification

The 2002 RSEIS calculated impacts based on HUs. This RSEIS 2 does not revisit project impact calculations. The following paragraphs describe how impacts were calculated in the 2002 RSEIS. Thus, impacts are expressed in HUs. This RSEIS 2 is accounting for transition periods for reforested areas. Therefore, benefits are expressed in AAHUs.

Cumulative HSI values were multiplied by the impacts to area to express habitat values in terms of Habitat Units (HUs) according to the following equation. Impacts are calculated by subtracting the HUs with-project conditions (recommended plan) from HUs without-project conditions (existing).

HU Impacts = HSI * (Existing ADFAs – Recommended Plan ADFAs)

Impacts to mid-season fish rearing habitat from construction of flood damage reduction features in the St. Johns Bayou Basin and closure of the New Madrid Floodway would impact 1,884 and 2,329 HUs, respectively (Table 4.4 and Table 4.5).

Table 4.4. Mid-Season Fish Rearing Impacts, St. Johns Bayou Basin

	HSI	Existing ADFAs	Recommended Plan ADFAs	HU Impacts
Agriculture	0.52	2,357	1,161	622
Fallow	0.90	278	148	117
BLH	1.95	943	526	813
Large Water	4.20	45	33	50
Small Water	3.20	224	136	282
TOTAL				**1,884**

Table 4.5. Mid-Season Fish Rearing Impacts, New Madrid Floodway

	HSI	Existing ADFAs	Recommended Plan ADFAs	HU Impacts
Agriculture	0.37	3,766	606	1,169
Fallow	0.40	332	60	109
BLH	0.70	1,099	203	627
Large Water	2.2	203	79	273
Small Water	1.2	213	87	151
TOTAL				**2,329**

4.3.1.5 2002 RSEIS Compensatory Mitigation

The 2002 RSEIS selected reforestation of frequently flooded agricultural lands as the mitigation method to compensate impacts to mid-season fish rearing habitat. Reforestation requirements to mitigate impacts were calculated by dividing HUs lost by the difference in cumulative HSI values between agricultural land and bottomland hardwoods (Table 4.6). The 2002 RSEIS recommended reforestation of 8,375 acres of frequently flooded agricultural lands.

Table 4.6. Required Amount of Mitigation Based on Reforestation of Frequently Flooded Agricultural Land

	HSI Difference	HUs Lost	Acres Required
St. Johns Bayou	1.43	1,884	1,317
New Madrid Floodway	0.33	2,329	7,058

There are many important aspects of mitigation planning for this project. First, some types of mitigation, such as the creation or the enhancement of permanent waterbodies provides much more fishery habitat value than the primary approach stated in the 2002 RSEIS of reforesting agricultural lands. The 2002 RSEIS specifically mentioned mitigating for impacts to mid-season fish rearing habitat by the creation of permanent

waterbodies (Section 6.2.2 on Page 116 of the 2002 RSEIS). However, reforestation was chosen as the overall methodology. This RSEIS 2 clarifies the benefits to mid-season fish rearing habitat from all mitigation measures including the creation of permanent waterbodies as originally considered in the 2002 RSEIS.

Second, any assessment of large-scale impacts relies on professional opinion because of the uncertainty regarding ecological relationships. In this analysis, several decision points can make large differences in the outcome. The period of record used to develop stage-duration values will directly affect ADFAs of usable habitat. If the period includes major floods, higher ADFAs will result and vice versa for droughts. Therefore, the magnitude of impacts is directly related to the period of record used in the analysis. The period of record utilized for all analyses for this project included both drought and flood conditions.

Third, HSI values for individual species range from 0.0 to 1.0, so the relative difference between habitat types can vary by orders of magnitude depending on the assigned values. The assigned values depend, at least in part, on the team's experience in floodplain ecology and personal perspectives. In addition, the cumulative HSI value used in impact and mitigation calculation is dependent on the group of fish species that are assigned to a specific time period, and in this case, it was the mid-season time period. Cumulative HSI is sensitive to the number of species and their preference for specific habitat types.

The aspects stated above influence the outcome of compensatory mitigation, demonstrating why it is important to obtain consensus on the approach and assumptions from an interagency and multidisciplinary team. It also indicates that predicted values are subject to interpretation and should be considered approximate numbers for planning purposes. Monitoring will be required to actually document biological responses to mitigation measures employed to offset impacts. Monitoring requirements for individual mitigation tracts and areas will be developed in site-specific mitigation plans after acquisition of tracts as described in Section 6.5.

4.3.2 Compensatory Mitigation Issues and Concerns Related to Fish

The following paragraphs describe several important issues and concerns in relation to compensating fishery impacts.

4.3.2.1 Fish Passage Through Culverts

The local sponsor, the St. Johns Levee and Drainage District, has the legal responsibility to operate flood control structures in the project area. The gates in the gravity drainage structures would be operated to allow fish periodic access into the floodway during spring floods. Fish normally concentrate below water control structures, and if suitable passage conditions exist, will move through the structure to access feeding and reproductive sites.

As currently designed, closure of the New Madrid Floodway would consist of four 10-foot by 10-foot gated box culverts across Mud Ditch. The culverts will be approximately 250 feet in length, placed along the channel bottom of Mud Ditch, and have nearly level slope (6 inch rise in 250 feet). Few studies have been conducted on fish access through culverts, and those studies that have shown impacts are related to small road crossing culverts or geographically disparate regions. For example, Coffman's (2005) predictive models were used to predict fish passage through small diameter culverts in the Mid-Atlantic Highlands region of the United States and are not applicable to large culverts adjacent to the Mississippi River such as the 10-foot by 10-foot box culverts proposed in the New Madrid Floodway.

Typical problems at culverts include a perched outlet, water velocities that exceed burst swimming speeds of fish, shallow depths that hamper swimming, and long distances between resting areas. None of these problems will exist for the New Madrid culverts for the following reasons:

- Water will be flowing into the basin during most operational periods, so excessive water velocity will not be an impediment to movement. In addition, those fishes that were spawned or are rearing in the basin can be easily transported back to the river when water direction is reversed during falling river stages.
- There will be no outlet or inlet drop in elevation.
- Culvert slope is nearly level.
- A relatively short distance will be required for fish to access the backwater.
- Water depth will be equal to the river stage up to the 10-ft height of the culvert, which is more than adequate for swimming fishes.

An additional aspect of fish passage is the condition of the entrance canal. Mud Ditch connects the Mississippi River to the New Madrid Floodway. The Ditch itself can be classified as a slackwater backwater during high river stages with a well-developed forested riparian zone. Therefore, fish will likely be attracted to the entrance canal and move towards the structure. Once the structure is open, fish will follow the primary flow paths into the basin. All of these reasons strongly indicate that fish passage conditions will exist at the New Madrid Floodway culverts.

As water recedes and flows out of backwater areas and other permanent waterbodies, fish often congregate and move into the waterbody feeding on abundant plankton and forage fishes. Therefore, outflows of backwater generally attract high numbers and diversity of fish. While swimming through a culvert or other swiftwater areas, most fish species seek areas of low velocity (*i.e.*, boundary layers along the bottom and sides of culverts) and have sufficient burst swimming speeds (1 meter/sec or greater) to move against a strong current for short distances. Therefore, fish are well adapted to move among habitats of varying velocities (Adams 1998; Boyd and Parsons 1998; Parsons and Smiley, 2003; Smiley and Parsons 1997).

Relative high species richness and presence of riverine fishes in the St. Johns basin, which has culverts similar to those planned for New Madrid, indicate that fish passage is highly probable and that gate operation will be an important management tool for managing fish populations in the floodway.

4.3.2.2 Permanent Waterbody Creation/Enhancement

The Mississippi River floodplain can be inundated for prolonged periods between winter and early summer. Fish respond to floods by moving laterally onto the floodplain to feed, avoid predators, and seek suitable areas for reproduction. A pulsed hydrograph (naturally rises and falls in water stage or elevation not necessarily synonymous with a flood event) during the winter and spring provides numerous opportunities for fish to access floodplain habitats where they may reside for extended periods to feed and reproduce. Permanent waterbodies harbor both resident and transient fishes. Therefore, construction and management of permanent waterbodies must allow opportunities for periodic connection to the mainstem river to accommodate access and dispersal, while maintaining suitable habitat for a variety of fish species.

Borrow pits are permanent waterbodies that provide high quality rearing habitat for a variety of species (Baker, *et al.,* 1991; others). Adult fish are attracted to borrow pits because of deep water and abundant forage fishes that often concentrate in permanent waterbodies. Many of these adult fish will spawn in shallow, structurally complex littoral areas of borrow pits. Plankton densities are usually high in permanent waterbodies, so once eggs hatch, larval fish have an abundant food source. High densities of fish are characteristic of borrow pits, and many of these individuals will eventually be transported or move into the Mississippi River during subsequent floods.

4.3.2.3 Mississippi River Batture Areas

Concerns have been raised over utilizing batture land for compensatory mitigation. The batture land offers valuable fish spawning and rearing habitat. However, there are opportunities to restore batture areas that can provide additional fish spawning and rearing habitat. Primarily, reforesting cropland or restoring floodplain lakes would create additional habitat that is currently not available to the fishery resource.

Flooded batture land that is reforested will have physiochemical characteristics similar to forested areas in the New Madrid Floodway: slackwater, structural diversity (habitat diversity such as scrub/shrub or cypress root areas that provide value to fish), and direct accessibility to the river. Swales and ridges in the batture create habitat similar to tributaries: deep, warm water that persists after floodwaters recede and a corridor for movement within the floodplain. In addition, increased hydraulic circulation in the batture will improve water quality in large backwaters during prolonged flooding in late spring and early summer. Batture land is also directly accessible to fish and has heterogeneous habitats suitable for fish spawning and rearing. Therefore, batture land is suitable to use for mitigation purposes.

4.3.2.4 Creation of Spawning and Rearing Habitat by Modifying Gate Operations

Strategic operation of the culverts at the New Madrid or the St. Johns Bayou levee closure would provide an opportunity to create and maintain a permanent waterbody.

There are numerous kinds of habitat that can be classified as permanent waterbodies (see Baker, *et al*., 1991 and references therein). Habitat classification schemes have been developed that refer to oxbow lakes, borrow pits, crevasse lakes, batture lakes, manmade lakes, vernal pools, floodplain depression lakes, sloughs, scatters, and brakes as permanent waterbodies. However, there are common characteristics of permanent waterbodies in the floodplain of the Mississippi River applicable to the proposed creation of the 2,000 acre pool behind the levee closure. These include the following:

1. Waterbodies form or are replenished during rising water levels but retain water on the floodplain after floods recede as river stages fall
2. Portions of the waterbodies remain sufficiently deep to retain significant volumes of water for a prolonged period
3. Reduced occurrence of water level fluctuation so that stranding of eggs and displacement of larvae are less likely
4. Warmer water temperatures that result in higher primary productivity (biomass produced per unit area) than the river (due to isolation and shallow littoral zone) thus providing an abundant food supply (phytoplankton and zooplankton) for fishes
5. Periodic connection to the mainstem river either prior to or during the rearing period to provide access by spawning adults
6. Depositional material forming a nutrient rich substrate that leads to higher chlorophyll content and rapid biochemical cycling
7. Structural diversity of the littoral zone

Because of these characteristics, a permanent waterbody has high spawning and rearing suitability for many species of commercial and recreational importance (*e.g*., buffalo, crappie, paddlefish, and sunfishes) as well as the state endangered golden topminnow. It provides food, shelter from predators, and stable habitat conditions as compared to temporary or transiently flooded lands. The spawning and rearing pool as described in the RSEIS 2 will provide these characteristics and is a permanent waterbody because:

1. Water will be retained during the mid-season rearing period after Mississippi River water recedes
2. Water depths will vary from shallow littoral zones to deeper pelagic zones exceeding twenty feet deep
3. Stable water levels during the peak spawning period of fish thus reducing the likelihood of stranding and desiccation of eggs and displacement of larvae

4. Conditions created by intentional pooling will provide an abundant food supply for larval fishes due to higher primary productivity than the transient conditions that currently exist
5. Periodic connection to the mainstem river will be provided either prior to or during the rearing period for access by spawning adults
6. Depositional material will form a nutrient rich substrate to further increase the productivity of the waterbody
7. Appropriate vegetation will be planted or naturally re-established providing structural diversity in the littoral zone

Aquatic habitat will persist in the spawning and rearing pool throughout the early and late spawning seasons although water levels may be considerably lower than mid-season. Conversely, "temporary" or transiently flooded lands are those created by rising water levels in the floodplain during rising stages in the river and which do not retain water as river stages fall. Portions of these waterbodies remote from the river are flooded later, for shorter durations, and less continuously than those closer to the river. Receding water levels near the water's edge result in stranding and desiccation of eggs and in displacement of larvae into sub-optimum habitats before they reach full development resulting in increased mortality. The HSI value is based on the underlying land use. Suitability of temporary flooded lands for individual fish species is highly variable with densities of invasive species (*e.g.*, gizzard shad, common carp) predominating in disturbed habitats (*e.g.*, agricultural and fallow land), and minnows, suckers, darters, and sunfishes in undisturbed habitats (*e.g.*, extensive bottomland hardwood forests). The spawning and rearing pool as described in the RSEIS 2 does not have these characteristics and therefore would not be characterized as a temporary waterbody.

Converting frequently flooded agricultural areas that provide HSI values of 0.37 (New Madrid Floodway) to a spawning and rearing pool that provide HSI values of 2.2 (New Madrid Floodway) provides significant gains to mid-season fish rearing habitat (see 2002 RSEIS page G-13). The significant gains are provided by increasing habitat value (HSI – see RSEIS 2, Section 4.3.1.3) and increasing quantity (ADFAs – see RSEIS 2, Section 4.3.1.1).

4.3.3 Terrestrial Wildlife Resources

A terrestrial HEP was used to evaluate the impacts of the St. Johns Bayou Basin and New Madrid Floodway Project on the wildlife habitat of forested areas. The interagency team selected eight HEP evaluation species to represent the overall wildlife population and oversaw the HEP analyses. The USFWS and MDC took the lead in selecting the model species, the sampling areas, and the number of sampling sites. Basically, the resource agencies determined species and sampling regimes; then the Corps and GEC performed the sampling and calculated the results.

The evaluation species represented guilds of all mammals, birds, amphibians, and reptiles that are found throughout the complete range of habitats in the project area. The team

developed assumptions for existing, future with-project, and future without-project conditions to quantify habitat changes. The habitat changes to any one of the evaluation species would be reflected on all the species within that particular guild. For example, the bottomland hardwood forest required by the barred owl and fox squirrel and the marshy and ditchbank wetlands required by the red-winged black bird and muskrat would represent amphibians and reptiles normally associated with those habitats. In this way, separate amphibian and reptile species evaluation were not required.

A discussion of the HEP methodology that was used to quantify impacts to terrestrial wildlife resources is found in Section 5.4 of the 2002 RSEIS. Further details regarding field data and the evaluation species selected are contained in the USFWS CAR, located in Appendix E of the 2002 RSEIS.

Construction of flood damage reduction features in the St. Johns Bayou Basin and the closure of the New Madrid Floodway would result in the direct loss of 1,993 and 66 wildlife AAHUs, respectively. HEP was used to quantify impacts to the barred owl, fox squirrel, pileated woodpecker, Carolina chickadee, and the mink (Table 4.7).

Table 4.7. Direct impacts to forested areas from levee construction and channel enlargement (USFWS, 2000).

Species	St. Johns AAHU	New Madrid Floodway AAHU
Barred Owl	489	15
Fox Squirrel	282	11
Pileated Woodpecker	393	13
Carolina Chickadee	515	15
Mink	314	11
Total	**1,993**	**66**

4.3.4 Waterfowl Resource

The WAM developed by the USFWS and the National Biological Service was used to quantify waterfowl impacts associated with the project. It is contained in Appendix E of the 2002 RSEIS.

In the St. Johns Bayou Basin, approximately 386 cumulative acres of primarily croplands are ponded with water less than 24 inches deep during November 1 to March 31. Approximately 89,758 DUDS, are available over the entire waterfowl season, the majority of which (84,307 DUDs) occur during the migration in February and March. In the New Madrid Floodway, approximately 931 cumulative acres less than 24 inches deep are available for waterfowl that provide a total of 243,402 DUDs, but as with the St. Johns Basin, the majority of these (238,392) occur during spring migration. The cumulative acres of water impacted are spread over several thousand acres in both basins.

Based on WAM, project implementation could actually produce a net increase in DUDs. This is because the project operation allows for the ponding of water on up to 6,400 acres during December and January. WAM results showed potential net gains of 545,856 DUDs in the St. Johns area and 53,374 in the Floodway. These gains may not be achieved every year because the operational plan would be altered to allow for the greatest possible diversity of flood timing, duration, and depth to provide water as needed for waterfowl and to consider bottomland hardwood health within the low elevation areas. In the long term, this flexible operational plan would provide the best management tool to benefit the ecosystem and waterfowl. Resource gains would be achieved over existing conditions because the project affords the opportunity during the winter waterfowl season to hold water where little currently exists.

The unavoidable impacts of project implementation that are associated with the prevention of backwater flooding would be most evident during March. As stated earlier, the majority of DUDs currently provided in each basin occurs during spring migration. Though the project would likely create a net gain in DUDs, the Corps and the USFWS believe it to be appropriate to mitigate this impact to spring migration duck habitat.

Based on WAM, the USFWS offered several scenarios for mitigating spring waterfowl habitat impacts. Their recommended method was reforestation of agricultural lands. The USFWS preferred reforestation for the following reasons: 1) Reforestation constitutes an ecosystem approach to restore historic vegetation and wetland communities in the Mississippi River floodplain; 2) It provides a stable, low maintenance, high reliability mitigation feature; 3) Reforestation has a proven high value for waterfowl; 4) Landscape ecology dictates the need to restore bottomland hardwoods - it is currently lacking in the project area and it would benefit many fish and wildlife species in addition to waterfowl; 5) It would offset terrestrial and wetland impacts in addition to waterfowl; and 6) Reforestation of farmlands or other cleared lands is technologically and economically feasible.

The analysis indicated that reforestation of 891 acres (70 percent red oak) would fully mitigate springtime waterfowl impacts. This was based on bottomland hardwoods providing approximately 229 DUD/acre to compensate over 200,000 springtime DUDs. The WAM report also stated that reforested areas should be subject to frequent and sustained winter flooding 18 inches deep or less and that, ideally, the flooding regime should mimic the historic flooding patterns in the area, including variability both within and among years. Also, the report stated that benefits could be expected immediately due to the presence and availability of native moist soil plants in the newly established "forest" and would gradually change to those benefits associated with forests dominated by red oaks and the associated benthic invertebrate community.

Concerns have been raised subsequent to the 2002 RSEIS. One is that the area would have to be flooded most of the time during the spring season to attain the projected benefits, even though the WAM preparers stated that flooding is expected to be varied

among and within years. This presumption of constant flooding would be contrary to the goal of reforesting with 70 percent red oak species. Generally, red oaks are less flood tolerant than other oak species; however, their value to waterfowl is very high. It is often the less frequent high rainfall or flood events that make these areas available to waterfowl. High red oak production therefore would not equate to constant availability for waterfowl. Based on DUD outputs per acre, the USFWS showed varying amounts of bottomland hardwoods that would need to be reforested to mitigate project impacts, *e.g.* 1,191 acres if 50 percent red oak and 1,692 if 30 percent red oak. It is very likely that some reforested areas will not be planted with 70 percent red oak (2002 recommended mitigation) due to frequent flooding. To date, the interagency mitigation team has identified potential reforestation sites throughout the lower New Madrid Floodway and are investigating reforestation of the Donaldson Point area outside the Floodway that would be subject to frequent springtime flooding. The project mitigation will include reforestation of thousands of acres of bottomland hardwoods that will provide waterfowl habitat at varying times of the year. One substantial tract of bottomland hardwoods has already been acquired next to the Ten Mile Pond CA that is managed primarily for waterfowl. Consistent with their current practice, it is anticipated that MDC will ultimately decide to manage this bottomland hardwoods area primarily for waterfowl.

Another criticism of WAM was that it was focused on dabbling ducks and did not consider diving ducks. One reason for this is because it was determined that the loss of shallow flooded backwater habitat was more critical for dabbling ducks and they comprise most of the waterfowl use of the project area. Although ring-necked ducks will occasionally use flooded bean fields, other divers such as scaup and canvasback seldom do. MDC biologists serving on the interagency mitigation team do not believe that loss of backwater flooding in the immediate project area would be significantly detrimental to diving ducks but do believe that creation of more permanent water habitat for fish and moist soil areas for shorebirds may be beneficial for diving ducks. The more permanent water habitats would allow for production of aquatic insect larvae, fingernail clams, and other invertebrate food sources necessary during pre-breeding conditions that are not normally available on periodically flooded croplands. It should also be pointed out that management of moist soil areas could allow for higher water levels during February to mid-March during spring waterfowl migration to benefit diving ducks. Subsequently, water levels could be lowered during peak shorebird migration to benefit the intended resource.

Another concern pertains to the availability of bottomland hardwoods for waterfowl use in the post-project condition due to decreases in backwater flooding. It is true that there will be less flooding and there would be less waterfowl use for many areas than under existing conditions. However, this overlooks the management potential for these newly created areas that would be used for compensatory mitigation. Compensatory mitigation would include plugging existing farm drains and creation of microtopography to emulate natural patterns of surface flooding in the Mississippi River floodplain. These actions would restore hydrology to the extent practical. Rainfall events would still cause flooding and it would be possible to establish perimeter levees to hold water. For

example, the Ten Mile Pond CA is above the existing 2-year flood elevation and a series of levees are used to control water and manage for a diversity of seasonally flooded waterfowl habitats.

Another concern is that reforesting existing agricultural lands causes a loss of waterfowl habitat based on a lowering of caloric production. Based on food production alone, this might have been presumed true if considerable waste grain (soybeans) were left in fields after harvest and crop seeds did not deteriorate quickly. However, recent research indicates that little waste grain remains in southeast Missouri crop fields after harvest because new varieties of crops mature earlier and harvest equipment is extremely efficient and leaves little grain in fields (*e.g.*, <70 lbs/acre rice, <40 lbs/acre soybeans, < 100 lbs/acre corn). Further, not all waste grain is available to ducks, because other animals (*e.g.*, blackbirds, rodents, rails, songbirds, etc.) consume some grain, some grain is covered with debris or soil, and seeds deteriorate rapidly after harvest. The latter is especially true with soybeans that decompose almost entirely within 90 days of harvest. For example, if soybeans are harvested in early October and leave 40 lbs/acre waste grain, by January < 10 lbs/acre soybean grain is left for potential consumption by ducks because of rapid decomposition and consumption by other species. It should also be pointed out that soybeans (the primary crop of the project area) have digestive inhibitors that actually reduce the amount of protein that a duck can metabolize from eating it. Cereal grains are high in carbohydrates, but should be considered as a supplement, instead of a substitute for natural food sources for waterfowl. Waterfowl cannot fulfill their nutritional requirements simply from ingesting grain. In contrast, natural foods found in bottomland hardwoods are resistant to deterioration and different foods are continually supplied throughout winter and spring including seeds, tubers, and rootlets of herbaceous plants, hard mast from oaks and pecans, and diverse invertebrates associated with detrital litter in bottomland hardwood areas. The argument of better value from waste grain also runs contrary to the goals of the Lower Mississippi Valley Joint Venture to increase quality waterfowl habitat by reforesting large portions of the Lower Mississippi Alluvial Valley to recover some historic habitat. Based on this idea of food productivity, WAM preparers put forth one option of making available an 828-acre soybean area to mitigate project impacts. The area would need to be a harvested field that is not fall plowed or burned and then managed to hold water. However, the argument that fewer acres of soybeans would serve to better mitigate impacts than greater acres of bottomland hardwoods relates to caloric output alone, dismisses the variety of food sources available from bottomland hardwoods, and totally diminishes the overall value of bottomland hardwoods to waterfowl resources. Therefore, the consensus among resource agencies, including the USFWS and the Corps, is that the provision of highly valuable bottomland hardwoods as compensatory mitigation is far superior to a flooded bean field.

Since the WAM was prepared, the Corps made a change in the recommended plan to allow for spring flooding in the New Madrid Floodway up to elevation 284.4 each year until May 15. The change in gate operation would allow flooding of about 2,000 acres in the lowest elevation lands of the floodway. The change was made to benefit the fishery

resource, but would also increase flooded habitat that would benefit waterfowl. Consequently, the project impacts to waterfowl in spring would be reduced and would lower mitigation needs. Because the total project mitigation plan already exceeded reforestation requirements for waterfowl, it was determined that a reassessment of impacts and mitigation was not needed. Mitigation was based primarily on dabbler habitat. But it should be noted that this change in gate operation, particularly if waters are allowed to flood this area prior to April 1, which would likely be the case, would result in substantial areas with deeper water (between 2 and 4 feet) that would provide feeding habitat for diving ducks.

Another option provided by the WAM preparers was to mitigate springtime waterfowl impacts by creation of a 202-acre moist soil area. This habitat, devoted exclusively to managing waterfowl, had the highest value to waterfowl of 1,037 DUD/acre. It should be noted that since preparation of the WAM, a shorebird analysis was completed that demonstrated a need to develop and manage 765 acres of herbaceous wetlands for shorebirds. As of November 2005, about 162 acres have already been acquired next to Ten Mile Pond CA for this purpose. Also, another 40-acre track close to the conservation area has been acquired and would likely be used for moist soil management. It is possible that the shorebird areas could approximate the value of moist soil areas for waterfowl. There is a large amount of data that shows complementary values for both ducks and shorebirds in moist soil sites. Also, more recent studies, *e.g.*, the Bayou Meto area in east central Arkansas, suggest much higher values for waterfowl in herbaceous (moist soil) habitats (1,704 DUD/acre) than were used in WAM analysis for this project. Based on the lower value of 1,037 DUD/acre for herbaceous wetlands, shorebird mitigation habitat could provide more than three times the mitigation required for waterfowl. Another important aspect of the moist soil areas is that there would likely be some areas that would, on occasion, provide habitat for diving ducks. Ring-necked ducks have adapted to taking advantage of the shallower water habitats. They have been documented in the Ten Mile Pond CA feeding on tubers and seeds (yellow nutsedge, millets, and sprangletop) and will stay from December through early March (depending on ice). Scaup, canvasback, and other diving ducks may use portions of moist soil areas during the February to March migration period, although canvasbacks prefer deeper waters, usually > 36 inches.

An additional concern is the loss of frequent widespread flooding during the spring. Following project construction, flooded areas would be more concentrated. Distribution is an important factor for waterfowl as well as diversity of available food sources. However, it should be pointed out that some flooding of agricultural lands from rainwater events and ephemeral ponding will still occur throughout the project area regardless of project construction. Therefore, all waterfowl will not be concentrated within those areas for which they are managed. Conversely, project mitigation areas such as bottomland hardwoods, and shorebird moist soil areas will provide quality waterfowl habitat even in dry years where little habitat currently exists. Also, additional avoid and minimize measures such as establishing riparian corridors along 64 miles of Floodway streams and ditches and establishment of a wildlife corridor between Ten Mile Pond CA and Big Oak

Tree State Park will improve the overall habitat diversity and food availability for waterfowl.

In summary, although spring and summer backwater flooding would be reduced following project construction, the ability to pond water during winter months plus the environmental measures proposed for mitigation of fish and wildlife resources are expected to increase waterfowl benefits in the project area.

4.4 Economic Factors

Four concerns have been raised with respect to project economics as described in the 2002 RSEIS. These include cost sharing, use of appropriate interest rates, the effect on project area benefits if substantial areas become ineligible for farm subsidies based on Swampbuster provisions, and general concerns with updating project economic analyses.

4.4.1 Cost Sharing

The cost sharing provisions of the 1986 WRDA, 33 USC §2213(a)(1) apply to any project in which construction had not been initiated by 1986 and to separable elements of older projects not constructed prior to 1986. Separable elements are defined as physically separable from other parts of the project and achieving hydrologic effects or producing physical and economic benefits which are separately identifiable from those produced by other portions of the project. 33 USC §2213(f). The concern has been raised that the portion of the project authorized as part of the MRL feature under the Flood Control Act of 1954 should be cost-shared in accordance with the 1986 WRDA. This is unfounded.

The cost share provisions of the 1986 WRDA apply to authorized but unstarted separable elements of the Mississippi River & Tributaries (MR&T) project and to MR&T elements that are authorized in the WRDA 1986 and later authorization bills. Specifically, any work authorized on the Mississippi River Levees is exempted from new cost sharing requirements. [Letter of Robert K. Dawson, Assistant Secretary of the Army (Civil Works) to Hon. Russell B. Long, 132 Cong. Rec. S. 3704 (March 27, 1986)]

The levee closure is also not physically separable from other portions of the MRL features of the MR&T Project. The levee closure acts to complete this section of the Mississippi River Levee system as a single, continuous structure from Commerce to New Madrid, Missouri, along the western bank of the river. Furthermore, at the time of the drafting of the 1986 WRDA cost-sharing provisions, separable elements were viewed as parts of the MR&T Project that are located along tributaries of the Mississippi River. These parts are necessary to provide flood protection from Mississippi River flooding. The Mississippi River Levees portion of the MR&T Project was a scheduled item and as such, is inseparable from the MR&T Project element. Thus, the provisions of the 1986 WRDA do not apply to the levee closure.

4.4.2 Interest Rates

A concern has also been raised regarding the use of a 2.5% interest rate for the MRL feature; the New Madrid closure levee and box culverts. The concern is that a more recent and higher interest rate should be used for project evaluation of these MRL features. The use of the 2.5% interest rate for certain project features under the Water Resources Development Act of 1974 (WRDA 1974) is proper. Section 204 of Public Law 95-28 (May 13, 1977, 91 STAT. 121) amended WRDA 1974 and states "[I]t is hereby reiterated that the interest rates or rates of discount to be used…shall be those interest rates or rates of discount established by Public Law 93-251…or by any prior law authorizing projects of the United States Army Corps of Engineers…" Accordingly, in preparing the 2002 RSEIS, the Corps appropriately used the interest rate that was established for the MRL feature of the project, (the New Madrid closure levee and gravity outlet) which was authorized under the Flood Control Act of 1954. This was the interest rate used for project formulation in the supporting economic data presented to Congress for the initial authorization by Congress.

The legislative history preceding enactment of Section 204 indicates that this provision was specifically intended to preclude the application of higher interest rates to previously authorized water resources development projects [See pages 3120 through 3138 of the Congressional Record – Senate, March 10, 1977, for a discussion of Amendment No. 60 to Senate Bill No. S. 247 which became Section 204 of Public Law 95-28]. Congress recognized that the appropriation of construction funds implies a commitment by the Government and raises a strong and reasonable expectation that the project will be built, and that non-Federal sponsors will often expend a portion of their cost-shared commitment in reliance on continued appropriations for the project.

At the time of the issuance of the General Design Memorandum (GDM) No. 1 – New Madrid Floodway, in November 1957, the Corps had assurances from local interests that the local interests would provide rights of way for construction and would pay for the operation and management of the project after completion (GDM No. 1, November 4, 1957, Page 3). The St. Johns Levee and Drainage District, under provisions of assurances accepted January 30, 1959, acquired flowage easements on about 57,000 acres of land in the New Madrid Floodway. (Review Report – St. Johns Bayou and New Madrid Floodway, May 1974)

Since the sponsor made this financial commitment in acquiring those flowage easements, per Section 204 of Public Law 95-28 stated above, the prevailing interest rate at that time is the proper rate for evaluation. That interest rate for the closure levee was 2.5%. Corps policy supports this Congressional mandate and the use of 2.5%.

4.4.3 Loss of Benefits Due to Swampbuster Ineligibility

Two concerns have been raised concerning the Food Security Act of 1985 (16 USC 3822(f)(4)) (FSA). These concerns relate to the Swampbuster provisions.

4.4.3.1 Swampbuster Ineligibility

Producers in the area who are enrolled in the NRCS farm program are not subject to the ineligibility provisions of the FSA. This is due to distinct provisions in the FSA and the Clean Water Act (CWA), as explained below.

The FSA states that a person is exempt from the ineligibility provisions of that Act for any action associated with the production of an agricultural commodity on a converted wetland, or the conversion of a wetland, if the action was authorized by a permit issued under Section 404 of the CWA and the wetland values, acreage, and functions of the converted wetland were adequately mitigated.

The St. Johns Bayou and New Madrid Floodway Project has the equivalent of a Section 404 permit. It is a Federal project specifically authorized by Congress for which the Corps has prepared several previous environmental impact statements and evaluated the project in accordance with the CWA Section 404(b)(1) Guidelines (see RSEIS 2 Section 5.11 for further clarification). Federal Civil Works Projects must comply with the 404(b)(1) guidelines (RSEIS 2 Section 4.5.2). In the case of a private applicant, once the guidelines have been met, the only additional step is to issue the permit. For Federal Civil Works projects this final step is omitted. However, there are additional differences between private projects and Federal Civil Works projects. This is highlighted in Section 404(r), which recognizes the distinction between Federal Civil Works projects and private applicants in terms of the benefits provided to the public.

In addition, the St. Johns Bayou and New Madrid Floodway Project is adequately mitigated. Federal Civil Works Projects must comply with NEPA. This includes complete detailed scientific analysis to identify significant resources and determine unavoidable impacts to those resources (2002 RSEIS Chapter 5). Detailed mitigation is formulated with specificity to compensate for the significant unavoidable impacts in accordance with the scientific analysis (RSEIS 2 Section 6.3). A Congressional review, including a NEPA analysis was conducted prior to Authorization. The St. Johns Bayou and New Madrid Floodway Volume 1 Phase 1 GDM (September 1980) was presented to Congress and included a Section 404 (b)(1) analysis (page 134). Subsequent NEPA documents have also included Section 404(b)(1) analyses; most recently Appendix F of the 2002 RSEIS. Per these analyses, and WQ Certification requirements (RSEIS 2 Appendix G), adequate mitigation for wetland impacts is not only provided, it is assured through monitoring.

In 1998, NRCS made the determination that the Corps' mitigation for this project met the requirements for retained eligibility under the FSA. Recently, the Corps requested that NRCS verify this determination. To do so, NRCS requested that the Corps provide an assessment of the functionality of lands within the project area to which this exemption (farmed wetlands) may apply, as well as the functional value of the Corps mitigation.

Concurrently, NRCS examined the impact of applying current mapping conventions to the project area. The NRCS team assembled Farm Service Agency "compliance slides" including wet and dry years, soil surveys, wetland inventories, Farm Service Agency base maps and color infrared photographs. Compliance slides are images used by the agency to aid in wetland analyses. The team selected three one-mile wide transects/sample areas (representing approximately 20 percent of the project area as outlined by the Corps) to evaluate the accuracy and applicability to the Wetland Conservation provisions. The sampling procedure verified that the original FSA wetland inventory is adequate for estimating farmed wetlands in the project area. Use of new mapping conventions did not yield greater amounts of wetlands in the sample. Therefore, wetland kinds and acres provided in previous NRCS correspondence with the Corps (NRCS letter dated May 29, 1998) are valid. The new mapping conventions were developed under a 1994 Memorandum of Agreement among the Department of Agriculture, the Environmental Protection Agency, the Department of the Interior, and the Department of the Army concerning the delineation of wetlands for purposes of Section 404 of the CWA and Subtitle B of the FSA.

NRCS's 1998 correspondence indicated the percentage of the project area that could be classified as farmed wetlands was estimated to be 0.4 percent for both the St. Johns Bayou and the New Madrid Floodway. Applying this percentage to the 130,000 acres expected to have some decrease in flood duration and/or frequency, 520 (or 530, See Section 2.1.1.) acres of farmed wetlands could be impacted.

The Corps contracted with ERDC to conduct an HGM assessment of potential project impacts on farmed wetland functions. A description of the HGM assessment and the mitigation ratios to offset the losses of the various functions is provided in Appendix D. The mitigation ratio for the most impacted function of farmed wetlands is 1.53:1. Applying this factor to the NRCS estimate of impacted farmed wetlands, approximately 800 acres would be needed to mitigate these impacts. The Corps wetland mitigation described in Section 5.2.2 will provide more than eight times that derived from the NRCS and HGM assessments.

NRCS confirmed (NRCS letter dated Oct. 5, 2005) their original estimate of inventoried (non-certified) farmed wetlands in the project area (NRCS letter dated May 29, 1998) using the current mapping conventions (RSEIS 2 Appendix G). Based upon the functionality of the estimated farmed wetlands, and the NRCS quantity estimate of existing farmed wetlands in the project area, NRCS concluded: "The COE's projections of the affected wetlands and the resulting mitigation are more than adequate for NRCS wetland conservation provisions of the Food Security Act." Therefore, producers who are enrolled in the farm program are exempted from the ineligibility provisions of the Food Security Act, as provided in 16 U.S.C. 3822(f)(4).

4.4.3.2 Loss of Subsidies

The second concern relates to the calculation of benefits of the project that could be affected by the loss of subsidies if large amounts of acres lose "Farm Bill Program" eligibility. In particular, this concern is that if participants in the Farm Bill program were ruled ineligible due to Swampbuster violations, then they would lose benefits afforded them in the form of price support subsidies and those losses of benefits should be reflected in the economic analyses for this project. As stated previously, producers who are enrolled in the farm program are exempted from the ineligibility provisions of the FSA.

Furthermore, the calculations of benefits provided by the implementation of the project's flood control features in the 2002 RSEIS did not include any direct benefit provided to producers due to any agricultural subsidy programs. There is an indirect effect of subsidies, but only from the fact that price indices are affected by subsidies such as price supports. The indices used for the economic analyses in the 2002 RSEIS are the "Normalized Prices" developed by the Economic Research Service (See Page B-5, 2002 RSEIS). Therefore, even in the event that participants lose eligibility, there would be no affect to the project's economic analyses.

4.4.4 Update of Project Economics

The economics of the recommended plan as presented in the 2002 RSEIS are revisited in this study to affirm the project's justification under current economic conditions. Agricultural benefits accounted for approximately 90% of the recommended plan's benefits and as such require an in-depth reanalysis to provide assurance of a reasonable current benefit estimate. Since the other benefits are relatively minor, they require less detailed scrutiny.

Pertinent data considered in the agricultural benefit reanalysis included land use, crop yields, current crop prices, costs of production, crop varieties that are grown in the area, and the interest rate used to discount the benefit streams. Of these factors, land use, crop type, and crop yields have experienced relatively insignificant changes. Crop prices, production costs, and the interest rate used to discount benefit and cost streams have changed significantly. The crop prices used in this reanalysis are the fiscal year 2005 prices developed by the Economic Research Service of the U.S. Department of Agriculture. The production costs were taken from crop budgets generated annually and published by the University of Missouri. The interest rate used in the economic reanalysis is the current (Fiscal Year 2005) Federal discount rate of 5 1/8 percent. This current rate is used for presentation purposes only. The authorized rates of 2 1/2 percent and 7 5/8 percent are used for formulation of the individual project features. The MRL levee closure is formulated at the "grandfathered" interest rate of 2 1/2 percent while the other features are formulated at 7 5/8 percent. See Section 4.4.2 for a discussion on interest rates.

4.5 Other Factors

4.5.1 Farmed Wetland Determinations

A concern has been raised that NRCS did not provide certified farmed wetland determinations. NRCS makes certified wetland determinations when requested by individual landowners (NRCS Policy letter dated April 12, 1995), or a classification will be made when a potential violation has been reported or other U.S. Department of Agriculture (USDA) programs require a certified determination (NRCS National Food Security Act Manual (NFSAM) Section 514.11, dated September 2000). Revised guidance to the NFSAM (dated June 15, 2005) maintains that NRCS will conduct certified wetland determinations when a USDA program participant indicates that he or she plans to conduct an activity that may affect program eligibility. There have been few such requests and therefore, the NRCS has made very few certified farmed wetland determinations in the study area.

NRCS provided estimates on the acres of farmed wetlands that have the potential to be impacted by the project. NRCS concluded that there are approximately 520 acres of farmed wetlands.

4.5.2 Civil Works Projects versus Regulatory Program Compensatory Mitigation

Concerns have been raised stating that the Corps does not mitigate Civil Works projects in the same manner as it requires private applicants under Section 404 of the Clean Water Act. The facts underlying these concerns are true, the Corps does not mitigate Civil Works projects in the same manner it requires of applicants. These concerns have been previously addressed and are available on the Corps's Internet website. The following paragraphs have been copied directly from the website (USACE, 2005).

> **Question - Why doesn't the Corps hold itself to the same standards for mitigation as is does private developers?**
>
> Answer - Mitigation as generally practiced by Corps planners affects a much broader range of resources than does the Corps Regulatory program which applies to aquatic resources. The most visible mitigation attributed to the Corps regulatory program is the compensatory mitigation done for wetlands impacts. To the extent a Corps Civil Works project impacts wetlands, the Section 404 (b)(1) guidelines are applied to the project. Those projects are treated in the same manner as a private developer's project. The only difference in process comes about during the project development phase. Private developers may use any reasonable standard they wish to economically justify their choices concerning projects. The Corps planning process requires the development of an NED project based on a cost benefit comparison. Civil Works projects are therefore developed in manner that places an emphasis on economics, which may

differ from that required of the private sector. This means that the proposed alternative is one that passes the Section 404(b)(1) Guidelines avoidance and least environmentally damaging alternative test as well as the Corps public interest review after having already passed through an economic based evaluation. For permit application, economics is only viewed as a function of reasonable cost, rather than the more structured and formal economic evaluation performed by the Corps. The same resource evaluation that occurs during the regulatory process is also required during the Civil Works process.

The standards that private developers are held to are different because, the cost and benefits for the project are borne by the private sector owner. Business decisions made by the private sector may or may not result in decisions similar to those made for Corps projects. The projects that the Corps Civil Works program proposes are developed to be in the National Interest. This means that no one person is benefiting from the project, but that there are benefits derived from the project that are benefiting the nation. The Department of the Army - Environmental Protection Agency 1990 Memorandum of Agreement on Mitigation (1) establishes the mitigation sequence, avoid, minimize, and then compensate to extent practicable, for remaining unavoidable impacts; (2) reiterates that significant degradation (loss of value) (40 CFR 230.10(c)) can be offset by compensatory mitigation to the level of non-significance; and (3) reiterates the requirement that the Corps should require mitigation to ensure no significant degradation of the waters of the United States occurs. In the Regulatory arena this strict sequence is a requirement, view of the project being proposed. Changes to the proposed project are recommended to the applicant for a permit. In the Civil works arena, the sequencing of decisions is made only after the NED project is developed. The Federal objective of water and related land resources project planning is to contribute to the national economic development consistent with the goals for protecting the Nation's environment.

Under the Corps Regulatory Program, quantifying impacts and compensatory mitigation would generally not be required for impacts of a construction activity to terrestrial wildlife, waterfowl, shorebirds, and fish rearing habitat. The Regulatory Program primarily focuses on impacts to jurisdictional wetlands. The Corps is proposing to mitigate for all significant impacts, not just jurisdictional wetlands.

Another important difference to mention is that the Corps Regulatory Program requires compensatory mitigation for impacts to jurisdictional wetlands. Prior converted croplands are not jurisdictional wetlands. Additionally, prior converted cropland is not regulated under the Clean Water Act. Mitigation for this proposed project compensates for decreased inundation on farmland, regardless of jurisdictional status. The Corps Regulatory Program and the 404(b)(1) Guidelines would not require compensatory

mitigation for non-jurisdictional areas. The Corps is proposing to mitigate for impacts to jurisdictional status on 622 acres (including 520 acres farmed wetlands indirect, 92 acres jurisdictional wetlands and 10 acres farmed wetlands directly impacted) of wetlands by restoring bottomland hardwoods and herbaceous wetlands on 7,121 acres of cropland. A private applicant would most likely compensate the same impact with only 1,078 of bottomland hardwood restoration, assuming results from the HGM analysis.

4.5.3 Additional NEPA Requirements

This document is intended to supplement the 2002 RSEIS. Coordination with the interagency team will occur regarding the suitability of potential mitigation tracts prior to purchase. Additional coordination will occur with the interagency mitigation team during the development of a site-specific detailed mitigation plans. Detailed mitigation plans are discussed in Section 6.3. The detailed mitigation plans will be submitted to the interagency mitigation team for review and comment prior to submittal for approval to MDNR. Additional NEPA documentation, such as an environmental assessment, may be required for particular mitigation plans. The Corps will make this determination and consideration will be afforded the comments received from the interagency mitigation team, applicable Federally recognized Indian Tribes, the Missouri SHPO, the non-Federal sponsor, and the general public.

4.5.4 Regulatory Guidance Letter 01-1

A concern was raised regarding the requirements of Corps' Regulatory Guidance Letter (RGL) 01-1 and potential issues raised by that RGL concerning temporal mitigation losses and requirements for a permit applicant to submit a mitigation work plan. Besides being superseded the following year by RGL 02-2, those concerns are misplaced and no longer applicable under the new guidelines.

Regarding mitigation ratios, RGL 02-2 is clear that wetland mitigation should focus on one-to-one functional replacement rather than acreages. In some cases, this means that replacing the functions lost from one wetland area can be achieved by another, smaller wetland. A ratio will be lower than one-to-one mitigation for wetland acreage lost where the functions associated with the area being impacted are demonstrably low and the replacement wetlands are of a higher function. Furthermore, mitigation is to be guided by the principle that compensatory mitigation must be practicable. "There may be instances where permit decisions do not meet the 'no overall net loss of wetlands' goal because compensatory mitigation would be impracticable…[and the goal] may not be achieved for each and every permit action". Id. at 2c.

As for temporal losses, that same RGL notes that construction of mitigation features should be concurrent with authorized impacts to the extent practicable and that advance or concurrent mitigation can reduce temporal losses. However, it is acceptable to allow impacts to aquatic resources to occur before accomplishing compensatory mitigation in circumstances where legal or contractual requirements require otherwise. In the present

case, mitigation lands will be fully acquired, although full mitigation credit will be subject to temporal reduction during the transition to complete restoration of the mitigation lands. This is acceptable under the RGL guidelines which state that "[i]nitial physical and biological improvements in the mitigation plan generally should be completed no later than the first full growing season following the impacts from authorized activities." Id. at 2.n.

Regarding a compensatory mitigation plan, RGL 02-2 requires a Corps-approved mitigation plan, a secured mitigation site, appropriate financial assurances, and legally protected, adequate water rights. Compensatory mitigation plans should include relevant information such as baseline information, environmental goals and objectives, site selection issues, a mitigation work plan, performance standards, contingency plans, and monitoring and long-term management. Id. at 3.a-j. While mitigation work plans should contain boundaries of proposed mitigation areas, the focus of the RGL concerning mitigation indicates that such a specific plan would not be required in situations such as large projects. Rather, an acreage surrogate could be relied upon (such as relying on the minimum one-to-one acreage replacement ratio) or computing credits for the functional changes to each mitigation site. See, id. at 2.d.3-4. Furthermore, compensatory mitigation plans are not required as a matter of regulation before the Corps can issue a public notice on a specific permit. 33 CFR §325.1(d)(9). Accordingly, if mitigation plans are available, they are included to the extent available in the public notice. In the present situation, the draft mitigation plan was included in the 2002 RSEIS and the mitigation strategies that the Corps is evaluating are analyzed in detail in this RSEIS 2. If later developments alter the practicability of these proposals, then subsequent NEPA documents will be issued in accordance with Corps and 404(b)(1) guidelines.

Site-specific detailed mitigation plans would follow the general outline of the RGL to the extent practical.

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Introduction

This chapter is written to supplement the 2002 RSEIS Section Environment Consequences, not to replace it. Impact analysis of the recommended flood damage reduction features is described in the 2002 RSEIS. This supplement section relates to the clarification of mitigation calculations, issues related to mitigation, and the addition of mitigation options to compensate for the unavoidable impacts to fish and wildlife resources. The chapter is divided by relevant physical, biological, and social factors. The environmental impact is described for the no Federal action, the basic mitigation feature, additional mitigation techniques, and mitigation scenarios for each relevant factor.

WRDA 1986 directs that acquisition of lands to mitigate impacts to fish and wildlife shall be undertaken: (1) before any construction of the project commences; or (2) concurrently

with the acquisition of lands and interests in lands for project purposes; and (3) that mitigation measures will generally be scheduled for accomplishment concurrently with other project features in the most efficient way. Section 906(b) of WRDA 1986 provides authority for the Secretary of the Army to mitigate damages to fish and wildlife without further specific Congressional authorization but limits post authorization acquisition or interests in lands for mitigation to willing sellers. Mitigation tracts must be purchased from willing sellers. Therefore, the precise location of the majority of actual mitigation tracts is currently unknown.

One objective of this RSEIS 2 is to examine whether compensatory mitigation is achievable and, if so, whether the project is economically justified. The values presented in the paragraphs below are general in nature and show overall mitigation strategies. Site-specific mitigation credits would be calculated during the development of detailed site-specific mitigation plans. Mitigation credit would be verified through monitoring to ensure that projected gains in habitat are met. Chapter 6.0 describes the acquisition, development, monitoring, and long-term management of site-specific mitigation.

5.2 Wetlands

Impacts to wetlands from project construction are described in Section 5.3 of the 2002 RSEIS and 4.2.1 of this RSEIS 2. All significant wetland impacts from the St. Johns Bayou and New Madrid Floodway Project will be mitigated.

The HGM analysis (Appendix D of this RSEIS 2) indicated expected gains in functional value from restoring forested wetlands on cropland. A summary is provided in Table 5.1. A mitigation ratio of 1.53:1 would fully compensate the greatest functional impact to farmed wetlands (1.53 x 530 acres of farmed wetland impacts = 811 acres of mitigation). A mitigation ratio of 2.9:1 would fully compensate the greatest functional impact to forested wetlands (2.9 x 92 acres of forested wetland impacts = 267). Therefore, all functional losses to wetlands would be fully mitigated by restoring wetlands on 1,078 acres of cropland.

It is important to note that the HGM analysis made the following assumptions concerning the mitigation areas:

- The mitigation areas will remain flooded at a frequency and duration sufficient to qualify as jurisdictional wetlands. The pattern of flooding will be predominantly backwater, or low-velocity flows of headwater, as described for the impact sites.

Mitigation areas that will be reforested will be assumed to start as bare fields with the same characteristics as the farmed wetland impact sites. They will be site-prepared to create microdepressional water storage at target levels established in the Arkansas Delta HGM guidebook (the percent ponding under natural conditions varies with the age and origin of the geomorphic surface – *e.g.*, modern meander belt features are more ponded than older Pleistocene outwash features),

Table 5.1. Gain in functional capacity per 1000 acres of compensatory mitigation and mitigation ratios to compensate impacts

	Detain Floodwater	Detain Precipitation	Cycle Nutrients	Export Organic Carbon	Remove Elements And Compounds	Maintain Plant Communities	Provide Wildlife Habitat
Functional Gains	582	906	589	663	348	814	507 (small tracts) 640 (large tracts)
Farmed Wetland Mitigation Ratios	No Impact	0.03:1	0.13:1	0.02:1	1.53:1	No Impact	No Impact
Forested Wetland Mitigation Rations	1.7 : 1	1.1 : 1	1.7 : 1	1.5 : 1	2.9 : 1	1.2 : 1	1.5 : 1 (small mitigation tracts – 250 acres average) 1.3 : 1 (large tracts – 3000 acres average)

- and be planted with appropriate native tree species (again, the initial composition must conform to the reference data presented in the Arkansas Guidebook). Planting densities, monitoring, and maintenance procedures will follow commonly accepted practices for wetland mitigation projects in the Corps' Memphis District.
- The composition variable (Vcomp) for the planted mitigation sites is assumed to be less than optimal even though the sites will be planted with appropriate species. This is based on experience, where relatively short-lived or understory species (*e.g.* box elder, dogwood) tend to invade and co-dominate with the planted species in the early years. Over time, the Vcomp score improves, and by the time trees are present, the replacement variable (Vtcomp) is assumed to be fully functional (*i.e.*, all dominants are target species for the site).

- Mitigation proposals other than reforestation of farm fields, such as development of moist soil units and the establishment of shallow-water perimeter wetlands in borrow pits, are not included in this assessment.

Construction of the flood damage reduction project would decrease inundation on a total of 1,296 and 5,417 acres of agricultural lands that meet the 15-day hydrologic criterion for farmed wetlands within the St. Johns Bayou Basin and the New Madrid Floodway, respectively, according to the Corps statistic inundation analyses (2002 RSEIS Appendix D). As previously stated, NRCS identified 0.4%, or about 520 acres, of this area as farmed wetlands (see RSEIS 2 Section 4.2.1.2.). The remaining cropland is prior converted cropland. The Corps is proposing to mitigate for all of the losses to agricultural lands that meet the 15-day hydrologic criterion regardless of jurisdictional status. The State of Missouri Compensatory Mitigation Guidelines were used to determine appropriate mitigation. Direct impacts to wetlands would be mitigated at a ratio of four acres of mitigation to every acre of impact (4:1). Indirect impacts to agricultural areas that meet the 15-day hydrologic criterion for farmed wetlands regardless of jurisdictional status would be mitigated at ratio of 1:1. Therefore, 7,121 acres would be provided to mitigate losses. Mitigation would include reforesting cropland, constructing moist soil units, creating vegetated buffer strips, and establishing a wildlife corridor. Functional wetland impacts would be overcompensated by the 7,121 acres of mitigation.

The Corps would monitor current jurisdictional wetlands within the New Madrid Floodway and St. Johns Bayou Basin below 295 feet NGVD for five years after the flood damage reduction features are built and are operated. This monitoring is separate from the monitoring that would be conducted on all mitigation sites. The jurisdictional wetland monitoring would ensure that all wetlands modeled by the Corps during the formulation of the 2002 RSEIS, would retain their jurisdictional status. Monitoring would include a comprehensive network of water level monitoring stations and physical site evaluations to fully characterize temporal and spatial variation of surface and subsurface water levels in the project area (or within the area having ground surface elevations below 295 feet NGVD) at least to the extent that project operations impacts can be determined for all wetlands within the project area. The exact number and location of monitoring stations would be determined in an approved monitoring plan submitted to MDNR.

A condition of the WQ Certification states that no net loss to jurisdictional wetlands would occur within the project area. Additionally, any drainage improvements conducted as part of the St. Johns Bayou New Madrid Floodway Project must not degrade or reduce adjacent wetlands. Additional mitigation may be required if monitoring results indicate a net loss to jurisdictional wetlands. The basic mitigation feature provides a net increase of 6,499 acres of jurisdictional wetlands. Therefore, it is highly unlikely that the project would result in a net loss to jurisdictional wetlands. Monitoring results would be coordinated with MDNR and the interagency mitigation team.

5.2.1 No Federal Action

Section 5.3.1 of the 2002 RSEIS describes the Without-Project Conditions. In summary, all forested wetlands that can be reasonably cleared have already been cleared and converted to agriculture. Any future impacts to wetlands would have to undergo Federal and State permitting under the Clean Water Act and/or the Food Securities Act. No wetland permitting requirements would be necessary for activities that impact prior converted croplands.

5.2.2 Basic Mitigation Feature

The basic mitigation feature would entail wetland restoration/creation on 7,121 acres of land. Table 5.2 provides expected benefits to wetlands from the basic mitigation feature in terms of functional capacity units for the various parameters measured in the HGM analysis. Wetland mitigation credits would be calculated during the development of tract specific detailed mitigation plans. Additionally, the functional gains to wetlands would be calculated from supplying Big Oak Tree State Park with Mississippi River surface water. The basic mitigation feature more than compensates for wetland functional losses and overall acreages.

Table 5.2. Expected functional benefits to wetlands from the basic mitigation feature[1]

	acres	FCU 1	FCU 2	FCU 3	FCU 4	FCU 5	FCU 6	FCU 7	Total FCU
Project Impacts	-622	-92	-105	-132	-99	-374	-92	-70	-964
Basic Mitigation									
Reforestation SJB	1,293	753	1,171	762	857	450	1,053	655	
Reforestation NM	2,326	1,354	2,108	1,370	1,542	809	1,893	1,179	
Modified Moist Soil Unit	765	0	19	57	10	408	0	0	
Vegetated Buffers	671	390	608	395	445	234	546	340	
Wildlife Corridor	266	154	241	157	176	93	217	135	
BOTSP Hydrologic Restoration	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	
BOTSP Perimeter Land Acquisition	1,800	1,048	1,631	1,060	1,193	626	1,465	913	
Borrow Pits	0	0	0	0	0	0	0	0	
TOTAL Basic Mitigation	7,121	3,699	5,778	3,801	4,223	2,620	5,174	3,222	28,023
NET CHANGE	6,499	3,607	5,673	3,669	4,124	2,246	5,082	3,152	27,059

[1]Represents the impacts to jurisdictional status only. Impacts attributed to a reduction of flooding on forested wetlands are not included. Impacts to these areas were quantified based on the fisheries HEP and waterfowl WAM.

FCU 1 – Detain Floodwater
FCU 2 – Detain Precipitation
FCU 3 – Cycle Nutrients
FCU 4 – Export Organic Carbon
FCU 5 – Remove Elements and Compounds
FCU 6 – Maintain Plant Communities
FCU 7 – Provide Wildlife Habitat

5.2.2.1 Reforestation

Forested wetland mitigation would include the following measures:

- Restore hydrologic functions to the extent practical. This may be accomplished by removing existing farm drains or plugging ditches. Perimeter levees may have to be constructed to prevent flooding on adjacent properties.
- Prepare the area for vegetation. This may involve deep disking or the use of a sub-soiler.

- Create microtopography based on the geomorphic setting. Dimensions would be based on patterns that occur in nearby reference sites.
- Plant appropriate vegetation dependent on site-specific hydrology and soil conditions. Native genotypes common to the area would be planted to the extent practical. Reforesting areas with 70% red oaks may not be practical.
- Plant each tract to the extent feasible with 15% RPM trees and 85% acorns/seeds. However, depending on site-specific conditions, it may be more appropriate to use seedlings. Planting would occur at appropriate times of the year.
- Utilize native genotypes in the plantings on the 1,800 acres of land surrounding Big Oak Tree State Park to mimic natural park conditions.
- Tree spacing, planting patterns, and maintenance requirements will be developed in consultation with resource agencies.

The preservation of highly desirable bottomland hardwoods that are in danger of being impacted by private individuals may also be pursued in lieu of reforestation. The interagency mitigation team recommended purchasing the Bogle Woods tract for preservation. This tract has been purchased. This specific tract of land was in danger of being cleared for timber production. Preservation of bottomland hardwoods would not be pursued unless the interagency mitigation team recommends it.

5.2.2.2 Shorebird Areas

Moist soil unit mitigation would include the following measures:

- Remove existing farm drains, if necessary.
- Construct a water control structure.
- Prepare the site. This may involve disking and terracing.
- Construct perimeter levees.
- Provide a source of water with sufficient capacity to flood the area.

Modifications would be made to the basic moist soil unit design. Moist soil units will be located adjacent to existing channels and within the two-year floodplain. A portion of the perimeter levee will be degraded to allow for surface water connectivity during out of bank events. These modifications would allow for benefits to mid-season fish rearing habitat. However, these actions would most likely result in gains to wetland functional capacity. The Arkansas Regional Guidebook (Klimas *et al*., 2004) limits wetland functional gains to reforestation techniques and do not include functional gains from the construction of moist soil units. Logic suggests that allowing surface water connectivity would result in gains at least equal to that of a farmed wetland and most likely more. However, HGM can not quantify the additional gains. The FCU gains in Table 5.2 represent that of a farmed wetland.

5.2.2.3 Vegetated Buffer Strips and Wildlife Corridor

Buffer strips and the wildlife corridor would include the following measures:

- Prepare the site.
- Plant appropriate vegetation

5.2.2.4 Big Oak Tree State Park Hydrologic Restoration

McCarty (2005) provided a summary of hydrology by plant communities. Big Oak Tree State Park can be broken into four distinct wetland zones. The zones are as follows:

- Zone II Wetlands – dominated by cypress swamp and shrub swamp exist below 290 feet NGVD. The flood regime is described as *"intermittently exposed. Surface water is present throughout the year except in years of extreme drought. The probability of annual flooding is nearly 100% and vegetation is flooded or saturated for the entire growing season."*
- Zone III Wetlands – dominated by mixed cypress/hardwood stands or cypress/cottonwood, dominate between 290 and 291 feet NGVD. Their flood regime is describes as "*semi-permanently flooded. Surface water or soil saturation persists for a major portion of the growing season in most years. Flooding frequency ranges from 51 to 100 years per hundred years. Flooding duration typically exceeds 25% of the growing season."*
- Zone IV Wetlands – dominated by overcup oak, sweetgum, red maple, green ash, and sugarberry; exist between 291 and 292 feet NGVD. Their flood regime is described as "*seasonally flooded. Surface water or saturated soil is present for extended periods, especially early in the growing season, but is absent by the end of the season in most years. Flooding frequency ranges from 51 to 100 years per one hundred. Typical duration is 12.5% to 25% of the growing season."*
- Zone V Wetlands – dominated by bottomland hardwoods exist in the small portion of the park above 292 feet NGVD. Their flood regime is described as "*temporally flooded. Surface water or soil saturation is present for brief periods during the growing season, but the water table usually lies well below the soil surface for most of the season. A typical frequency of flooding is 11 to 50 years out of one hundred. Typical duration is 2% to 12% of the growing season."*

A water delivery system is currently being designed that would allow Mississippi River water to flood the park and mimic a natural flooding regime. Specifically, the regime would allow for flooding of the park up to an elevation of 291 feet NGVD and to drain the park to an elevation of 288 feet NGVD. The average Mississippi River elevation from 1943 to 1974 at the likely historic source of river water to the park area, the mouth of St. James Bayou, from April 1 through May 15 is 294.3 feet NGVD. The river at this

elevation would back into St. James Bayou if the frontline levee had not isolated the rest of the Bayou from the river. Therefore, it is very likely that a gravity flow system could be managed to allow for inundation in an average year.

Constructing a water delivery system to Big Oak Tree State Park would restore wetlands in the park to historic conditions.

5.2.2.5 Big Oak Tree State Park Perimeter Land Acquisition

Mitigation would generally follow the recommendations of reforestation as stated in Section 5.2.2.1. Native genotypes would be used to mimic natural park conditions. Additionally, notches would be excavated in the existing perimeter levee surrounding the park to allow for surface water connectivity from the existing parkland to newly acquired areas. Depending on site-specific elevation, a new perimeter levee may have to be constructed surrounding newly acquired lands.

5.2.2.6 Borrow Pits

No expected gains to wetlands are anticipated by the construction of modified borrow pits. However, approximately 50% of each borrow pit constructed would have an average depth of three feet. Depending on site-specific depths, these areas may result in gains to wetland habitat. Potential gains to wetland credit would be determined during the formulation of the site-specific detailed mitigation plans.

5.2.3 Additional Mitigation Techniques that Supplement the Basic Feature and Compensate for Mid-Season Fish Rearing Losses

5.2.3.1 Technique 1: Additional Reforestation

Additional areas within the St. Johns Bayou Basin, the New Madrid Floodway, or the batture area could be reforested to benefit mid-season fish rearing habitat. These areas would be jurisdictional wetlands after mitigation measures are implemented. Mitigation measures would generally follow what was previously stated under Section 5.2.2.1. Technique 1 would result in a greater amount of wetlands restored than with the basic mitigation feature, and as a result, overall wetland impacts would be overcompensated.

5.2.3.2 Technique 2: Mitigation Measures That Increase Flood Duration

Flood durations between April 1 and May 15 would be increased on reforested areas by removing farm drains, plugging existing ditches, and/or constructing perimeter levees and water control devices. Increasing flood durations on mitigated areas would not change overall wetland jurisdictional status. However, increasing duration of flooding on mitigated tracts of land may change overall wetland functional quality. Benefits to wetland function would be determined during the development of site-specific detailed mitigation plans.

Excavating deeper areas in mitigation tracts, plugging existing drains, and construction of perimeter levees and water control devices may be regulated by Section 404 of the CWA. The applicability of additional Section 404 requirements would be addressed during the development of site-specific detailed mitigation plans.

5.2.3.3 Technique 3: Creation, Restoration, or Enhancement of Large Permanent Waterbodies

Creation, restoration, or enhancement of large permanent waterbodies would be achieved by increasing depth by excavating historical channels to achieve the desired depth, or constructing weirs in outlet channels to raise the water surface elevation. Both of these methods may result in the conversion of jurisdictional wetlands to deepwater aquatic habitat. Additionally, this action may result in the deposition of fill material into waters of the United States. Deepwater aquatic habitat is defined as areas that are permanently inundated at mean annual water depths > 6.6 feet or permanently inundated areas ≤ 6.6 feet in depth that do not support rooted-emergent or woody plant species. However, creation, restoration, or enhancement of permanent waterbodies may also result in an increase in jurisdictional wetland habitat due to the creation of additional shoreline and shallow water habitat.

The benefits and potential impacts to wetlands would be analyzed during the development of the site-specific detailed mitigation plan. Overall mitigation would be revised accordingly. For example, required acreage of wetland compensatory mitigation may increase if it is determined that creation, restoration, or enhancement of permanent waterbodies would result in an additional net loss to jurisdictional wetlands. However, overall wetland compensatory mitigation may be reduced if it is determined that the creation, restoration, or enhancement of a permanent waterbody would result in an overall net gain to jurisdictional wetlands. The applicability of additional Section 404 requirements would be addressed during the development of detailed mitigation plans.

5.2.3.4 Technique 4: Restoration or Enhancement of Small Permanent Waterbodies

Restoration or enhancement of small permanent waterbodies would result in an increase in wetland habitat. As stated above, restoration of small permanent waterbodies may involve deposition of fill material into waters of the United States to plug existing drains. The applicability of additional Section 404 requirements would be addressed during the development of detailed mitigation plans.

5.2.3.5 Technique 5: Modified Gate Operation

Modifications to gate operations in either the New Madrid Floodway or the St. Johns Bayou Basin would result in an average increase in depth and duration of flooding within the pool area during the period of April 1 to May 15 in the majority of years.

It is anticipated that areas within the spawning and rearing pool would be acquired in fee. Appropriate vegetation that can tolerate the expected flooding regime would be planted in areas that are currently in agricultural production. Non-cropped areas that are currently vegetated have been classified as wetlands. No impact to jurisdictional status of these areas is anticipated. Creation of a spawning and rearing pool would result in gains to jurisdictional wetland acres through appropriate vegetative plantings on prior converted cropland.

Pool creation would also significantly benefit fish spawning and rearing habitat. However, vegetation that is present in the spawning and rearing pool elevation may be distressed due to an increase in flood durations from April 1 to May 15. Black willow is the dominant species found in this area. Black willows are very flood tolerant and should be able to survive deep, prolonged flooding during the growing season (Whitlow and Harris, 1979). Distressed vegetation may result in decreases to available terrestrial wildlife habitat. Vegetated areas will be monitored. Compensatory mitigation may be adjusted in the event that creation of the spawning and rearing pool impacts existing vegetation. Further discussion on the potential impact to terrestrial wildlife is found in Section 5.5.3 of this RSEIS 2.

There are approximately 3,775 acres of Wetland Reserve Program (WRP) lands in the project area (NRCS letter dated August 17, 2005). Almost 800 acres of WRP land are located within the New Madrid spawning and rearing pool at an elevation of 284.4 feet NGVD. The NRCS did not plant any vegetation in this area. Revegetation occurred naturally. The majority of the vegetation in these areas consists of black willows. No impact to jurisdictional status of these areas is anticipated. NRCS would continue to be consulted with throughout the development of the site-specific detailed mitigation plans.

5.2.4 Mitigation Scenarios that Compensate for all Significant Fish and Wildlife Resources

Table 2.7 provides expected gains to wetland acreages and functions by implementing several mitigation scenarios. Each scenario results in the overcompensation of jurisdictional wetland acres and functions.

5.3 Water Quality

Project impacts were considered during the development of the 2002 RSEIS for each option using methodology agreed upon by resource agencies (Supplemental Water Quality Analysis- St. Johns Bayou and New Madrid Floodway, Ashby, Ruiz, and Deliman (2000); Appendix I of the SEIS, page I-3).

5.3.1 No Federal Action

Section 5.10.1 of the 2002 RSEIS describes without-project conditions. In summary, water quality in both basins is expected to remain unchanged from present conditions.

5.3.2 Basic Mitigation Feature

The basic mitigation feature would improve water quality throughout the project area. The conversion of cropland to bottomland hardwood is effective for reducing nutrient loading to the river. Moist soil units are functional wetlands and reduce nutrient loading to the river. Additionally, the reforestation of thousands of acres of cropland concurrent with their removal from crop production also logically leads to a reduction in agrichemical use on those acres and a reduction in the bare soil/tilled conditions that exist during bed preparation and planting times of the year, thus reducing both nutrient load and turbidity/erosion/siltation.

Riparian buffer zone establishment, which was proposed in the 2002 RSEIS, also must be taken into account and credited when general wetland impacts are considered with respect to this project. These buffer zones or strips along streams have been shown to reduce stream nutrient loading and bank erosion (Fischer and Fischenich, 2000). Hydrologic improvements to 991 acres in Big Oak Tree State Park, which is the portion of the existing park that would be inundated with the proposed hydrologic system, will also provide increased wetland functions for water quality. These improvements were not accounted for in the 2002 RSEIS. All these measures would reduce the export of nitrogen from the project site.

Table 5.3 provides estimates of nitrogen loads to the Mississippi River from the New Madrid Floodway at various flow scenarios and project formulations. The estimates in Table 5.3 show that the overall quantity of nitrogen loading from the New Madrid Floodway is an extremely small portion of the existing Mississippi River loading.

One of the features of the analysis included accounting for reduced runoff due to earlier flood retention of primarily headwaters. This would result in a positive effect on hypoxia by reducing the amount of nutrients entering the river conduits. Since the land cover conditions tend to decrease in ability to retain nutrients as elevation increases (*e.g.*, moving from wetland types to croplands), increased flooding increases the total amount of nutrients available for processing. Relative efficiencies (% load retained/total load) were used to compare the project options in the 2002 RSEIS. The use of total loads to describe project impacts fails to normalize for the different volumes and mass of various flood stages. In general, the 2002 RSEIS Recommended Plan alternative provided the highest level of percentage material retention. The estimate calculated for the basic mitigation (last row in the Table) was developed using mitigation of 765 acres for moist soil units, 671 acres for buffer strips, and 266 acres for a wildlife corridor considering the conversion of soybean land cover to riparian land cover. The estimates also took into account converting 1,800 acres surrounding Big Oak Tree State Park and 3,619 acres from soybean land cover to bottomland hardwood for the other reforestation mitigation.

Table 5.3. Estimated Nitrogen Loads to Mississippi River from New Madrid Floodway

	Loading from NM Floodway discharge (metric ton N)	% of Mississippi River Load	References
Base Flow and runoff 275 feet NGVD	0.0426	2.66×10^{-6}	Ashby, Ruiz, and Deliman (2000) Table C1
Moderate high flow 290 feet NGVD (2 year flood)	120	7.5×10^{-3}	Ashby, Ruiz, and Deliman (2000) Table C1
Extreme high flow 300 feet NGVD (30+ year flood)	974	6.1×10^{-2}	Ashby, Ruiz, and Deliman (2000) Table C1
2002 RSEIS Recommended Plan 280 and 282 feet NGVD	4	2.5×10^{-4}	2002 RSEIS
BASIC MITIGATION Moderately High Flow 290 feet NGVD	58.3	3.64×10^{-3}	Using the spreadsheet in Ashby, Ruiz, and Deliman (2000) Table C1

The basic mitigation feature increased nitrogen removal efficiency from 12.5% to 38.6% from existing conditions (final loads went from about 120,880 kg to 58,322 kg - a 50% increase in efficiency for nitrogen removal compared to existing conditions). Adding increased material retention associated with the basic mitigation of 7,121 acres of currently proposed wetland mitigation yielded an estimated load comparable to estimated loads for a 2-year event with existing conditions.

5.3.3 Additional Mitigation Techniques and Mitigation Scenarios

Additional mitigation techniques that reforest cropland in the floodway also result in larger nutrient removals. Overall water quality of floodway drainage would improve with most mitigation techniques due to a reduction in agriculture. Therefore, each mitigation scenario that fully mitigates for all significant fish and wildlife resources and takes farmland out of production would likely result in additional improvements to water quality.

5.4 Fisheries

Impacts to fisheries are described in Section 5.6 of the 2002 RSEIS. Duration of flooding events (with-project) is a significant factor in calculating mid-season fish rearing mitigation credits. The 2002 RSEIS recommended reforesting 8,375 acres of frequently flooded agricultural areas to compensate for impacts to mid-season fish rearing habitat.

Calculations for mid-season rearing habitat utilize the same HSI values that were utilized during the preparation of the 2002 RSEIS. The 2002 RSEIS did not include an ADFA component in calculating mitigation. To calculate the ADFAs of mitigation tracts it is necessary to know the percent average duration of flooding from April 1 to May 15. To calculate mitigation benefits from selected tracts, the duration of flooding pre- and post-mitigation must be known. Pre-mitigation flood duration must be based on post-flood damage reduction hydrology. It is not appropriate to use existing flood durations (pre-floodway closure conditions) to calculate mitigation benefits because these lands would most likely experience shorter flood durations after the flood damage reduction measures are in place and operating. The 2002 RSEIS accounted for all mid-season fish rearing habitat impacts based upon a reduction in flooding.

Benefits to mid-season fish rearing can basically occur in two ways. The first is the conversion of one type of habitat into another type of habitat that is of higher value to mid-season rearing fishes. An example is converting agricultural areas (HSI value of 0.37 in the New Madrid Floodway) to bottomland hardwoods (HSI value of 0.7 in the New Madrid Floodway). The other way to increase mid-season fish rearing is to increase flood duration between April 1 and May 15. Therefore, it is possible to obtain benefits from tracts of land if hydrology is introduced or extended during the mid-season period with no other change in habitat conditions. Fish must have access to the site.

5.4.1 No Federal Action

Without-Project conditions are described in Section 5.6.1 of the 2002 RSEIS. In summary, existing conditions would remain unchanged. The St. Johns Bayou structure would continue to operate as it has since the late 1950's. Interior runoff would continue to be trapped in the basin and flood adjacent lands when the control structure is shut during high Mississippi River stages. Floodwaters would continue to periodically inundate 5,613 average annual rearing acres in the New Madrid Floodway.

5.4.2 Basic Mitigation Feature

5.4.2.1 Reforestation

Reforesting cropland with bottomland hardwoods provides benefits to numerous species of fish and wildlife. Flood durations are required to calculate benefits to mid-season fish rearing habitat.

As an example, suppose there is a 100-acre tract of agricultural land within the New Madrid Floodway that is purchased for reforestation. The HSI value of agricultural lands for fish rearing is 0.37. After the closure of the levee, the tract only floods an average of 15% of the time from April 1 to May 15. Therefore, the pre-mitigation average annual habitat unit value (with-project hydrology) is 5.6 AAHUs. Mitigation includes reforesting the area with trees (20-year transition period) that are tolerant to site-specific conditions. Therefore, the mitigated habitat unit is 9.6 AAHUs. Mitigation credit is calculated by subtracting AAHUs of pre-mitigated conditions from AAHUs of mitigated conditions. Therefore, the hypothetical 100-acre mitigation tract that was reforested would yield a net increase of 4.0 mid-season fish rearing AAHUs. The following equations are used to calculate mid-season fish rearing habitat gains of the hypothetical 100-acre mitigation tract.

Habitat Gains = AAHUs per tract with mitigation – AAHUs per tract without mitigation

Where AAHUs are calculated by (50-year project life),

AAHUs = Cumulative HUs/50 years

and Cumulative HUs are calculated by,

$$\text{Cumulative HUs} = \sum_{n=1}^{3} \left[(T_{n+1} - T_n) * (\text{ADFA}) * \left[\frac{HSI_{n+1} + HSI_n}{2} \right] \right]$$

For n from 1 (existing conditions at initial time) to 3 (condition at end of project life)

where

T_n = first target year of time interval
T_{n+1} = last target year of time interval
ADFA = acres * % average duration of post project flooding from April 1 to May 15.
HSI_n = HSI at beginning of time interval
HSI_{n+1} = HSI at end of time interval

<u>Without Mitigation</u>

Agricultural Area: 277.5 Cumulative HUs = (50 – 0) * (15 ADFAs) * [(0.37 + 0.37)/2]

5.6 AAHUs = 277.5 Cumulative HUs/50 years

With Mitigation

Transition from Agriculture to Fallow: 5.78 HUs = (1-0) * (15 ADFAs) * [(0.37 + 0.4)/2]

Transition from Fallow to BLH: 156.75 HUs = (20-1) * (15 ADFAs) * [(0.4 + 0.7)/2]

BLH for Remainder of Project Life: 315.00 HUs = (50 – 20) * (15 ADFAs) * [(0.7 + 0.7)/2]

477.53 Cumulative HUs = 5.78 HUs + 156.75 HUs + 315.00 HUs

9.6 AAHUs = 477.53 Cumulative HUs/50 years

Mitigation Benefits

4.0 AAHUs Gain = 9.6 AAHUs with mitigation – 5.6 AAHUs without mitigation

Location of mitigation areas is needed to calculate the percent average flood duration from April 1 to May 15. To date the Corps has identified 1,157 and 6,413 acres of potential mitigation areas from willing sellers in the St. Johns Bayou Basin and the New Madrid Floodway, respectively. Duration of flooding from April 1 to May 15 has been estimated on each specific tract. For planning purposes only, average duration from each respective basin has been calculated from the following equation:

$$\text{Average Flood Duration} = \frac{\sum \text{acreage of specific tract} * \text{percent flooded of specific tract}}{\text{total acres}}$$

With-project flood durations in the St. Johns Bayou Basin on identified tracts of land range from 5% to 47%. The average duration of identified tracts of land is 20%. Reforesting (20-year transition period) 1,293 acres of cropland in the St. Johns Bayou Basin (basic mitigation feature) would yield an increase of 313 mid-season fish rearing AAHUs.

With-project flood durations in the New Madrid Floodway on identified tracts of land range from 0% to 42%. The average duration of all identified tracts of land is 6%. Reforesting (20-year transition period) 2,326 acres of cropland in the New Madrid Floodway (basic mitigation feature) would yield an increase of 38 mid-season fish rearing AAHUs.

These durations are only used for planning purposes for the completion of this RSEIS 2. Flood durations and mid-season fish rearing benefits would be revised during the development of site-specific mitigation plans. Additionally, acquiring lands that have long periods of flood duration from April 1 to May 15 is the focus of mitigation efforts. Acquiring these lands would result in higher gains per acre to the fishery resource and

thus may lower overall acreage of land required. Flood duration may be increased to maximize benefits on particular tracts. Regardless, a minimum of 7,121 acres of land would be acquired for wetland compensation.

5.4.2.2 Shorebird Areas

To compensate for the unavoidable impacts to shorebird habitat from project construction, the Corps would construct 765 acres of moist soil units (105 acres in the St. Johns Bayou Basin and 660 acres in the New Madrid Floodway). Moist soil unit tracts would be developed to allow precise management of the tract to provide the proper vegetation and water depths required for shorebird management. This would be accomplished by constructing perimeter levees, water control structures, and supplying a source of water (rain water, surface water, or groundwater pump). To provide benefits to mid-season fish rearing habitat, moist soil units would be modified by degrading sections of perimeter levees to create a connection to an existing channel. This action would allow fish access into shorebird areas during flood events.

Benefits to mid-season fish rearing can be calculated if certain conditions are met in the shorebird tracts. These conditions are as follows:

1. The site allows for suitable fish passage into the area during flood events.
2. The site remains flooded during all or portions of the mid-season fish rearing period (April 1 to May 15). Groundwater or surface water pumps may augment water supply during dry years. However, fish passage must still be accomplished.
3. The site allows for return access to a channel (ditch, bayou, stream, etc).

Shorebird tracts would be located adjacent to permanent water. These areas would most likely be located in the vicinity of Ten Mile Pond CA in the New Madrid Floodway and the lower portion of St. Johns Bayou near the outlet structure. Beginning in winter, water would be held on shorebird tracts until late spring, generally early May through June. Water levels will be dropped at a slow rate about one inch a day through stop log structures or other water control devices. Benefits to mid-season fish rearing habitat may be calculated because floodplain fishes will have access to the tract, water would remain on the tract for portions of the mid-season fish rearing period, and fish would return to the channel naturally, through the degraded perimeter levee, or through the water control device.

Concerns have been expressed over the possibility of utilizing moist soil units to create shorebird habitat and mid-season fish rearing habitat. These concerns primarily relate to lack of water from April 1 to May 15, fish access, water temperature, and dissolved oxygen concentrations. The USFWS stated in the 2000 CAR that shorebird areas may be used to offset a small portion of the habitat impacts to fisheries and waterfowl, depending on the depths of water and access to the area. Shorebird areas would primarily be managed for shorebird habitat.

During the development of this RSEIS 2, the interagency mitigation team failed to reach a consensus on benefits to floodplain fishes from modifying moist soil units. Therefore, calculation of any benefits to mid-season fish rearing habitat from the construction of modified moist soil units is not included in this RSEIS 2. However, the Corps intends to construct modified moist soil units that could benefit floodplain fishes. Sites would be monitored for floodplain fish usage. Mid-season fish rearing mitigation credit would be calculated for shorebird areas in the event that monitoring reveals fish usage. Constructing 105 and 660 acres of moist soil units in St. Johns Bayou Basin and the New Madrid Floodway have the potential to yield a maximum of 75 and 238 mid-season fish rearing AAHUs, respectively. This calculation is included in Appendix C, Calculation 3.

5.4.2.3 Vegetated Buffer Strips

Buffer strips would be planted along 64 miles of small to large streams in the New Madrid Floodway. Forested riparian zones provide habitat for floodplain-spawning fishes similar to larger tracts of bottomland hardwoods, but also contribute to in-stream habitat quality by shading, filtering sediment-laden water from agricultural fields during run-off, and adding woody debris to the stream that is utilized as cover by fish and attachment sites by invertebrates.

Precise locations for vegetated buffer strips have not been identified. Duration of flooding was estimated based upon determinations that were made on identified tracts of land from willing sellers. These tracts of land are located within the New Madrid Floodway and are adjacent to channels on which buffer strips are proposed.

Approximately 671 acres (260 acres of large streams, 233 acres of medium streams, and 178 acres of small streams) of existing agricultural areas would be planted in bottomland hardwoods. For planning purposes, buffer strips would have a 20-year transition period. Flood duration of these areas is approximately 5%. No significant change in flood duration is expected from implementing mitigation features. Planting 671 acres of vegetated buffer strips would yield an increase of approximately 9 mid-season fish rearing AAHUs within the New Madrid Floodway. This calculation is included in Appendix C, Calculation 4.

A 20-year transition period was used in the above calculation. Depending on site-specific conditions, buffer strips may be planted in species of trees that would have a 10-year transition.

5.4.2.4 Wildlife Corridor

A 300-foot wide riparian corridor would be developed along each side of an existing waterway between Big Oak Tree State Park and the Ten Mile Pond CA. The total area to be reforested is approximately 266 acres. Precise locations of the wildlife corridor have not been identified. Duration of flooding was estimated from a tract of land from a

willing seller. This tract is located between Big Oak Tree State Park and Ten Mile Pond CA and is adjacent to Wilkerson and St. James Ditches. Duration of flooding has been determined to be approximately 5%.
Approximately 4 mid-season fish rearing AAHUs are expected from converting 266 acres of agricultural areas (HSI = 0.37, duration = 5%) to bottomland hardwoods (HSI 0.7, duration = 5%) for a wildlife corridor. This calculation is included in Appendix C, calculation 5.

5.4.2.5 Big Oak Tree State Park Hydrologic Restoration

Under existing conditions, Big Oak Tree State Park does not offer any significant mid-season fish-rearing habitat due to the infrequency of flooding in the area. Due to existing flood control measures in the general vicinity, backwater is prevented or restricted from entrance into the park until the river elevation at New Madrid is approximately 297 feet NGVD (approximately 10 – 25-year flood event). This elevation is above the Mississippi River 2-year floodplain (HSI = 0). Therefore, under pre-mitigation conditions the park has a mid-season fish rearing habitat value of 0 AAHUs.

Based upon a review of Mississippi River stage data from 1943 to 2000, the hydrologic restoration feature would provide Mississippi River water to the park in about 90% of the years. Therefore, the park complex would now offer suitable mid-season fish rearing habitat. However, fish passage must be established. Fish passage measures would be considered in the design of the water delivery system in consultation with the interagency mitigation team. Potential measures could include but are not limited to the following:

1. The overall design would be gravity fed and would not rely on the use of pumps.
2. The diameter/opening of the culvert would be as large as economically justified and engineeringly feasible.
3. The culvert through the levee would have the smallest slope practical.
4. Hydraulic drops would be avoided to the extent allowed.
5. Deep pools would be constructed at both ends of the culvert to provide areas for fish to concentrate and rest.
6. The closure gate would remain open to the extent practical to provide fish access during different periods of the year.
7. New channels constructed from the park to St. James Bayou would be designed in ways to maximize fish usage. These measures include but are not limited to:

    - Provide meandering channels
    - Provide a low flow channel
    - Provide a vegetated shelf
    - Plant a riparian buffer strip
    - Ensure permanent water

There are 991 acres of bottomland hardwoods within the park. Approximately 583 acres are at or below elevation of 290 feet NGVD (Zone II Wetlands). Approximately 193 acres of the park are within elevation 290 – 291 feet NGVD (Zone III Wetlands). The water delivery system is being designed to allow water to enter the park up to an elevation of 291 feet NGVD. Therefore, elevations within the park at or below 291 feet NGVD would offer suitable habitat for mid-season rearing fishes, if fish access is achieved (Zone II, BLH acres = 583 acres, HSI = 0.7, duration = 100% and Zone III, BLH acres = 193 acres, HSI = 0.7, Duration = 25%). Therefore, 442 mid-season fish rearing AAHUs can be expected by the construction of a water delivery system and providing suitable access and egress for fish to Big Oak Tree State Park within the New Madrid Floodway.

5.4.2.6 Big Oak Tree State Park Perimeter Land Acquisition

The Corps is committed to purchasing 1,800 acres of farmland around Big Oak Tree State Park and reforesting that land over a 20-year transition period with native genotypes to mimic park conditions. This commitment has been made in the WQ Certification and the Memorandum of Understanding with MDNR. Approximately 2,000 acres of land have been offered for mitigation from willing sellers. The surrounding farmland ranges in elevation from 285 to 295 feet NGVD. Approximately 697 acres fall below elevation 290 feet NGVD (potential Zone II Wetlands). Approximately 93 acres are between an elevation of 290 to 291 feet NGVD (potential Zone III Wetlands). No mid-season fish rearing habitat exists in these areas under pre-mitigation conditions due to the infrequency of flooding.

Notches would be excavated into the existing park perimeter levee to allow for surface water connectivity and access for fish between existing park land and newly acquired lands. Therefore, if fish access is established, the 697 acres of potential Zone II wetlands (BLH = 697 acres, HSI = 0.7, duration = 100%) and 93 acres of potential Zone III wetlands (BLH = 93 acres, HSI = 0.7, duration = 25%) would now offer suitable mid-season fish rearing habitat. Reforestation of 1,800 acres of land surrounding Big Oak Tree State Park, supplying Mississippi River water, allowing surface water connectivity, and providing fish access and egress would yield a net increase of 504 mid-season fish rearing AAHUs in the New Madrid Floodway. No mid-season fish rearing habitat is expected by reforesting the remaining areas that are above an elevation of 291 feet NGVD. These areas would more than likely be jurisdictional wetlands after reforesting because of soil types, groundwater, and rainfall. Benefits to wetland, wildlife, and waterfowl resources would be quantified for the lands above 291 feet NGVD.

Benefits to mid-season fish rearing habitat can only be achieved if fish have access to Big Oak Tree State Park. No benefits to mid-season fish rearing habitat have been credited for the acquisition and reforestation of these lands for the purpose of this RSEIS 2. However, mitigation credit would be quantified if the Big Oak Tree State Park hydrologic restoration feature provides adequate fish passage.

5.4.2.7 Borrow Pits

Borrow pits would be constructed on existing farmland in the lower areas of the St. Johns Bayou Basin. Approximately 387 acres of borrow pits would be required to complete associated levee raises.

If constructed properly, borrow pits are permanent waterbodies that provide high quality rearing habitat for a variety of species (Baker, *et al.,* 1991; others). When access is available during flood events, adult fish are attracted to borrow pits because of deep water and abundant forage fishes that often concentrate in permanent waterbodies. Many of these adult fish will spawn in shallow, structurally complex littoral areas of borrow pits. Plankton densities are usually high in permanent waterbodies, so once eggs hatch, larval fish have an abundant food source. High densities of fish are characteristic of borrow pits, and many of these individuals will eventually be transported or move into the Mississippi River during subsequent floods.

Construction of borrow pits would follow the guidelines established by Aggus and Ploskey (1986), which recommend some areas of deep water (*e.g.*, 6-10 feet), a sinuous shoreline, establishment of islands, and a variable bottom topography. Average depth of borrow pits, influences the fish assemblage. Shallow areas are suitable for characteristic wetland fishes such as fliers, pirate perch, taillight shiners, and young-of-year fishes. Deeper areas are more conducive for sport and commercial fishes. Therefore, borrow pit construction will recognize the importance of providing shallow and deep water to benefit the maximum number of species and life stages.

Borrow pits would be constructed to ensure that the following conditions are met:

- 50% of each pit would have an average depth of at least six feet to provide habitat for species that are commercially and recreationally valuable.
- 50% of each pit would have an average depth of at least three feet to provide habitat for fishes that require shallower floodplain habitat.
- Sites would be accessible to river and floodplain fishes during flood events.
- Islands and diverse topography would be created.
- Aquatic vegetation would propagate in shallow areas.
- Large trees would be preserved along the edges of borrow pits to the extent practical to control erosion, provide shade, and provide organic input. Efforts would be made to locate borrow areas adjacent to reforested areas.
- Structure would be placed within borrow pits where practical. Natural structure would be obtained from cleared sites necessary for other project purposes. No vegetation would be cleared for the sole purpose of obtaining structure for borrow pits.
- Borrow pits would not be located in jurisdictional wetlands.

- Connection with existing permanent waterbodies would be made to the extent practical.
- Public access would be made available to the extent practical.

Duration of flooding in areas proposed for borrow pit creation has been determined to be approximately 27% (post-project hydrology) prior to those areas being converted to borrow pits. Since they will be permanent waterbodies, the duration of flooding after the borrow pits are created will be 100% during the mid-season rearing period. The 387 acres of farmland (HSI = 0.52) in St. Johns Bayou Basin provide 54.3 mid-season fish rearing AAHUs. Constructing 387 acres of large permanent waterbodies (HSI = 4.2, % average duration = 100%) would provide 1,625.4 mid-season fish rearing AAHUs. Therefore, constructing 387 acres of borrow pits within the lower end of St. Johns Bayou Basin would yield an increase of 1,571 mid-season fish rearing AAHUs (1,625.4 AAHUs – 54.3 AAHUs).

5.4.3 Additional Mitigation Techniques that Supplement the Basic Feature and Compensate for Mid-Season Fish Rearing Losses

5.4.3.1 Technique 1: Additional Reforestation

Reforestation remains one method to compensate for impacts to mid-season fish rearing habitat. Reforestation must consider ADFAs and the transition period for growth. As seen in Appendix C of this RSEIS 2, reforesting agricultural areas into bottomland hardwoods provides 1.31 (10-year duration) or 1.21 (20-year duration) AAHUs per ADFA in St. Johns Bayou Basin and reforesting agricultural areas into bottomland hardwoods in the New Madrid Floodway provides 0.30 (10-year duration) or 0.27 (20-year duration) AAHUs per ADFA.

Additional reforestation would occur in areas within St. Johns Bayou Basin, New Madrid Floodway, and the batture area. Reforestation would mimic natural conditions in species composition to the extent practical. Reforestation within St. Johns Bayou Basin and the New Madrid Floodway would most likely be planted in bottomland hardwoods that would have a 20-year transition period. Fast growing species such as black willow or cottonwood are typically found within the batture areas. These types of trees would have a 10-year transition period.

The Basic Mitigation Feature does not fully compensate for impacts to mid-season fish rearing habitat in the New Madrid Floodway. An additional 2,278 mid-season fish rearing AAHUs are necessary to fully compensate the impacts. Concerns expressed since the 2002 RSEIS include the allegation that the acres are generally flooded only a third (33%) of the period, or for 15 days. Approximately 25,567 acres of additional reforestation (20-year transition, 0.27 AAHUs per ADFA, 33% flood duration) would be required to fully mitigate the remaining impacts to mid-season fish rearing habitat if mitigation was based solely on reforestation.

Many areas within the batture lands offer suitable habitat for mid-season rearing fishes. Donaldson Point is used as an example. There are numerous areas within the batture area that could be reforested within the immediate study area. There are approximately 2,640 acres of agricultural areas (HSI = 0.37, utilizing New Madrid Floodway HSI values) on Donaldson Point. The 2-year flood stage at river mile 900, which is adjacent to the southern tip of Donaldson Point, is approximately 295.5 feet NGVD. Duration of inundation at elevation 295.5 feet NGVD was determined to be 31%. Replanting bottomland hardwoods (10-year transition period, 31% duration) on 2,640 acres of agricultural areas (HSI = 0.37) would yield an increase of 243 mid-season fish rearing AAHUs. This calculation is included as Appendix C, calculation 6.

To reiterate, areas that have the highest duration of flooding from April 1 to May 15 offer the highest benefit to mid-season fish rearing habitat. These areas include the lower portion of the St. Johns Bayou Basin and the Eagles Nest area of the New Madrid Floodway.

5.4.3.2 Technique 2: Mitigation Measures That Increase Flood Duration

Benefits to mid-season fish rearing habitat can be achieved by increasing habitat suitability and by increasing duration of flooding. Converting agricultural areas to bottomland hardwoods increases the habitat suitability of the area. Existing soil types throughout the basin have high clay contents with very low permeability. Mitigation tracts have the potential to maintain high durations of flooding during the mid-season fish rearing period. However, most agricultural fields in the area have extensive drainage features that limit the duration of flooding. There are several methods that can be implemented to increase duration of flooding on the mitigation lands.

Some agricultural fields in the area have drainage features such as perimeter levees, ditches, farm drains, and water control devices (screw gates, stop log structures, flap gates). Areas within such tracts could be excavated to create variable topography (higher and lower elevations). Excavated material can be placed along the perimeter levees (required to ensure that adjacent landowners are not flooded) or used to plug existing field drains. Portions of perimeter levees can be degraded in areas that are adjacent to channels (ditches, sloughs, etc.) that support aquatic life. During flood events, water would spill from the existing channel into the mitigation area. Thus, fish would move onto the floodplain. Floodwater would remain trapped in the mitigation area due to the altered topography, natural soil properties, plugged farm drains, and the high water table. It is conceivable that mitigation areas could retain water throughout most of the mid-season fish rearing period (April 1 to May 15), resulting in an increased duration of flooding.

Water control structures would be left in place or constructed to hold water until May 15 and operated to allow floodplain fishes to return to the adjacent channels. These structures could also be used to precisely manage water levels during other parts of the

year (*e.g.* waterfowl season) or used to better manage the overall health of the replanted forest.

Species to be planted would depend on the constructed topography and expected hydrology. Therefore, species to be used in the lower areas would consist of extremely flood-tolerant species that could withstand high levels of inundation (bald cypress, tupelo, green ash, Nuttall oak, water hickory). High frequencies of inundation from April 1 to May 15 could cause high mortality rates of recent plantings. Therefore, mitigation sites could be managed for drier conditions (water control structures remain open to allow drainage) during the first several years following initial planting to promote tree growth. Higher frequencies of inundation could be introduced after the trees have developed to the point that they could withstand higher flood frequencies. Increasing durations of flooding to the full 45-day period is conceivable. However, it is not recommended on all tracts. Prolonged flooding stresses many species of trees unless planted species can tolerate such conditions (such as bald cypress). A 2-week period (31% duration) during April 1 to May 15 is practical for planning purposes.

As an example, suppose that mitigation on the same 100-acre tract that was used as an example in Section 5.4.2.1 of this RSEIS 2 also includes removing farm drains, constructing perimeter levees, and installing a stop log structure. The tract would be managed to hold water for two weeks (31% duration) during the mid-season fish rearing period. Reforestation without any increase in duration would yield an increase of 4.0 AAHUs. Reforesting and increasing flood duration from 15% to 31% would yield an increase of 14.2 AAHUs (19.7 AAHUs – 5.5 AAHUs).

Site-specific detailed mitigation plan would reflect changes to mid-season fish rearing habitat by implementing different management options. For example, appropriate flood durations would be calculated for tracts that are managed for drier conditions to promote tree growth during the first several years.

5.4.3.3 Technique 3: Creation, Restoration, or Enhancement of Large Permanent Waterbodies

There are numerous opportunities (see Table 2.3) within the batture area to create and enhance permanent waterbodies. Gains in mid-season fish rearing habitat would be realized from the conversion of existing habitat to permanent large waterbodies. The creation of permanent waterbodies would also maximize duration of flooding (duration = 100%) from April 1 to May 15.

The Mississippi River floodplain can be inundated for prolonged periods between winter and early summer. Fish respond to floods by moving laterally onto the floodplain to feed, avoid predators, and seek suitable areas for reproduction. A pulsed hydrograph during the winter and spring provides numerous opportunities for fish to access floodplain habitats where they may reside for extended periods to feed and reproduce. Permanent waterbodies harbor both resident and transient fishes. Therefore, construction

and management of permanent waterbodies must recognize opportunities to allow periodic connection to the main stem river to accommodate access and dispersal, while maintaining suitable habitat for a variety of fish species.

Numerous floodplain lakes, such as Riley Lake, exist in the batture. Normally, these lakes become very shallow or completely dewatered after floods recede. Larval fish abundance can be high in floodplain lakes because many species concentrate in permanent waterbodies for feeding and reproductive purposes. Maintaining suitable water depths after disconnection will improve survival rate and contribute to overall recruitment of fish once the lakes become reconnected to the Mississippi River during flood pulses. Riley Lake is but one example of opportunities to reconnect or manage water levels of permanent waterbodies to enhance survival of early life history stages of fish. For example, the Lower Mississippi River Resource Committee has published a list of backwaters in the Mississippi River floodplain that state and Federal resource agencies have identified as restoration sites. The mitigation team may consider restoring some of these permanent waterbodies as mitigation for the flood control project.

An outlet channel was dug at Riley Lake in an attempt to drain it for agricultural purposes (Robert Henry, personal communication). A rock weir could be constructed within the outlet of the lake in order to restore surface water elevations to historical conditions. Depending on the height of the weir, restored conditions would increase water depths, thus restoring historical mid-season fish rearing habitat. Table 5.4 lists the potential benefits to mid-season fish rearing habitat from implementing Riley Lake measures.

The New Madrid gage is about six miles downstream from the proposed weir location, the two-year Mississippi River flood elevation at the weir is higher than at New Madrid gage. The approximate change in elevation in this reach of the Mississippi River is six inches per mile. Therefore, the two-year flood stage at the weir is estimated to be 293-feet NGVD. The maximum weir elevation of 288 feet NGVD (Table 2.7, Scenario C) is well below the 2-year flood elevation at Riley Lake. Therefore, flood waters are expected to inundate Riley Lake frequently.

Table 5.4. Expected surface acres and mid-season fish rearing habitat value for Riley Lake

		Pre-Mitigation Conditions				Mitigated Conditions			
Elevation	Habitat	Acres	HSI Per acre	Duration %	AAHUs	Acres	HSI Per acre	Duration %	AAHUs
285	Agriculture	97	0.37	53	19		0.37		
	BLH	112	0.7	53	42		0.7		
	Water	36	2.2	100	79	245	2.2	100	539
	Total				**140**				**539**
	AAHU GAIN	**399**							
286	Agriculture	145	0.37	49	26		0.37		
	BLH	150	0.7	49	51		0.7		
	Water	36	2.2	100	79	333	2.2	100	733
	Total				**156**				**733**
	AAHU GAIN	**577**							
287	Agriculture	216	0.37	47	38		0.37		
	BLH	180	0.7	47	59		0.7		
	Water	36	2.2	100	79	432	2.2	100	950
	Total				**176**				**950**
	AAHU GAIN	**774**							
288	Agriculture	274	0.37	43	44		0.37		
	BLH	228	0.7	43	69		0.7		
	Water	36	2.2	100	79	538	2.2	100	1,184
	Total				**192**				**1,184**
	AAHU GAIN	**992**							
289	Agriculture	349	0.37	38	49		0.37		
	BLH	295	0.7	38	78		0.7		
	Water	36	2.2	100	79	680	2.2	100	1,496
	Total				**206**				**1,496**
	AAHU GAIN	**1,290**							

5.4.3.4 Technique 4: Restoration or Enhancement of Small Permanent Waterbodies

Within the project area, historical stream conditions consisted of slow-moving meandering streams, bayous, and small oxbows. Most of these natural conditions have been altered by ditching, channelizing, and leveling. Remnants of these historical channels remain throughout the study area. These areas flood frequently but have low durations due to drainage features that have been constructed. Opportunities exist to restore hydrology to these areas. Techniques for restoring hydrology to such areas can include but are not limited to, plugging drains and ditches, excavating channels to reconnect historical oxbows, restoring historical meanders, and removing small levees.

Benefits to mid-season fish rearing would result from the change in habitat (agriculture or fallow areas to small permanent waterbody) and the increased duration of flooding. It is not known how many acres of small waterbodies can be created. One 22-acre tract that is currently farmland has been identified that could potentially be restored to a small waterbody. Based on examination of 1-foot contours obtained from Light Detection and Ranging (LIDAR) data, the area appears to be a historic channel of Ten-Mile Pond Ditch. Mitigation of this tract could potentially include removing existing farm drains and excavating portions of the tract to reconnect it to Ten Mile Pond Ditch.

The creation of a small permanent waterbody on this specific tract (1.2 AAHUs per ADFA, duration = 100%) on 22 acres of farmland (0.37 AAHU per ADFA, duration = 5%) in the New Madrid Floodway would yield a net increase of 26 mid-season fish rearing AAHUs (26.4 AAHUs – 0.4 AAHUs). Other similar tracts of land likely exist throughout the area. The restoration of these areas would be considered in the development of detailed mitigation plans.

5.4.3.5 Technique 5: Modified Gate Operation

Modifying operation of the gates in the St. Johns Bayou and the New Madrid Floodway closure structures to hold water throughout the mid-season fish rearing period would provide spawning and rearing habitat. As mentioned in Section 4.3.2.4, this action would create a permanent waterbody that can be managed to enhance fish reproduction.

The 2002 RSEIS recommended that the gates be closed when the Mississippi River reaches an elevation of 284.4 feet NGVD. Additionally, the 2002 RSEIS stated pumps would be used to evacuate interior water down to an elevation of 283.4 NGVD. Gates would be opened when the Mississippi River fell below an elevation of 284.4 feet NGVD (2002 RSEIS, Table 2-1). Under these conditions, the sump area would drain during the mid-season fish rearing period reducing habitat quality for floodplain fishes.

This RSEIS 2 analyzes several modifications to gate operations that would maintain water levels throughout the mid-season fish rearing period. This action provides significant spawning and rearing habitat for fish that have accessed the area prior to gate closure. Depending on river stages, gates will be opened after the reproductive season to

allow for dispersal into the Mississippi River. This modified gate operation converts a transient habitat into a permanent waterbody habitat (See RSEIS 2, Section 4.3.2.4).

Fish will have ample opportunities to access the spawning and rearing pool during the reproductive season. There are over 100 species of fish that can potentially utilize Mississippi River floodplains for spawning and rearing (2002 RSEIS, Appendix G Tables 1 and 2). These species can be separated into three major groups based on their spawning behavior (Baker and Ross, 1981; Baker, *et al.*, 1991; Hoover and Killgore, 1998):

> Facultative floodplain spawners are those that move onto the floodplain for short periods to spawn. Eggs and larvae remain for extended period during development if water levels are conducive, and then juveniles move back into the river to complete their development (*e.g.*, gars, shad, buffalo, and carpsuckers).
>
> Backwater or wetland species are those that thrive in shallow, slackwater environments and spawn in littoral zones. Eggs and larvae develop into juveniles and adults which rarely move into the river during any phase of their development (*e.g.*, topminnows, pygmy sunfishes, pirate perch, and bantam sunfish).
>
> Obligate riverine species are those that spawn and rear in the river, and rarely move into floodplains for spawning purposes (*e.g.*, shovelnose sturgeon, skipjack herring, speckled chub, freshwater drum). The reproductive success of these species will not be significantly impacted by the project.

The gate will be operated to maximize periods of access for the first two groups of species. The gates do not have to be open continuously, only intermittently before and during the mid-season rearing period to provide suitable access for spawning adults. Intermittent access is a naturally occurring hydrologic characteristic of large floodplains with a pulsed hydrograph. Depending on Mississippi River stages, gates may be open during the winter for waterfowl (managed to provide waterfowl habitat) and continue to remain open during early and mid spring if a flood event does not occur. At higher water levels, the gates may be closed, but those fish that have previously accessed the floodplain will spawn and rear. Depending on Mississippi River stages, gates may be reopened after the mid-season fish rearing period. Therefore, adult and young of the year fish will be able to access the mainstem river.

By analyzing the 32-year period of record and utilizing an elevation of 284.4 feet NGVD gates have the potential to be open for 68% of the time over the period of record in February, 54% of the time over the period of record for March, 51% of the time over the period of record for April, and 62% of the time over the period of record for May 1 – 15. Additionally, based on an elevation of 280 feet NGVD, gates have the potential to be open for 59% of the time over the period of record for May 16-31 and 80% of the time

over the period of record for June 1-30. The potential to be open means that, while there may be biological reasons for the gates to remain open, there would be no flood control rationale to close the gates when the river stage was below those elevations.

As part of managing the spawning and rearing pool, the gates will be operated in a fashion that balances periods of fish access with the need to reduce flood damage. Best Management Practices (BMP) for gate operation will be developed to maximize access during the entire reproductive period of fishes. BMP will be developed during formulation of site-specific detailed mitigation plans with input from the interagency mitigation team. BMP will include the development of guidelines for gate operation to maximize access during the entire reproductive period of fishes. Consideration will be given to the purpose (waterfowl or fish), time of year (*i.e.*, temperature-based rules coinciding with spawning activities), controlling stage elevations (*i.e.*, identifying all combinations of interior and exterior stages to maximize length of gate openings), minimizing high water velocities through the structure, and managing stable sump elevations to ensure successful rearing

5.4.3.5.1 Technique 5a: New Madrid Floodway

Depending on the elevation of inundation, up to 2,699 AAHUs could be gained by modifying gate operation in the New Madrid Floodway. Table 5.5 provides potential gains to mid-season fish rearing habitat from modifying operation of the New Madrid Floodway Gate.

HSI values for large, permanent waterbodies were used because of the intentional management of water depth and duration, and the recognized importance of these habitats for rearing, feeding, and survival of fishes. Once the gates are operational and depending on Mississippi River elevations, water could be pooled to 284.4 NGVD during the mid-season period. Continuous duration, therefore, will provide 1 ADFA for every 1 acre of pooled habitat behind the structure. Constant water levels during the mid-season rearing period provides permanent habitat during development of larval fishes, while adjacent, unregulated lands may dewater prior to completion of the larval stage. Fish can enter the regulated pool when gates are open allowing inflow of Mississippi River water through the culverts. Fish passage is likely as explained in Section 4.3.2.1. In the absence of flooding from Mississippi River backwater, gates will be opened after May 15th to drain interior lands and transport young fishes into the Mississippi River.

5.4.3.5.2 Technique 5b: St. Johns Bayou Basin

Table 5.6 provides expected benefits to mid-season fish rearing habitat from modifying operation of the closure gates in the St. Johns Bayou Basin.

5.4.4 Mitigation Scenarios that Compensate for all Significant Fish and Wildlife Resources

The basic mitigation feature compensates for all resource categories except for mid-season fish rearing habitat in the New Madrid Floodway. An additional 2,278 mid-season fish rearing AAHUs are required in the New Madrid Floodway. Table 5.7 provides four mitigation scenarios that fully mitigate for the remaining mid-season fish habitat losses not compensated by the basic mitigation featured.

Table 5.5. Potential gains to mid-season fish rearing habitat from modifying the New Madrid Floodway Gate Operation

	Existing[1]		284.4' NGVD April 1 – May 15		283.4' NGVD April 1 – May 15		Combination[2]		282' NGVD April 1 – May 15	
Habitat	ADFAs	AAHUs	ADFAs	AAHUs	ADFAs	AAHUs	ADFAs	AAHUs	ADFAs	AAHUs
Agriculture	606	224								
Fallow	60	24								
BLH	203	142								
Large Water	79	174	1,531	3,368	1,131	2,488	1,384	3,045	707	1,555
Small Water	87	105								
TOTAL	1036	669	1,531	3,368	1,131	2,488	1,384	3,045	707	1,555
AAHU Gain		**-**		**2,699**		**1,819**		**2,376**		**1,145[3]**

[1]The existing condition is the 2002 RSEIS recommended plan (Alternative 3-1B). Data derived from 2002 RSEIS, Table 12, page C-22.

[2]Elevation of 284.4 from April 1 to April 30 and drop to an elevation of 283.4 from May 1 to May 15.

[3]The existing condition of elevation 282 feet NGVD provides 410 AAHU. Benefits to a spawning and rearing pool held at elevation 282 feet NGVD were calculated by subtracting the existing condition (410 AAHU) from the mitigated condition (1,555 AAHU).

Table 5.6. Potential gains to mid-season fish rearing habitat from modifying the St. Johns Bayou Gate Operation

	St. Johns Bayou HSI Values				New Madrid Floodway HSI Values			
	Existing[1]		283' NGVD 1 Apr – 15 May		Existing[1]		283' NGVD 1 Apr – 15 May	
Habitat	ADFAs	AAHUs	ADFAs	AAHUs	ADFAs	AAHUs	ADFAs	AAHUs
Agriculture	172	89			172	64		
Fallow	33	30			33	13		
BLH	144	281			144	101		
Large Water	16	67	726	3,049	16	35	726	1,597
Small Water	63	202			63	75		
TOTAL	428	669	726	3,049	428	288		
AAHU Gain		**-**		**2,380**				**1,309**

[1]Based on the 2002 RSEIS recommended plan (Alternative 3). Data presented is consistent with selected gate operation scenario.

Table 5.7. Mitigation Scenarios that Compensate for Losses to Mid-Season Fish Rearing Habitat in the New Madrid Floodway

Mitigation Scenarios	New Madrid Floodway AAHU
Basic Mitigation	51
Scenario A	
Additional Reforestation – 200 acres batture (fee)	19
Modified Gate – NMF 283.4 feet NGVD – 2,000 acres (fee)	1,819
Riley Lake - 286 feet NGVD – 430 acres (fee)	577
TOTAL Basic Mitigation and Scenario A	2,466
Scenario B	
Modified Gate – NMF 284.4 to 283.4 feet NGVD Combination – 2,850 acres (fee)	2,376
TOTAL Basic Mitigation and Scenario B	2,427
Scenario C	
Additional Reforestation – 1,050 acres batture (fee)	117
Modified Gate – SJB[1] 283 feet NGVD – 1,154 acres (fee)	1,309
Riley Lake - 288 feet NGVD – 700 acres (fee)	992
TOTAL Basic Mitigation and Scenario C	2,469
Scenario D	
Modified Gate SJB[1] 283 feet NGVD – 1,154 acres (fee)	1,309
Modified Gate NMF 282 feet NGVD – 1,215 acres (fee)	1,145
TOTAL Basic Mitigation and Scenario D	2,505

[1]Utilizing New Madrid Floodway HSI values

5.5 Wildlife Resources

Impacts to wildlife resources are described in Section 5.4 of the 2002 RSEIS. In summary, construction of the flood damage reduction project would impact 2,163 terrestrial wildlife AAHUs.

5.5.1 No Federal Action

The without-project conditions are described in detail in Section 5.4.1 of the 2002 RSEIS. In summary, no change to land use is expected. There may be declines to significant habitat such as large tracts of bottomland hardwoods due to timber cutting (Bogle Woods).

Big Oak Tree State Park would continue to experience drier conditions under the no action option. Animal species represented would change as the forest composition changes.

5.5.2 Basic Mitigation Feature

The basic mitigation feature calls for reforesting a total of 6,356 acres of cropland (671 acres of buffer strips, 266-acre wildlife corridor, 1,800 acres surrounding Big Oak Tree State Park, and 3,619 additional acres). Table 5.8 provides a summary of mitigation options that were developed during the formulation of the 2002 RSEIS.

Red oaks would be used to the extent practical because they offer significant habitat to a variety of wildlife. It is anticipated that species such as sugarberry and green ash would recolonize areas naturally. Acorn plantings would be used if site conditions allow. Additionally, 15% of reforested areas would utilize RPM trees or another similar product. The basic mitigation feature calls for reforesting 6,356 acres of cropland (St. Johns Basin = 1,293 acres, New Madrid Floodway = 2,326 acres, vegetated buffers = 671 acres, wildlife corridor = 266 acres, Big Oak Tree State Park perimeter land acquisition = 1,800 acres). Therefore, the basic mitigation feature provides 9,075 terrestrial wildlife AAHUs.

Due to expected hydrology in mitigated tracts, acorns and red oaks may not suitable in all cases. It may be appropriate to use seedlings in some cases. Tree spacing, planting patterns, and maintenance requirements will be developed in consultation with resource agencies. Native genotypes would be used to the extent practical to mimic natural conditions. The gains in wildlife AAHUs may be modified depending on actual species to be used and survivorship standards.

Table 5.8. AAHUs per 100 acres of reforested area (USFWS, 2000)

Species	Acorns	Seedlings	RPM
Fox Squirrel	53.76	43.88	64.04
Pileated Woodpecker	0	0	21.89
Carolina Chickadee	56.81	54.65	61.72
Barred Owl	22.6	18.2	49.61
Mink	0	0	0
Total	**133.17**	**116.73**	**197.26**

5.5.3 Additional Mitigation Techniques and Scenarios that Compensate for all Significant Fish and Wildlife Resources

Table 5.9 provides a summary of the additional mitigation techniques and the potential impacts they would have on the wildlife AAHU calculations that were made during the development of the 2002 RSEIS.

Potential decreases in AAHUs are attributable to longer durations of flood water on compensatory mitigation tracts. Percent canopy closure of trees that produce hard mast is a variable in calculating fox squirrel suitability. Mitigated areas that retain water for longer periods of time would be made up of fewer hard mast producing species. Therefore, the fox squirrel HSI may decrease.

Table 5.9. Additional mitigation techniques and the potential impact on wildlife AAHU calculations

Mitigation Technique	Fox Squirrel	Pileated Woodpecker	Carolina Chickadee	Barred Owl	Mink
Additional Reforestation	+	+	+	+	+
Increasing Flood Duration on Reforested Areas	-	0	0	0	+
Large Permanent Waterbodies	0	0	0	0	+
Small Permanent Waterbodies	0	0	0	0	+
Modified Gate Operation	-	TBD	TBD	TBD	TBD

+ AAHUs are expected to increase from basic reforestation
0 No impacts/benefits are expected
- AAHUs are expected to decrease from basic reforestation

Potential increases in AAHUs are attributable to taking additional lands out of agricultural production and reforesting them to benefit wildlife. Additional benefits to mink would be attributable to mitigated areas that hold water for a minimum of nine months of the year (Allen, 1983), or reforested areas that are adjacent to permanent water (USFWS, 2000). These areas provide optimum foraging habitat for this species. Areas

that only provide saturated soil conditions do not have any appreciable value as mink habitat (Allen, 1983).

Modifying operation of either the St. Johns Bayou or the New Madrid Floodway outlet gate may impact existing bottomland hardwoods due to the increase in flood duration during the period of April 1 to May 15. Black willows are the dominant vegetation in the majority of non-agricultural areas. Impacts to black willow habitat are not anticipated due to increased durations. Existing land use within the spawning and rearing pool elevations would be evaluated during the development of the site-specific detailed mitigation plan. Additionally, existing vegetation would be monitored to determine if black willow habitat is being impacted. It is anticipated that the basic mitigation feature would still compensate for any additional impacts to black willow habitat that may be attributed to the creation of a spawning and rearing pool elevation.

Additionally, restoring or creating a floodplain lake in the batture will likely impact existing bottomland hardwoods. In the case of Riley Lake, the existing vegetation (*i.e.,* farmland and black willows) that is present around the lake is the result of past drainage attempts. No additional compensatory mitigation would be required from the mortality of the existing vegetation due to permanent inundation because this action would result in restoration of historical habitat that would produce a net increase to mid-season fish rearing habitat.

5.6 Waterfowl Resources

Waterfowl resources are described in Section 5.5 of the 2002 RSEIS. Construction of flood damage reduction features in the St. Johns Bayou Basin and closure of the New Madrid Floodway would impact 204,039 waterfowl AAHUs. Waterfowl impacts are fully mitigated as developed in the 2002 RSEIS and further clarified in Section 4.3 of this document. The Corps still intends to provide winter waterfowl ponding on 6,400 acres of land, acquired through easements, as described in Section 5.5 of the 2002 RSEIS.

5.6.1 No Federal Action

The without-project condition is described in Section 5.5.1 of the 2002 RSEIS. In summary, there would be little change in DUDs without the project. Waterfowl gains associated with the project implementation and mitigation and other environmental features would not be realized.

5.6.2 Basic Mitigation Feature

The USFWS CAR (2000) provided various options to mitigate impacts to waterfowl (Table 5.10). Utilizing the figures provided in Table 5.10, the basic mitigation feature would fully mitigate impacts to waterfowl (Table 5.11).

Table 5.10. Duck-Use Days per Acre (USFWS, 2000)

Habitat	Duck-Use Days/acre
Moist Soil/Fallow Field	1,037
Corn	970
Soybeans	253
30% Red Oak	90
50% Red Oak	155
70% Red Oak	229
90% Red Oak	302

Table 5.11. Expected Gains in Waterfowl Habitat from Basic Mitigation Feature

Mitigation	Acres	Duck-Use Days
Modified Moist Soil Units	765	793,305
Vegetative Buffer Strips[1]	671	104,005
Wildlife Corridor[2]	266	60,914
Big Oak Tree State Park Perimeter Land Acquisition[3]	1,800	162,000
Reforestation[2]	3,619	828,751

[1]Assumes 50% red oaks
[2]Assumes 70% red oaks
[3] Assumes 30% red oaks

5.6.3 Additional Mitigation Techniques and Scenarios that Supplement the Basic Mitigation Feature and Compensate for all Significant Fish And Wildlife Resources

Any additional technique that provides more water to benefit fish would also provide additional habitat for waterfowl. Diving ducks could benefit as well as dabblers, depending primarily on the size and depth of the waterbody. Larger waterbodies are generally more valuable for diving ducks. In addition, those areas connected with the Mississippi River would be particularly beneficial since over-water avenues that do not require overland passage are preferable; particularly for scaup, canvasback, and bufflehead.

5.6.4 Duration of Flooding and Waterfowl

The Corps intends to compensate impacts to waterfowl as recommended by the WAM. However, to address the concerns regarding flooding and waterfowl habtiat, this section of the RSEIS 2 is for illustrative purposes only.

The WAM analysis indicated that reforestation of 891 acres (70 percent red oak) would fully mitigate springtime waterfowl impacts from the flood damage reduction project. Concerns have been raised that mitigation areas would have to be flooded most of the

time during the spring season (similar to the methodology used to quantify impacts and benefits to mid-season fish rearing habitat) to attain the projected benefits event though the WAM preparers stated that flooding is expected to be varied among and within years (see RSEIS 2, Section 4.3.4). Table 5.12 provides hypothetical gains to waterfowl habitat if duration of flooding was factored into the benefit calculation. No estimates were made for the duration of flooding in February and March. However, for illustrative purposes only, the estimates of flood durations that were used to quantify benefits to mid-season fish rearing habitat are used. It is highly likely that actual flood durations are much greater in February and March than the values presented in Table 5.12.

Table 5.12. Hypothetical Gains in Waterfowl Habitat from Basic Mitigation Feature if Spring Flood Durations are Factored

Mitigation	Acres	DUD/Acre	Duration	Duck-Use Days
Modified Moist Soil Units	765	1,037	95%	753,640
Vegetative Buffer Strips[1]	671	155	5%	5,200
Wildlife Corridor[2]	266	229	5%	3,046
Big Oak Tree State Park Perimeter Land Acquisition				
Zone II[4]	697	N/A	100%	N/A
Zone III[4]	93	N/A	25%	N/A
Remaining Lands[3]	1,010	90	5%	4,545
Reforestation[2]	3,619	229	5%	41,478
Total				**807,909**

[1]Assumes 50% red oaks
[2]Assumes 70% red oaks
[3] Assumes 30% red oaks
[4]Assumes no red oaks

The flood damage reduction project will impact 204,029 DUDs in February and March. As can be seen in Table 5.12, the basic mitigation feature still overcompensates impacts to waterfowl by 603,880 DUDs even if duration of flooding in February and March is utilized in the calculation of benefits.

5.7 Freshwater Mussels

Impacts to freshwater mussels are described in Section 5.7 of the 2002 RSEIS. Deepening and widening existing channels in the St. Johns Bayou Basin would adversely impact local mussel fauna; the most direct effect would be the physical removal and destruction of mussels in the dredge path.

5.7.1 No Federal Action

The without-project condition is described in Section 5.7.1 of the 2002 RSEIS. No changes are anticipated to the mussel populations in either drainage basin.

5.7.2 Basic Mitigation Feature, Additional Mitigation Techniques that Supplement the Basic Feature, and Scenarios that Compensate for all Significant Fish and Wildlife Resources

The Corps would coordinate with MDC and USFWS to determine measures to monitor and relocate the freshwater mussel resource. Preliminary relocating and monitoring measures include the following:

- Conduct a pre-construction quantitative survey of mussel populations in the construction right of way of Setback Levee Ditch.
- Conduct a pre-construction quantitative survey in upper reaches of Setback Levee Ditch in the same manner to act as a control site.
- Relocate a percentage of the freshwater mussels along the construction reach of Setback Levee Ditch. Preliminary locations suggest that upper portions of Setback Levee Ditch above the construction zone and outside the reference area may be suitable habitat.
- Relocate a percentage of mussels from the lower limits of St. James Ditch. Relocation area, same as above.
- Conduct a post construction-quantitative survey one year after construction to determine the impacts of channel widening on freshwater mussel populations. Continue surveys over ten-years to monitor recolonization.
- Monitor areas in the lower portions of St. Johns Bayou to determine the impacts to mussel colonization from the construction of transverse dikes and hard points (Avoid and Minimize Measures).
- Monitor relocated mussels to determine survivorship of relocation.

It is likely that results from this long term monitoring effort could be used to develop avoid and minimize strategies for other projects.

5.8 Economics

The evaluation of economic aspects of the flood reduction features of the recommended plan have not changed from the 2002 RSEIS. Economic information was provided for the evaluation interest rates in Table 29 of Appendix B of the 2002 RSEIS. Table 30 of Appendix B of the 2002 RSEIS presented economic data for all project features, regardless of authorization source, at the fiscal year 2002 interest rate – 6.125%.

For this RSEIS 2, project costs have been updated from October 2002 to October 2005 price levels. The costs for construction activities were adjusted using the change in the appropriate cost index for similar construction and using recent appraisals and land purchase prices in the area. Cost tables based on October 2005 price levels are provided in Appendix E.

Costs of ecological monitoring are included as a portion of the engineering and design (E&D) project costs for both the flood control features and basic mitigation features within Appendix E. The E&D feature costs range from less than three percent to more than five percent of the overall feature costs from the costs of each Mitigation Scenario in Appendix E. The only project costs which do not include some E&D costs are for land acquisition.

Economic data for the additional mitigation techniques detailed in Section 2.7 of this RSEIS 2 are provided in Table 5.13. Each technique is categorized according to the project component to which the mitigation is attributable or required, either the MRL feature or the St. Johns Phase 1. Additionally, the scenarios are presented at the fiscal year 2005 interest rate (5.125%). The purpose of this table is to indicate the relative efficiency in terms of habitat units per dollars of the additional mitigation techniques.

The difference in economic aspects between the Recommended Plan from the 2002 RSEIS and this RSEIS 2 is primarily the result of the price level update from October 2002 to October 2005 and the cost of additional mitigation techniques. The costs and benefits for Project Construction, Operation and Maintenance, Basic Mitigation Feature, and various fishery mitigation scenarios presented in this RSEIS 2 are presented in Tables 5.14 through 5.17. Also, the project flood control features, regardless of authorization, and basic mitigation feature are presented together at the fiscal year 2005 interest rate (5.125%) and are economically justified. Additional borrow pit costs associated with mitigation have been included.

Table 5.13. Economic Efficiency of Additional Mitigation

	Fishery AAHUs New Madrid Fldwy	Annual Cost Data ($000)	Fishery AAHUs St Johns Basin	Annual Cost Data	Cost Per AAHU Provided (actual $)
Basin/Project	MRL	MRL	St Johns	St Johns	
Remaining Required Mitigation (after basic)	2,278		0[2]		
Interest Rate 1/		2.500%		7.375%	
Excess Annual Benefit – Flood Control Features and Basic Mitigation		**431,000**		**829,000**	
Annual Cost of Additional Mitigation Techniques:					
Additional Batture Reforestation (1,000 acres)	93	89,000	N/A	0	$960
Measures to Increase Flood Duration in NM Fldwy (2,000 acres)	135	111,000	N/A	0	$822
Creation, Restoration, or Enhancement of Large Permanent Waterbodies (Lake Riley to 287 ft NGVD)	774	79,000	N/A	0	$102
Additional NM Fldwy Reforestation (1,000 acres)	16	113,000	N/A	0	$7,062
Modified Gate Operation-NM Fldwy (284.4 pool)	2,699	106,000	N/A	0	$39
Modified Gate Operation-St. Johns Basin (283 pool) to compensate New Madrid Floodway Impacts	1,309			177,000	$135
Modified Gate Operation-St. Johns Basin (283 pool)			2,380	177,000	$74

1/ Current interest rate for FY 2005 is 5.125%.
2/ See Table 2.7 Conceptual Mitigation Scenarios

Table 5.14. Annual Benefit-Cost Summary Project Construction, Operation and Maintenance, and Basic Mitigation Feature and Mitigation Scenario A

Basin/Project	MRL Closure	St Johns Bayou Basin & New Madrid Floodway Pump	Total Project
Interest Rate 1/	2.500%	7.375%	5.125%
Annual Benefit			
Inundation Reduction	1,007	3,138	4,139
Intensification	1,004	905	1,887
Streets and Roads	165	522	683
Advanced Replacements	0	78	58
Betterments	0	5	5
Total	2,176	4,648	6,772
Annual Cost			
Interest	1,541	3,876	5,833
Sinking Fund	632	114	523
Operation Maintenance			
and Replacement	0	196	203
Total	2,173	4,186	6,559
Annual Excess Benefit	3	462	213
Benefit-Cost Ratios	1.00	1.11	1.03

1/ Current interest rate for FY 2005 is 5.125%.

Table 5.15. Annual Benefit-Cost Summary Project Construction, Operation and Maintenance, and Basic Mitigation Feature and Mitigation Scenario B

Basin/Project	MRL Closure	St Johns Bayou Basin & New Madrid Floodway Pump	Total Project
Interest Rate 1/	2.500%	7.375%	5.125%
Annual Benefit			
Inundation Reduction	1,007	3,138	4,139
Intensification	1,004	905	1,887
Streets and Roads	165	522	683
Advanced Replacements	0	78	58
Betterments	0	5	5
Total	2,176	4,648	6,772
Annual Cost			
Interest	1,522	3,876	5,793
Sinking Fund	625	114	519
Operation Maintenance and Replacement	0	196	203
Total	2,147	4,186	6,515
Annual Excess Benefit	29	462	257
Benefit-Cost Ratios	1.01	1.11	1.04

1/ Current interest rate for FY 2005 is 5.125%.

Table 5.16. Annual Benefit-Cost Summary Project Construction, Operation and Maintenance, and Basic Mitigation Feature and Mitigation Scenario C October 2005 Price Levels, ($000)

Basin/Project	MRL Closure	St Johns Bayou Basin & New Madrid Floodway Pump	Total Project
Interest Rate 1/	2.500%	7.375%	5.125%
Annual Benefit			
Inundation Reduction	1,007	3,138	4,139
Intensification	1,004	905	1,887
Streets and Roads	165	522	683
Advanced Replacements	0	78	58
Betterments	0	5	5
Total	2,176	4,648	6,772
Annual Cost			
Interest	1,612	3,876	5,985
Sinking Fund	662	114	536
Operation Maintenance			
and Replacement	0	196	203
Total	2,274	4,186	6,724
Annual Excess Benefit	-98	462	48
Benefit-Cost Ratios	.96	1.11	1.01

1/ Current interest rate for FY 2005 is 5.125%.

Table 5.17. Annual Benefit-Cost Summary Project Construction, Operation and Maintenance, and Basic Mitigation Feature and Mitigation Scenario D October 2005 Price Levels, ($000)

Basin/Project	MRL Closure	St Johns Bayou Basin & New Madrid Floodway Pump	Total Project
Interest Rate 1/	2.500%	7.375%	5.125%
Annual Benefit			
Inundation Reduction	1,007	3,138	4,139
Intensification	1,004	905	1,887
Streets and Roads	165	522	683
Advanced Replacements	0	78	58
Betterments	0	5	5
Total	2,176	4,648	6,772
Annual Cost			
Interest	1,511	3,876	5,771
Sinking Fund	620	114	517
Operation Maintenance			
and Replacement	0	196	203
Total	2,131	4,186	6,491
Annual Excess Benefit	45	462	281
Benefit-Cost Ratios	1.02	1.11	1.04

1/ Current interest rate for FY 2005 is 5.125%.

5.9 Cultural Resources

5.9.1 No Federal Action

The without-project conditions are described in Section 5.12.1 of the 2002 RSEIS.

5.9.2 Basic Mitigation Feature, Additional Techniques, and Scenarios that Compensate for all Significant Fish and Wildlife Resources

The Memphis District will complete the NHPA Section 106 process as natural resources mitigation lands are acquired and developed, and follow NHPA Section 110 as the lands are operated. The process to be followed will be defined by a Programmatic Agreement to be developed with the SHPO and consulting Federally Recognized Indian Tribes. Identification and treatment of historic properties, in compliance with NHPA, will be included in the development of detailed natural resources mitigation plans for each tract of land as it is acquired. Each draft plan will be coordinated with the SHPO and consulting parties prior to submittal to MDNR for approval. Cultural resources surveys will be conducted at all mitigation sites to ensure that natural resources mitigation features do not impact historic properties. Protection of unidentified cultural resource sites will be incorporated into the natural resources mitigation plan and long term management of the mitigation land(s).

5.10 Section 122 of the Rivers and Harbors Act of 1970

There is no significant change from the 2002 RSEIS to impact categories as specified in Section 122 of the 1970 Rivers and Harbors Act. Section 122 items are found in Section 5.13 of the 2002 RSEIS.

5.11 Section 404 of the Clean Water Act

The CWA, 33 U. S. C. 1344, states that:

> "The discharge of dredged or fill material as part of the construction of a Federal project specifically authorized by Congress…is not prohibited by or otherwise subject to regulation under this section…if information on the effects of such discharge, including consideration of the guidelines developed under subsection (b)(1) of this section, is included in an environmental impact statement for such project pursuant to the National Environmental Policy Act of 1969 and such environmental impact statement has been submitted to Congress before the actual discharge of dredged or fill material in connection with the construction of such project…"

This project is a Federal project specifically authorized by Congress for which the Corps has prepared several previous environmental impact statements and evaluated the project in accordance with its 404(b)(1) Guidelines. A 404(b)(1) Evaluation was completed of the impacts of discharging dredged or fill material into waters of the United States. The

404(b)(1) Evaluation is found in Appendix F of the 2002 RSEIS. In summary, based on the guideline, the project is specified as complying with the requirements of the 404(b)(1) guidelines with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the affected aquatic ecosystem.

Some mitigation measures may require the discharge of dredged or fill material into waters of the United States. For example, restoring hydrology to site-specific tracts of land may involve plugging existing ditches with riprap. Mitigation activities will generally not result in a significant impact to waters of the United States. Any revision to the original 404(b)(1) Evaluation will be determined during the development of each site-specific mitigation plan.

5.12 Cumulative Impacts

Cumulative impacts were described in Section 5.17 of the 2002 RSEIS. The implementation of the additional mitigation measures would not significantly change the conclusions as stated in Section 5.17.4 of the 2002 RSEIS. In summary, the St. Johns Bayou Basin and the New Madrid Floodway are highly altered landscapes and their functional value has declined. Past activities have resulted in significant reductions in forested lands and wetlands throughout the area. State parks and conservation areas have been set aside to preserve the largest remaining stands of bottomland hardwood forests. Legislative regulations have been implemented to restrict further loss of wetlands. The proposed mitigation entails restoring and creating a significant amount of wetlands on prior converted cropland. The proposed mitigation will certainly not restore the Missouri Bootheel Region to its presettlement condition, but it will be an incremental improvement over the present condition.

6.0 MITIGATION IMPLEMENTATION

6.1 Introduction

Compensatory mitigation is required to offset unavoidable impacts to significant fish and wildlife resources. One purpose of this document is to identify the types and extent of information that would be necessary to ensure success of mitigation. The 2002 RSEIS stated that reforesting frequently flooded agricultural lands was the basic mitigation strategy. Reforestation of frequently flooded agricultural areas remains a method to mitigate some of the unavoidable impacts, but not necessarily the sole strategy.

WRDA of 1986 directs that acquisition of lands to mitigate impacts to fish and wildlife resources shall be undertaken or acquired either (1) before any construction of the project commences; or (2) concurrently with the acquisition of lands and interests in lands for project purposes; and (3) that mitigation measures will generally be scheduled for accomplishment concurrently with other project features the most efficient way. Section 906(b) of WRDA 1986 provides authority for the Secretary of the Army to mitigate damages to fish and wildlife resources without further specific Congressional

authorization but limits post authorization acquisition or interests in lands for mitigation to willing sellers.

6.2 Land Acquisition

Acquisition of land must be made from willing sellers. Potential sites would be determined by identifying willing sellers in the project area and ranking proposed sites by the interagency mitigation team. Rankings would be based on the likelihood of success, likely gains in habitat units, proximity to existing high value habitat (Big Oak Tree State Park, Ten Mile Pond CA, and other bottomland hardwoods), and management potential.

6.3 Detailed Mitigation Plans

Detailed mitigation plans would be developed for each tract of land as it is acquired. Mitigation plans would include a description of the site (hydrology, elevations, soils, etc.), detailed construction plans, detailed planting plans, and calculations of potential benefits to all resource categories. The plans would also include details on the monitoring program for the site to verify gains in habitat and provisions for long term management.

The interagency mitigation team would be consulted throughout the planning of the mitigation features. A draft plan would be disseminated for review to the interagency mitigation team prior to submittal to MDNR for approval.

Identification and treatment of historic properties, in compliance with NHPA, will be included in the development of detailed natural resources mitigation plans for each tract of land as it is acquired. Each draft plan will be coordinated with the SHPO and consulting parties prior to submittal to MDNR for approval. Cultural resources surveys will be conducted at all mitigation sites to ensure that natural resources mitigation features do not impact historic properties. Protection of cultural resource sites that may be identified will be incorporated into the natural resources mitigation plan and long term management of the mitigation land(s).

Relevant comments would be incorporated into the final detailed mitigation plan. The mitigation plan for each tract would be submitted to MDNR for approval. Implementation of mitigation features can commence on some tracts while other tracts are being acquired. Compensatory mitigation would occur concurrently with flood damage reduction features construction. Neither the New Madrid portion of the project nor the St. Johns Bayou portion of the project shall be operated until all mitigation lands for that respective portion of the project are acquired and all detailed mitigation plans approved.

6.4 Mitigation Construction

Construction of mitigation features on specific tracts would commence after MDNR approves the site and all requirements of NHPA Section 106 are met. To control undesirable vegetation, acquired lands would most likely remain in agricultural production until mitigation measures can be implemented.

6.5 Monitoring

Each mitigation tract would be monitored to ensure success. Table 6.1 includes parameters that would be monitored. Monitoring requirements would be revised during the development of detailed mitigation plans. Monitoring would be developed and coordinated with the interagency mitigation team. Monitoring would be conducted before mitigation measures are undertaken and until mitigation has been determined to be successful. Post-mitigation surveys would be compared to pre-mitigation conditions to measure success. Biological monitoring would entail appropriate fish and wildlife surveys that would be determined on a site-specific basis. Monitoring of the hydrologic regime would include flood frequencies, flood duration, and depth. Water quality parameters would be measured monthly in permanent waterbodies, including borrow pits. Measured parameters would include temperature, dissolved oxygen concentration, turbidity, pH, conductivity, total suspended solids, and nutrients (nitrogen and phosphorus).

Visual inspections of each tract would occur at least annually to ensure the area is functioning as it was designed. Corrective actions would be taken as necessary to ensure success.

6.6 Long Term Management

All tracts of land acquired for compensatory mitigation purposes would be protected in perpetuity to benefit fish and wildlife resources. Under current authorities and policies, mitigation acquired for the MRL features of the project would be turned over to the USFWS once mitigation acquisition is completed. The Service could then turn the lands over to state agencies for management. Acquired mitigation tracts may be temporarily assigned by an appropriate instrument to a non-Federal agency prior to full completion of the project. Management and transfer decisions will be coordinated with the interagency mitigation team to facilitate turnover of mitigation lands to the most appropriate agencies for management once mitigation acquisition is completed.

Table 6.1. Monitoring Parameters

Mitigation Type	Variable
Preservation	Vegetation Present % Species Composition (Timber Cruise) Hydrologic Conditions Floodplain Fish Usage Other Biological Monitoring
Bottomland Hardwood Restoration	Vegetation Present % Species Composition % Success of Planted Vegetation Hydrologic Conditions Floodplain Fish Usage Other Biological Monitoring
Modified Moist Soil Units	Hydrologic Regime Floodplain Fish Usage Other Biological Monitoring
Vegetative Buffer Strip and Wildlife Corridor	% Success of Planted Vegetation Hydrologic Conditions Floodplain Fish Usage Other Biological Monitoring
Permanent Waterbody	Hydrologic Regime Fish Usage Other Biological Monitoring Water Quality

7.0 PROJECT MONITORING

In addition to monitoring each specific mitigation tract, the Corps would monitor several variables throughout the St. Johns Bayou Basin and the New Madrid Floodway to ensure that predictions made during the formulation of the 2002 RSEIS and this RSEIS 2 are accurate. All aspects of monitoring would be developed with input from the interagency mitigation team. Financial assurance for monitoring is provided since the costs from monitoring activities are included in the E&D costs for individual project flood control and basic mitigation features (See Section 5.8). These are provided as a percentage of the E&D costs, including some contingency.

7.1 Jurisdictional Wetlands

The Corps maintains that forested wetlands within the project area would retain jurisdictional status after construction due to conditions other than backwater flooding. The Corps would monitor these areas below an elevation of 295 feet NGVD for five years after the project is completed to ensure that these areas do not lose jurisdictional status. Monitoring would include a comprehensive network of water level monitoring

wells and physical site evaluations to fully characterize temporal and spatial variation of surface and subsurface water levels in the project area.

Additionally, the Corps would take appropriate enforcement action if it is determined that the Section 404/401 process has been evaded in the conversion of jurisdictional wetlands.

7.2 Water Quality

Water quality parameters would be monitored throughout the St. Johns Bayou Basin and the New Madrid Floodway. At a minimum, water quality parameters would include water temperature, dissolved oxygen, turbidity, pH, conductivity, total suspended solids, and nutrients (nitrogen and phosphorous).

7.3 Aquatic Biological Populations

The natural biological community within St. Johns Bayou and the New Madrid Floodway waterways would be monitored for five years after construction to ensure the re-establishment of similar aquatic populations indigenous to the waterways prior to impact. As part of the WQ Certification, populations will not be significantly different from the original streams or existing reference streams. Remedial mitigation would be undertaken if monitoring two years after construction reflects the development of aquatic macroinvertebrate communities with taxonomic structure and feeding function classes less than the 25^{th} percentile of reference criteria.

7.4 Freshwater Mussels

Freshwater mussel populations within the St. Johns Bayou Basin would be monitored. Monitoring would include the following:

- Conduct a pre-construction quantitative survey of mussel populations in the construction right of way of Setback Levee Ditch.
- Conduct a pre-construction quantitative survey in upper reaches of Setback Levee Ditch in the same manner to act as a control site.
- Relocate a percentage of the freshwater mussels out of Setback Levee Ditch. Preliminary evaluations suggest that upper portions of Setback Levee Ditch above the construction zone and outside the reference area may be suitable habitat.
- Relocate a percentage of mussels from the lower limits of St. James Ditch. Relocation area, same as above.
- Conduct a post construction-quantitative survey one year after construction to determine the impacts of channel widening on freshwater mussel populations. Continue surveys over ten-years to monitor recolonization.

- Monitor areas in the lower portions of St. Johns Bayou to determine the impacts to mussel colonization from the construction of transverse dikes and hard points (Avoid and Minimize Measures).
- Monitor relocated mussels to determine survivorship of relocation.

7.5 Fish Passage

Fish passage through the New Madrid closure would be monitored by conducting a mark/recapture study to determine the relative number and species that pass through the culverts. The study would also include an assessment of spawning and rearing utilization of mitigation tracts.

8.0 PUBLIC INVOLVEMENT

8.1 Scoping Process

Appendix B of this RSEIS 2 describes the public involvement and scoping process that was conducted for this RSEIS 2.

8.2 Distribution

The Draft RSEIS 2 was distributed to the following recipients, as well as to those who provided comments on the June 2002 RSEIS, for a 45-day comment period. A copy of the Draft RSEIS 2 was placed on the Memphis District's Internet Homepage and can be viewed at the following website:

www.mvm.usace.army.mil

Additionally, a Notice of Availability appeared in the Federal Register on December 9, 2005.

8.2.1 Federal

Senator Christopher Bond
Senator James Talent
Congresswoman Jo Ann Emerson
Council on Environmental Quality
Environmental Protection Agency:
NEPA Compliance Division, Washington, D.C.
Regional Administrator, Kansas City
NEPA Team Leader, Kansas City
Wetlands Protection Section, Kansas City
Department of Interior:
Denver Federal Center
Office of Environmental Policy and Compliance, Washington, D.C.

USFWS, Columbia, MO Field Office
USFWS, Regional Office, Ft. Snelling
Natural Resources Conservation Service:
District Conservationist, Benton, MO
New Madrid Field Office
Charleston Field Office
State Conservationist
State Biologist
Department of Agriculture:
USDA/RHS, Washington, D.C.
USDA-Rural Development, Columbia

8.2.2 Federally Recognized Tribes

Mr. Lee Edwards, Governor, Absentee-Shawnee Tribe, Shawnee, OK
Ms. Jennifer Makaseah, Tribal Representative, Absentee-Shawnee Tribe, Shawnee, OK
Mr. Theodore R. Watson, Jr., Tribal Representative, Absentee-Shawnee Tribe, Shawnee, OK
Ms. Augustine Asbury, Tribal Representative, Alabama-Quassarte Tribal Town, Wetumka, OK
Mr. Tarpie Yargee, Chief, Alabama-Quassarte Tribal Town, Wetumka, OK
Mr. Richard Allen, Tribal Representative, Cherokee Nation of Oklahoma, Tahlequah, OK
Mr. Chad Smith, Principal Chief, Cherokee Nation of Oklahoma, Tahlequah, OK
Mr. Bill Anoatubby, Governor, Chickasaw Nation of Oklahoma, Ada, OK
Ms. Virginia Nail, Tribal Historic Preservation Officer, Chickasaw Nation of Oklahoma, Ada, OK
Mr. Terry Cole, Director, Choctaw Nation of Oklahoma, Durant, OK
Mr. Gregory E. Pyle, Chief, Choctaw Nation of Oklahoma, Durant, OK
Ms. Tamara Francis, Tribal Representative, Delaware Nation, Anadarko, OK
Mr. Edgar Francis, President, Delaware Nation, Anadarko, OK
Mr. Charles Enyart, Chief, Eastern Shawnee Tribe of Oklahoma, Seneca, MO
Ms. Janie Roark, Tribal Representative, Eastern Shawnee Tribe of Oklahoma, Seneca, MO
Ms. Evelyn Bucktrot, MEKKO, Kialegee Tribal Town, Wetumka, OK
Mr. Raul Garza, Chairman, Kickapoo Traditional Tribe of Texas, Eagel Pass, TX
Mr. Steve Caude, Chairman, Kickapoo Tribe of Kansas, Horton, KS
Mr. Curtis Simon, Tribal Representative, Kickapoo Tribe of Kansas, Horton, KS
Mr. Kenneth H. Carleton, Tribal Historic Preservation Officer, Mississippi Band of Choctaw Indians, Choctaw, MS
Mr. Phillip Martin, Chief, Mississippi Band of Choctaw Indians, Choctaw, MS
Ms. Joyce A. Bear, Tribal Historic Preservation Officer, Muscogee (Creek) Nation, Okmulgee, OK
Mr. A. D. Ellis, Chief, Muscogee (Creek) Nation, Okmulgee, OK
Mr. Tim Thompson, Tribal Historic Preservation Officer, Muscogee (Creek) Nation, Okmulgee, OK

Mr. Jim Gray, Chief, Osage Nation of Oklahoma, Pawhuska, OK
Mr. Anthony Whitehorn, Tribal Representative, Osage Nation of Oklahoma, Pawhuska, OK
Mr. C. Michael Harwell, Tribal Chairman, Otoe-Missouria Tribe of Oklahoma, Red Rock, OK
Ms. Mildred Hudson, Tribal Representative, Otoe-Missouria Tribe of Oklahoma, Red Rock, OK
Mr. John P. Forman, Chief, Peoria Tribe, Miami, OK
Mr. Emmett E. Ellis, NAGPRA Representative Peroria Tribe, Tulsa, OK
Mr. Robert Thrower, Tribal Representative, Poarch Band of Creek Indians, Atmore, AL
Mr. Eddie L. Tullis, Tribal Chairman, Poarch Band of Creek Indians, Atmore, AL
Mr. Dwight Buffalohead, Chairman, Ponca Tribe of Oklahoma, Ponca City, OK
Ms. Joyce Greenwood, NAGPRA Representative, Ponca Tribe of Oklahoma, Ponca City, OK
Mr. John Berrey, Chairman, Quapaw Tribe of Oklahoma, Quapaw, OK
Ms. Carrie Wilson, Tribal Representative, Quapaw Tribe of Oklahoma, Fayetteville, AR
Ms. Deanne Bahr, Tribal Representative, Sac and Fox Nation of Missouri, Hiawatha, KS
Mr. Edmore Green, Tribal Representative, Sac and Fox Nation of Missouri, Hiawatha, KS
Ms. Sandra Keo, Chairwoman, Sac and Fox Nation of Missouri, Hiawatha, KS
Mr. Don Abney, Principal Chief, Sac and Fox Nation of Oklahoma, Stroud, OK
Ms. Sandra Massey, NAGPRA Representative, Sac and Fox Nation of Oklahoma, Stroud, OK
Principal Chief, Seminole Nation of Oklahoma, Wewoka, OK
Mr. Emman Spain, NAGPRA Representative, Wewoka, OK
Mr. Mitchell Cypress, Chairman, Seminole Tribe of Florida, Hollywood, FL
Mr. Willard Steel, Tribal Historic Preservation Officer, Ah-Tah-Thi-Ki Museum, Seminole Tribe of Florida, Clewiston, FL
Ms. Rebecca Hawkins, Tribal Representative, Shawnee Tribe, Miami, OK
Mr. Ron Sparkman, Chairman, Shawnee Tribe, Miami, OK
Mr. Charles Coleman, NAGPRA Representative, Thopthlocco Tribal Town, Weleetka, OK
Mr. Brian McGertt, Chief, Thopthlocco Tribal Town, Okemah, OK
Ms. Dawena Pappan, Chief, Tonkawa Tribe, Tonkawa, OK
Mr. Anthony Street, Executive Director, Tonkawa Tribe, Tonkawa, OK
Mr. Earl Barbry, Jr., Tribal Historic Preservation Officer, Tunica-Biloxi Tribe of Louisiana, Marksville, LA
Mr. Earl Barbry, Sr., Chairman, Tunica-Biloxi Tribe of Louisiana, Marksville, LA
Ms. Mary Tidwell, Historic Preservation Officer, United Keetoowah Band of Cherokee Indians of Oklahoma, Tahlequah, OK
Mr. George Wickliffe, Chief, United Keetoowah Band of Cherokee Indians of Oklahoma, Tahlequah, OK

8.2.3 State

Governor Matt Blunt
Senator Peter Kinder
Representative Denny Merideth
Representative Lannie Black
Representative Peter Myers
Missouri Department of Conservation:
- Office of the Director
- Planning Section
- Cape Girardeau Field Office
- Duck Creek Conservation Area
- Tenmile Pond Manager

Missouri Department of Natural Resources:
- Office of the Director
- Water Pollution Control Program
- State Historic Preservation Office
- Division of State Parks

Missouri Highway and Transportation Department
Missouri Department of Social Services, Mississippi County Director
Kentucky Department of Environmental Protection

8.2.4 Local

Mayor, City of Sikeston, MO
Mayor, Village of Pinhook, MO
Mayor, City of New Madrid, MO
Mayor, City of East Prairie, MO
Mayor, City of Charleston, MO
Manager, City of Sikeston, MO

8.2.5 Libraries

Mississippi County Library, Charleston, MO
Mississippi County Library, East Prairie, MO
New Madrid County Library, New Madrid, MO
Sikeston Public Library, Sikeston, MO
Missouri State Library, Jefferson City, MO
Riverside Regional Library, Benton, MO
Colorado State University Libraries, Fort Collins, CO

8.2.6 Other Organizations and Individuals

Mr. Jack McIntosh, Superintendent, Reorganized School Dist No. 2, East Prairie, MO
Mr. David B. Brewer, Levee District No. 3, Mississippi County, Missouri, Wyatt, MO
Mr. John D. Story, Consolidated Drainage District, #1, Charleston, MO
Mr. Jim Blumenburg, President, Mississippi County Commission, Charleston, MO.
Consolidated Drainage District No 1 of Mississippi County, Missouri, Charleston. MO
Mr. Garland Buck, Levee District #2 of Scott County, Charleston, MO
Mr. Lynn Bock, St John Levee and Drainage District, New Madrid, MO
Mr. H. Riley Bock, St John Levee and Drainage District, New Madrid, MO
Ms. Caroline Puffalt, Conservation Chair, Ozark Chapter Sierra Club, St. Louis, MO
Robin Mann, National Wetlands Working Group, Sierra Club, Rosemont, PA.
Mr. Ken Midkiff, Program Manager, Ozark Chapter, Sierra Club, Columbia, MO
Mr. Timothy D. Searchinger, Senior Attorney, Environmental Defense Fund, Washington, D.C
Ms. Yvonne Homeyer, Conservation Chairperson, Webster Grove Nature Study Society, St Louis, MO
Mr. Jim Holsen, President, St. Louis Audubon Society, Kirkwood, MO
Ms. Bea Covington, Executive Director, Missouri Coalition for the Environment, St. Louis, MO
Ms. Liz Anderson, Editor, Enterprise-Courier, Charleston, MO
Mr. Dale R. Ludwig, Missouri Soybean Association, Jefferson City, MO
Mr. James E. French, President, French Implement Co., Charleston
Mr. Charles E. Kruse, Missouri Farm Bureau Federation, Jefferson City
Mr. Lonnie Thurmond, Enterprise Community, East Prairie
Mr. Dwight Bird, Delta Growers Association, Charleston, MO
Dr. Martha Ellen Black, Enterprise Community, East Prairie, MO
Mr. Glenn Ault, Charleston, MO.
Mr. David Brewer, Wyatt, MO
Dr. Christopher Barnhart, SW Missouri State University, Springfield, MO
Mr. John Besser, Columbia, MO
Ms. Celeste Koon, Jefferson City, MO
Ms. Mary Ratliff, NAACP, President, Missouri State Conference, Columbia, MO
Mr. Arthur Cassel, NAACP, Charleston Missouri Chapter, Charleston, MO.
Ms. Terri Treacy, Carbondale, IL
Ms. Cheryl Delashmit, Leslie, MO.
Mr. Alan Journet, SE Missouri State University, Cape Girardeau, MO
Mr. Rene DeKriek, French Implement Co., Charleston, MO.
Dr. Mike Barnes, Superintendent Reorganized School District #1, Enlarged, New Madrid, MO.
Mr. Ronnie Jimerson, New Madrid, MO.
Mr. Donald Crawford, Harrisburg, AR.
Mr. William Dee Dill, East Prairie, MO.
Mr. Joe Sorrells, J-Mar Agri Group, East Prairie, MO
Mr. John E. Burke, Charleston, MO

Mr. Stephen T. Burke, Charleston, MO
Mr. Clyde Hawes, New Madrid County Commission, New Madrid, MO
Mr. Lester Goodin, Charleston, Mo
Mr. Donald R. Dann, Highland Park, IL
Ms. Patsy Tisher, New Madrid, MO
Mr. Michael V. Ganey, Greenway Network, Inc., St. Charles, MO
Ms. Rhonda Monroe, Carbondale, IL
Mr. George C. Grugett, Mississippi Valley Flood Control Association, Collierville, TN
Mr. Ronald C. Gladney, Bartley, Goffstein, Bollato, and Lange, L.L.C., St. Louis, MO
Ms. Kathie Simpkins, East Prairie, MO
Mr. James Bogle, East Prairie, MO
Dr. Jack Grubaugh, The University of Memphis, Memphis, TN
Mr. William D. Levalle, New Madrid, MO
Ms. Linda Frederick, Rolla, MO
Mr. R. D. James, New Madrid, MO
Dr. Mary Byrd Davis, Eastern Old Growth Clearinghouse, Georgetown, KY
Ms. Laraine Wright, Director, Publications Office, Southern Illinois University, Carbondale, IL.
Ms. Judy Lincoln, Columbia, MO
Ms. Mary Collinge, Memphis, TN
Mr. Randy Sutton, Ducks Unlimited, Ten Mile Pond Chapter, East Prairie, MO
Mr. Teddy Bennett, East Prairie, MO
Mr. Ricky Penrod, President, East Prairie Park Board, East Prairie, MO
Mr. James C. Moreton, President, Susanna Wesley Family Learning Center, East Prairie, MO
Ms. Brenda Brewer, Director, Retired Senior Volunteer Program, East Prairie, MO
Director, Mississippi County Health Department, East Prairie, MO
Ms. Silvey Barker, Chairperson, East Prairie Tourism Council, East Prairie, MO
Ms. Patsy Hutcheson, County Director, Missouri Department of Social Services, East Prairie, MO
Mr. Martin Hutcheson, East Prairie, MO
Mr. Wendell Choate, East Prairie

8.3 Comments

The Corps received five letters commenting on the DRSEIS 2. Comments and the Corps responses are addressed in Appendix F. Additionally, the U.S. Fish and Wildlife Service provided a Supplemental Fish and Wildlife Coordination Act Report (RSEIS 2 Section 8.6). Comments were received from the following:

Federal

United States Department of Interior, Office of the Secretary, Office of Environmental Policy and Compliance
United States Environmental Protection Agency, Region VII

State

Missouri Department of Natural Resources
Missouri Department of Natural Resources State Historic Preservation Office

Other Organizations and Individuals

Environmental Defense

8.4 Coordination

A coordination meeting with state and Federal agencies occurred on 15 July 2005 between Corps, USFWS, MDC, and MDNR personnel. A Memorandum for Record was produced from this meeting and is included in Appendix B.

Coordination with the interagency mitigation team was maintained throughout the development of this RSIES 2 by conducting additional meetings, teleconferences, and other correspondences.

8.5 U.S. Fish and Wildlife Planning Aid Letter

The U.S. Fish and Wildlife Service submitted a Planning Aid Letter on 11 August 2005 (included in Appendix B). The following paragraphs state the Service's position on key aspects of the project. The Service's comments are in bold and the Corps' response follows.

Comment: The Corps grouped potential mitigation measures into two categories: inside and outside the project area (*i.e.*, St. Johns and New Madrid Basins). Inside the project area, the Corps proposes to use redesigned borrow pits to provide increased habitat value for fish, and thereby reduce the acreage that would need to be reforested to offset fisheries habitat impacts. Throughout the previous planning and NEPA processes, resource agencies and the Corps agreed that borrow pits would be appropriate only to mitigate for impacts of permanent waterbodies. Even then, borrow pits can only provide comparable floodplain habitats if they permit *full fish access* (including Mississippi River fishes) and have slack water conditions.

Response: Compensatory mitigation is based on the replacement of habitat that is impacted from construction of the flood damage reduction features, not a certain quantity of acres. In previous NEPA planning, reforestation of cropland was chosen as an adequate method to mitigate impacts to fish rearing habitat because it offers higher habitat value than agricultural or fallow lands and forested floodplains benefit many other biological resources (wetlands, waterfowl, terrestrial wildlife, etc.). Previous NEPA reports did not account for ADFA in calculating compensatory mitigation requirements. However, due to concerns, the Corps acknowledges that compensatory mitigation must

be based on ADFA. Analysis subsequent to the 2002 RSEIS has indicated that reforesting agricultural areas is not an efficient means to provide benefits to mid-season fish rearing habitat due to the infrequency of flooding. Creation of permanent waterbodies provides significant habitat for floodplain fishes and maximizes ADFA. Therefore, mitigation for fish rearing habitat is no longer based solely on reforestation.

Construction of flood damage reduction features in the St. Johns Bayou Basin and closure of the New Madrid Floodway would impact 100 and 250 ADFAs of permanent waterbodies in the mid-season rearing period, respectively (2002 RSEIS, Appendix G Tables 10 and 13). Therefore, constructing 387 acres of modified borrow pits would be suitable to mitigate the impact to permanent waterbodies.

The Corps recognizes that permanent waterbodies harbor both resident and transient fishes. Therefore, construction and management of permanent waterbodies must allow opportunities for periodic connection to the mainstem river to accommodate access and dispersal, while maintaining suitable habitat for a variety of fish species. As currently planned, the borrow pits would be located in the lower end of the St. Johns Bayou Basin. Fish would have periodic access to the pits during high Mississippi River stages, or during spawning and rearing pooling periods in the St. Johns Bayou Basin. With respect to the phrase "full fish access," as stated in Section 4.3.2.1, fish respond to floods by moving laterally onto the floodplain to feed, avoid predators, and seek suitable areas for reproduction.

Borrow pits and other permanent waterbodies provide high quality rearing habitat for a variety of species (Baker, *et al.,* 1991; others), and the HSI scores developed by the interagency team clearly indicate that permanent waterbodies have higher rearing value than reforested agricultural lands. Adult fish are attracted to borrow pits because of deep water and abundant forage fishes that often concentrate in permanent waterbodies. Many of these adult fish will spawn in shallow, structurally complex littoral areas of borrow pits. Plankton densities are usually high in permanent waterbodies, so once eggs hatch, larval fish have an abundant food source. High densities of fish are characteristic of borrow pits, and many of these individuals will eventually be transported or move into the Mississippi River during subsequent floods.

<u>Comment:</u> Another fish mitigation measure being considered by the Corps uses the shorebird mitigation areas to provide fisheries habitat. Such a proposal has two important considerations. First, use of shorebird habitat to replace reforestation for fish would not contribute to the significant forested wetland mitigation needs considered during mitigation planning and as detailed in the Service's previous Fish and Wildlife Coordination Act reports. Second, many of the shorebird areas would be actively managed for shallow water and wetted edge, minimizing suitable open water habitat available for fish reproduction and rearing. Active water management through water control structures, dikes, culverts, and other artificial means (*i.e.,* pumps) greatly reduces opportunities for successful fish ingress and egress.

Response: Creation of modified moist soil units would consist of flooding herbaceous wetlands. Restoring herbaceous wetlands and flooding them would offset some impacts to jurisdictional wetlands. No credits to terrestrial wildlife are provided from the construction of modified moist soil units. The Corps no longer intends to compensate impacts to fish habitat solely from reforestation. It is important to note that rearing habitat consists of flooded habitat with no regard to depth or duration. Given the habitat value for fish rearing that has been assigned to the current agricultural lands, construction of modified moist soil units that provide access for fish would most likely provide suitable rearing habitat. The sites would primarily be managed for shorebirds. The Corps acknowledges that there are several concerns over the timing of flooding, duration of suitable habitat, dissolved oxygen concentrations, and ingress and egress. Therefore, no credits to mid-season fish rearing habitat were calculated for this RSEIS 2. The Corps still intends to consider modification of moist soil units to allow for fish access. Sites would be monitored and benefits to mid-season fish rearing habitat would be calculated. Overall mitigation would be adjusted, if necessary.

Comment: The fish HEP model used for the EIS focuses entirely on the value of an area to support reproduction and does not measure fish access. Selected species used in project impact analysis of the New Madrid Floodway include both Mississippi River and floodplain fish. The unique value of the New Madrid Floodway as an open access backwater habitat is universally recognized. Therefore, using the fish HEP model to estimate habitat value is valid *only if* mitigation sites provide comparable access for Mississippi River fish as well as resident floodway fish. Closure of the floodway during the spawning and rearing season will significantly reduce, and potentially eliminate, this seasonal access. As proposed, the culverts will be closed when fish normally move into the Floodway, thus blocking access to the Floodway when habitat should be available and is most needed by fish. In addition, the ability of Mississippi River fish to access the Floodway and specific mitigation sites therein through open culverts is unknown. Eliminating or reducing the movement of many species of fish through structures is well documented in fisheries literature (Warren and Pardue 1988, Coffman 2005, Behlke *et al.* 1991 (as cited in Coffman 2005)), and is a predictable outcome of water control projects. Mitigation sites landward of other levees would have comparable problems with meaningful fish access.

Response: The Corps acknowledges that closing the culverts in the New Madrid Floodway at a Mississippi River elevation of 284.4 feet NGVD would prevent fish access to higher elevation lands. Consequently, this was taken into account when impacts were calculated and mitigation requirements were determined. However, the gates would remain open at elevations below 284.4 feet NGVD. Therefore, there would be suitable fish access to that portion of the floodway nearest the Mississippi River.

Corps fisheries biologists support the view that fish will move through the New Madrid Floodway culverts. As currently designed, closure of the New Madrid Floodway would

consist of four 10-foot by 10-foot gated box culverts across Mud Ditch. The culverts will be approximately 250 feet in length, placed along the channel bottom of Mud Ditch, and have a nearly level slope (6 inch drop in 250 feet). Few studies have been conducted on fish access through culverts, and those studies that have shown impacts are related to small road crossing culverts or geographically disparate regions. For example, Coffman's (2005) predictive models were used to predict fish passage through small culverts in the Mid-Atlantic Highlands region of the United States and are not applicable to large culverts like the proposed 10-foot by 10-foot box culverts.

Typical problems at culverts include a perched outlet, water velocities that exceed burst swimming speeds of fish, shallow depths that hamper swimming, and long distances between resting areas. None of these problems will exist for the New Madrid culverts for the following reasons:

- Water will be flowing into the basin during most operational periods, so excessive water velocity will not be an impediment to movement. In addition, those fishes that were spawned or are rearing in the basin can be easily transported back to the river when water direction is reversed during falling river stages.
- There will be no free fall, or 'waterfall' condition at either the outlet or inlet.
- Culvert slope is nearly level (6 inch elevation change over 250 linear feet).
- The length of the culvert is a relatively short distance that fish will need to travel to access the backwater.
- Water depth will be equal to the 10-foot height of the culvert, which is more than adequate for swimming fishes.

An additional aspect of fish passage is the condition of the entrance canal. Mud Ditch connects the Mississippi River to the New Madrid Floodway. The ditch itself can be classified as a slackwater backwater during high river stages with a well-developed forested riparian zone. Therefore, fish will likely be attracted to the entrance canal and move towards the structure. Once the structure is open, fish will follow the primary flow paths into the basin. All of these reasons strongly indicate that fish passage conditions will exist at the New Madrid Floodway culverts.

The Corps will continue to work with the interagency mitigation team to develop best management practices (BMP) for the New Madrid Floodway box culverts. These BMPs will seek ways that enhance fish passage to the extent practical and would be included in the closure design and overall operation and maintenance plan. Additionally, the Corps will conduct a mark/recapture study to determine the relative number and species that pass through the culverts. The study will also include an assessment of spawning and rearing utilization of mitigation tracts.

Comment: **Providing accessible habitat for Mississippi River fishes at Big Oak Tree State Park (BOTSP) presents a greater biological and engineering challenge. To access the Park, fish will have to traverse a mile or more of pipe; in addition, it is unknown how fish will return to the Mississippi River as floodwaters recede. The objectives for BOTSP mitigation focus on greater ability to manipulate water within the Park to restore and enhance the native plant communities. The measures proposed to restore ecological functions to BOTSP do not compensate for fishery impacts.**

Response: Supplying Big Oak Tree State Park is intended to restore ecological functions to the park. However, this action has the potential to restore fish spawning and rearing habitat. The conceptual plan consists of a gated structure through the Mississippi Mainline Levee System and open channels. The only pipe that would have to be traversed is at the structure itself. Estimates suggest that the structure would consist of two 60-inch diameter concrete culverts. The Corps acknowledges that fish passage may not be feasible from either an engineering or economic standpoint. However, every effort would be made throughout the design and construction to provide fish access to the extent practical. The interagency team, as well as fish passage experts would be consulted throughout the design of the hydrologic restoration feature. Mid-season fish rearing habitat credits would be calculated for supplying Big Oak Tree State Park and the surrounding areas with water if it is determined that fish can access the site. If applicable, credits would be calculated in the site-specific detailed mitigation plan and verified through monitoring.

Comment: **As stated in the Corps' list of potential additional fish mitigation options, adequate fish passage is a requirement for sites to qualify for fish mitigation. Therefore, a technically sound fish passage evaluation must be completed for each alternative mitigation measure and site. We recommend that the Corps, Service, and Missouri Department of Conservation collectively identify a panel of fish passage experts to conduct these reviews during continued project planning. Furthermore, the draft RSEIS II should fully discuss the critical issue of fish passage and access, including how the Corps will rectify the current lack of information on this topic for previous and future proposed fish mitigation measures. The Service will provide additional input addressing mitigation monitoring needs pending the results of those analyses.**

Response: As stated above, the Corps will work with the interagency mitigation team and any other individuals that are collectively identified in the development of fish passage BMP, access to specific tracts, and monitoring fish passage and usage of mitigated areas. The Corps recommends that this should occur during the development of site-specific detailed mitigation plans. A discussion of fish passage is found in Section 4.3.2.1 of this RSEIS 2.

Comment: **The Corps is exploring a number of potential enhancement projects outside the Floodway as compensatory mitigation. Because this area has been**

highly modified through previous flood control, navigation, and agricultural projects, opportunities exist to improve fisheries habitat along the river and batture lands. However, the measures proposed by the Corps would not offset project-related fisheries impacts in the floodplain. Main stem riverine habitat are inherently different than floodplain habitat and both serve critical, yet complementary, roles in supporting fish and wildlife resources in the project area. On the floodplain, these conditions include low velocity water that warms relatively early in the spring because it is shallower and off the main channel. In addition, the floodplain provides a variety of macro and microhabitats that include diverse depths, temperatures, substrates, vegetation, forage, and refuge, interspersed with a stream/ditch network that fish can use to access the floodplain and can recede into as floodwaters recede. At the same time, the potential riverine mitigation areas proposed by the Corps currently provide significant fisheries habitat value without further enhancement. Proposed enhancement features appear to be a conversion of existing, valuable habitat to an alternative habitat, rather than a net increase in habitat value.

Response: Restoration efforts along the river or within the batture area are expected to significantly benefit multiple Lower Mississippi River Valley communities, including offsetting mid-season fish rearing habitat impacts from construction of the flood damage reduction project.

The Corps agrees with the USFWS that batture land is valuable to a variety of fishes and other aquatic organisms. Flooded batture land that is reforested will have physicochemical characteristics similar to forested areas in the New Madrid Floodway: slackwater, structural diversity (habitat diversity such as scrub/shrub or cypress root areas that provide value to fish), direct accessibility to the river. Swales and ridges in the batture create habitat similar to tributaries: deep, warm water that persists after floodwaters recede and a corridor for movement within the floodplain. In addition, increased hydraulic circulation in the batture will improve water quality in large backwaters during prolonged flooding in late spring and early summer. Batture land is also directly accessible to fish and has heterogeneous habitats suitable for fish spawning and rearing.

The Lower Mississippi River Conservation Committee, through a series of state meetings, has identified restoration and enhancement of floodplain lakes as a primary goal of improving habitats in the lower Mississippi River. Therefore, the Corps does not agree with the Service's statement that the existing areas in the batture cannot be further improved and offset project impacts. The Corps maintains that reforesting agricultural areas and restoring floodplain lakes provides much greater benefit to fisheries habitat than agricultural lands and shallow or isolated lakes. In addition, there will be a net increase in habitat value that is quantifiable using the existing habitat models developed for this study, and mitigation credits will take into account the value of existing conditions prior to restoration (*i.e.*, mitigated AAHU – existing AAHU).

Comment: **All alternative fish mitigation measures must be fully evaluated at the planning stage through an independent scientific peer review to ensure that many of the underlying presumptions, suppositions, and hypotheses driving mitigation for this project are indeed valid. A key component of this peer review must be validation of the assumptions pertaining to fish use and access to each area proposed for compensatory mitigation credit. In consideration of the quality and quantity of fish habitat lost, especially the magnitude of these impacts on the regional and national significance of the Mississippi River fishery, such an independent peer review is justified. That review would further the success of the Corps in meeting its resource responsibilities and may help direct future mitigation efforts, particularly for multiple species and habitats.**

Response: This draft RSEIS 2 will undergo a 45-day comment period. The draft document will be sent to all applicable regulatory and resource agencies, Federally Recognized Indian Tribes, elected officials, municipalities, private businesses, non-governmental organizations, and the general public. Expected benefits to mid-season fish rearing habitat from mitigation measures are calculated in the same manner that impacts were calculated by the interagency team. The Corps has diligently sought peer review from responsible resource management agencies such as USFWS, MDNR, and MDC. The Corps is confident that the comments received from these agencies will reflect their professional opinions regarding environmental safeguards. The Corps will respond to any relevant comments in the Final Revised Supplemental Environmental Impact Statement 2.

8.6 U.S. Fish and Wildlife Service Coordination Act Report

The U.S. Fish and Wildlife Service submitted a Supplemental Fish and Wildlife Coordination Act (FWCA) Report on 15 March 2006 (included in Appendix G). The following paragraphs state the Service's position on key aspects of the project. The Service's comments are in bold and the Corps' response follows.

USFWS FWCA Comment 1:
This constitutes the U.S. Fish and Wildlife Service's (Service) Supplemental Fish and Wildlife Coordination Act (FWCA) Report for the St. Johns Bayou and New Madrid Floodway Project, Missouri. This Supplemental FWCA Report pertains to revised fish and wildlife mitigation measures proposed by the Corps of Engineers (Corps) in its December 2005 Draft Revised Supplemental Environmental Impact Statement 2 (DRSEIS 2). This Report supplements the analyses and recommendations provided by the Service in previous FWCA reports, planning aid letters, and comments on prior environmental impact statements.

Since July 2005, the focus of the Corps' planning efforts for this project, as reflected in the DRSEIS 2, has involved a major re-evaluation of measures to compensate for project caused fishery losses in the New Madrid Floodway.

In June 2005, the Corps decided to withdraw its 2003 Record of Decision for the project and conduct this re-evaluation due to an error in how it addressed fishery impacts and mitigation needs in the 2002 Revised Supplemental Environmental Impact Statement (RSEIS).

Early in the planning process for this project, the Habitat Evaluation Procedures (HEP) Team, which consists of the Corps, Service, and Missouri Department of Conservation (MDC), agreed upon a fish model to be used in evaluating the project's impacts and mitigation needs for fish rearing. Using this model, the HEP Team determined that 8,375 Average Daily Flooded Acres (ADFAs) were needed to compensate for fish rearing losses. This mitigation benchmark was subsequently addressed in the Service's FWCA Reports. However, as a basis for determining mitigation requirements in the 2002 RSEIS, the Corps used 8,375 acres instead of 8,375 ADFAs. Due primarily to the drainage and flood damage reduction objectives of the project, more than 8,375 acres are needed to achieve 8,375 Average Daily Flooded Acres. Thus, the mitigation needs for the project were underestimated in the 2002 RSEIS.

To address this deficiency in fishery compensation, the Corps identifies additional conceptual mitigation measures in the DRSEIS 2. Among the measures the Corps proposes are four categories of measures to add ADFAs and Average Annual Habitat Units (AAHUs) for fishery compensation: (1) modification of the design of construction borrow pits; (2) modification of gate operations; (3) creation, restoration, or enhancement of large permanent water bodies - primarily existing Mississippi River floodplain lakes (oxbows) located on batture lands, such as Riley Lake; and (4) reforestation of batture lands. These proposed mitigation categories can be further categorized as those occurring inside the project area (Nos. 1 and 2) and those outside the project area (Nos. 3 and 4).

The measure involving modification of the design of construction borrow pits is incorporated by the Corps into a "basic mitigation feature," which includes most of the mitigation features presented in the 2002 RDEIS and stipulated in the section 401 Water Quality Certification issued by Missouri Department of Natural Resources. The measures in the remaining three categories are identified by the Corps as additional measures to compensate for fishery losses remaining in the New Madrid Floodway. These three categories are presented by the Corps in the DRSEIS 2 in four "mitigation scenarios," with varying costs and acreages, with the "basic mitigation feature" being a part of each scenario.

The Corps provides a brief description of two other measures to compensate for the loss of fish rearing habitat in the New Madrid Floodway: (1) increasing flood duration on reforested areas from April 1 to May 15; and (2)

restoration of small, permanent water bodies within the project area. However, neither in its presentation of the four mitigation scenarios discussed above nor in other descriptions of these measures in the DRSEIS 2 does the Corps define any values (AAHUs) for these other measures in compensating for New Madrid Floodway fish rearing losses. The Service focuses its analysis and comments provided below on the four categories of measures where the Corps has assigned compensation values.

USFWS FWCA Response 1: Comment noted. The 2002 RSEIS recommended reforestation of 8,375 acres of frequently flooded agricultural land. Reforesting 8,375 acres of cropland without additional consideration for flood frequency does not necessarily fully mitigate impacts to mid-season fish rearing habitat due to the difference in flood frequency between the period of analysis calculated using Average Daily Flooded Acres (ADFAs) and the 2-year flood frequency on mitigated tracts of land.

The RSEIS 2 is analyzing a variety of techniques including 1) borrow pits, 2) creation of a spawning and rearing pool, 3) creation, restoration, or enhancement of large permanent waterbodies, such as restoration of Riley Lake to historical levels as presented in the RSEIS 2, and 4) reforestation of agricultural lands within either or both St. Johns Bayou Basin and New Madrid Floodway, in addition to batture lands (RSEIS 2 Sections 2.6.2.1 and 2.6.2.2). Additionally, mitigation includes restoring hydrology to Big Oak Tree State Park, restoring bottomland hardwoods on up to 1,800 acres of farmland surrounding Big Oak Tree State Park, 64 miles of riparian buffer strips, wildlife corridor to connect Big Oak Tree State Park with Ten Mile Pond Conservation Area, and the creation of moist soil management areas.

All proposed mitigation features are formulated to compensate for impacts of the flood damage reduction project. Therefore, mitigating within and adjacent to the project area, will provide benefits to Mississippi River floodplain fishes; local populations of fish within the St. Johns Bayou Basin, New Madrid Floodway, and batture areas; waterfowl that utilize the Mississippi Flyway; migrating shorebirds; local wildlife, as well as neotropical migrants; and restore a significant amount of wetlands (acres and functions) found within the highly modified project area. Additionally, mitigation will restore hydrology to Big Oak Tree State Park, a National Natural Landmark by the US Department of the Interior.

Mitigation planning will retain flexibility. Opportunities will be explored with the Interagency Mitigation Team in the restoration of small permanent waterbodies within the project area and increasing flood duration on reforested mitigation tracts. Methodology of these opportunities will follow the analysis presented in RSEIS 2 Section 5.0.

USFWS FWCA Comment 2

Modification of the Design of Construction Borrow Pits

The Corps plans to construct 387 acres of borrow pits in the lower area of the St. Johns Bayou as it borrows material for levee construction. The Corps now proposes to modify the design of these pits to improve fishery habitat by providing a diversity of water depths and sinuous shorelines, establishing islands, and placing structures (i.e., trees). According to the Corps, the borrow pits will increase the compensation for lost fish rearing habitat because they will provide permanent water bodies during the fish rearing season and will be designed to allow free ingress and egress of Mississippi River fishes during flood events. The Corps believes these modified borrow pits will provide high quality habitat supporting a high density of fish and diversity of fish species and could provide an additional 1,571 fish rearing AAHUs.

During all previous mitigation planning efforts for this project, the Corps, Service, and MDC agreed that modified borrow pits would only be considered as compensation for project-caused losses of other permanent water bodies – not as compensation for the loss of river-floodplain connectivity and fish rearing habitat in the New Madrid Floodway. The Corps presents no information in the DRSEIS 2 concerning how these borrow pits would be designed to provide access for Mississippi River fishes. Furthermore, anecdotal information, not scientific documentation or predicative models, is used in the DRSEIS 2 to describe the ability of Mississippi River fishes to use these structures in completing their reproductive life cycle. The Service acknowledges that there is limited movement of fishes through the gates in the St. Johns Bayou. However, the extent of fish movement into the St. Johns Bayou is considerably less than the unrestricted access that River fishes currently have into and out of the New Madrid Floodway.

USFWS FWCA Response 2: Borrow pits will be constructed to maximize fish benefits (See RSEIS 2 Section 2.6.1.7). Borrow pits are planned in the lower end of the St. Johns Bayou Basin because it is the location where borrow material is required, publicly accessible for recreational opportunities, and they are within the 2-year floodplain to ensure fish ingress and egress. Borrow pits are optimum habitats for rearing fishes (see Baker, *et al.*, 1991 and references therein in addition to RSEIS 2 Section 2.6.1.7), and are totally adequate to mitigate project impacts.

Construction of flood damage reduction features in the St. Johns Bayou Basin and closure of the New Madrid Floodway would reduce inundation to 100 and 250 ADFAs of permanent waterbodies in the mid-season rearing period, respectively (2002 RSEIS,

Appendix G Tables 10 and 13). The impact analysis quantified this reduction in inundation.

In the 2002 RSEIS Appendix E, USFWS called for, to the extent possible, in-kind mitigation for fisheries habitat losses of permanent waterbodies. These compensatory mitigation measures could include improving existing permanent waterbodies, reconnecting old chutes, sloughs, and oxbows with the Mississippi River, or reforestation in addition to borrow pit construction (2002 RSEIS, Appendix E). The 387 acres of proposed borrow pits will provide the necessary 2.4 million cubic yards of material needed for the Setback Levee grade raise and compensate for the reduction in inundation on backwater areas. This RSEIS 2 concludes borrow pits and other forms of permanent waterbodies, if properly designed and located, can compensate for project-caused losses of other permanent waterbodies, as well as compensation for the loss of river-floodplain connectivity and fish rearing habitat.

Borrow pits will be situated in the 2-year floodplain. Regular inundation of surrounding lands will provide numerous opportunities for fish to move from the river into the borrow pit. Borrow pits provide high quality rearing habitat for a variety of species (Aggus and Ploskey, 1986; Baker, *et al.*, 1991). Adult fish are attracted to borrow pits because of deep, slack water and abundant forage fishes that often concentrate in these areas (RSEIS 2 Section 5.4.2.7). Many of these adult fish will spawn in shallow, structurally complex littoral areas of borrow pits. Like most natural lakes, plankton densities are usually high, so once eggs hatch, larval fish have an abundant food source. High densities of fish are characteristic of borrow pits, and many of these individuals will eventually be transported or move into the Mississippi River during subsequent floods. These waterbodies only have to be periodically connected. As water recedes, those fish that remain in the pit will take advantage of abundant food and structurally complex habitats to avoid predators and spawn.

USFWS FWCA Comment 3:

<u>Modification of Gate Operations</u>

The Corps is proposing to modify the gate operations in the New Madrid and St. Johns Bayou to provide compensation for the loss of fish rearing habitat caused by the closure of the New Madrid Floodway. In the 2002 RSEIS, the Corps proposed a compensation measure that left the gates in the New Madrid Floodway open to an elevation of 284.4 feet NGVD when the Mississippi River is flooding during the period April 1 to May 15. When river flood levels drops below 284.4 feet NGVD, the gates would be opened to allow for the draining of water that had pooled inside the Floodway. The new proposed gate operation would still have the gates open until river flooding reached 284.4 feet NGVD, at which time they would be closed. The proposed change involves leaving the gates closed after river levels drop,

thereby creating a pool behind the gates until May 15, at which time the gates would be opened and the pooled water would be drained.

The Corps presents four different scenarios for gate operations for the New Madrid Floodway. Three of the scenarios involve holding the pool elevation constant at 284.4 feet, 283.4 feet, or 282 feet NGVD over the entire period of April 1 to May 15. In the fourth scenario, the pool elevation would be at 284.4 feet from April 1 to April 30 and 283.4 feet from May 1 – May 15. The ponded area in the New Madrid Floodway created by the modified gate operations corresponds to the project sump area, as described in the 2002 RSEIS. The size of the sump area is approximately 2,000 acres, of which 800 acres is currently enrolled in the Wetland Reserve Program (WRP). The sump area is the lower elevation portion of the Floodway where the new pumps would operate to evacuate interior drainage water when the river is in flood stage and the gates are closed. Under the current proposal, the pumps would be used to remove interior water to an elevation of 284.4 feet NGVD (or to the elevation described in the other three gate scenarios). In the DRSEIS 2, the Corps also provides a similar modified gate operation for the St. Johns Bayou, although with only one elevation (283 feet) for the entire period.

The Corps believes the ponded area created by these modified gate operations would provide fish spawning and rearing habitat that is comparable to the habitat that currently exists in the Floodway during flood events. The Corps states that fish will enter the Floodway and the pooled area while the gates are open, complete spawning and rearing in the impounded pool, and return to the river when the gates are re-opened. For the New Madrid Floodway, the Corps identifies the following range of fish rearing compensation values for this measure: 2,000 acres (at 284.4 feet NGVD) to 853 acres (at 282 feet NGVD) of spawning and rearing habitat; 1,531 ADFAs (at 284.4 feet) to 707 ADFAs (at 282 feet); and a gain in AAHUs ranging from 2,699 (at 284.4 feet) to 1,145 (at 282 feet).

The importance of the Floodway in providing Mississippi River fishes open access to valuable backwater habitat to complete reproductive and early life stages has been well documented by the Service, MDC, Corps, and several researchers. To qualify as in-kind compensation, a mitigation measure must allow river fishes to enter and leave the Floodway unabated. Such mitigation measures must ensure successful fish recruitment – otherwise, the mitigation will fail to achieve its intended purpose. Factors that should be considered include the natural timing of fish movements in relation to their reproductive cycles and river stages, water temperature and other water chemistry, and habitat that allows young fish to avoid predators.

The Corps has not provided information indicating that it has consulted with fish-passage engineering experts or that it has conducted any fish-passage studies to scientifically evaluate the ability of river fishes to freely access the Floodway through the gates. On several occasions, the Service has requested such an evaluation, including in our August 11, 2005, Planning Aid Letter. Furthermore, information is needed to determine if such artificially created habitats would provide the other necessary features (e.g., timing, temperature) for successful fish recruitment. Without conclusive information on this issue, the Service maintains its position that in-kind compensation of fish spawning and rearing habitat cannot be achieved inside of the Floodway with the proposed project. The Service recommends that the proposal to modify gate operations to pond water for fish spawning and rearing be withdrawn from consideration as a fishery mitigation measure until these studies have been completed.

USFWS FWCA Response 3: The description of the modification of the gate operation provided in the first two paragraphs of the comment generally describes the approach in the RSEIS 2.

Creation of a spawning and rearing pool will provide stable spawning and rearing habitat that currently does not exist in the Floodway due to fluctuations of the Mississippi River. Creation of this pool will result in significant gains to spawning and rearing habitat.

The Corps concurs that the Floodway provides reproductive and early life history habitat for fish. However, open and unabated access is not required. Under the recommended plan, there are periodic opportunities to access floodplain habitat and mitigation sites. These mitigation sites will ensure successful fish recruitment and will be monitored to verify benefits. BMPs will be developed during formulation of site-specific detailed mitigation plans with input from the interagency mitigation team to balance periods of fish access with the need to reduce flood damage. BMPs will include the development of guidelines for gate operation to maximize access during the reproductive period of fishes. Consideration will be given to the purpose, time of year (*i.e.*, temperature-based rules coinciding with spawning activities and water chemistry), controlling stage elevations (*i.e.*, identifying combinations of interior and exterior stages to maximize length of gate openings), minimizing high water velocities through the structure, and managing stable sump elevations to ensure successful rearing. The spawning and rearing pool will provide diverse habitat that will allow spawning and rearing usage by multiple riverine species while providing refugia for young fish to complete their development.

The studies cited concerning fish passage in the Planning Aid Letter were considered in the analysis that was conducted for this RSEIS 2. Coffman's (2005) predictive models were used to predict fish passage through small culverts in the Mid-Atlantic Highlands region of the United States and are not applicable to large culverts like the proposed 10-foot by 10-foot box culverts.

Typical problems at culverts include a perched outlet, water velocities that exceed burst swimming speeds of fish, shallow depths that hamper swimming, and long distances between resting areas. None of these problems will exist for the New Madrid culverts for the following reasons:

- Water will be flowing into the basin during most operational periods, so excessive water velocity will not be an impediment to movement. In addition, those fishes that were spawned or are rearing in the basin can be easily transported back to the river when water direction is reversed during falling river stages.
- There will be no free fall, or 'waterfall' condition at either the outlet or inlet.
- Culvert slope is nearly level (6 inch elevation change over 250 linear feet).
- The length of the culvert is a relatively short distance that fish will need to travel to access the backwater.
- Water depth will be equal to the 10-foot height of the culvert, which is more than adequate for swimming fishes.

An additional aspect of fish passage is the condition of the entrance canal. Mud Ditch connects the Mississippi River to the New Madrid Floodway. The ditch itself can be classified as a slackwater backwater during high river stages with a well-developed forested riparian zone. Therefore, fish will likely be attracted to the entrance canal and move towards the structure. Once the structure is open, fish will follow the primary flow paths into the basin. All of these reasons strongly indicate that fish passage conditions will exist at the New Madrid Floodway culverts.

To address the Service's remaining concerns regarding fish access, the Corps will work with the interagency mitigation team and any other individuals that are collectively identified in the development of fish passage BMP, access to specific tracts, and monitoring fish passage and usage of mitigated areas. The Corps recommends that this should occur during the development of site-specific detailed mitigation plans. Additionally, the Corps will conduct a mark/recapture study to determine the relative number and species that pass through the culverts. The study will also include an assessment of spawning and rearing utilization of mitigation tracts.

Based upon the likely gains to habitat that is provided by the spawning and rearing pool and likely passage of fish through the structure, the Corps concludes the spawning and rearing pool will provide mitigation for Mississippi River floodplain fishes. Monitoring of fish passage and usage of the spawning and rearing pool will verify this conclusion.

USFWS FWCA Comment 4:

<u>Creation, Restoration, or Enhancement of Large, Permanent Water Bodies</u>

With this category of mitigation measures, the Corps is proposing to compensate for the loss of New Madrid Floodway fish spawning and rearing habitat by modifying oxbow lakes and chutes that occur on the Mississippi River floodplain (batture lands). A number of such floodplain lakes exist in the batture. These lakes are an integral component of the river's ecosystem. There are now fewer of these oxbows lakes and chutes due to the restriction of the Mississippi River floodplain by extensive levees and training dikes. Typically, during normal river flows, these depressional areas of the floodplain are not directly connected to the river. Some river fishes remain in these oxbow lakes after flood waters recede. However, because the substrates of these oxbows consist of permeable, alluvial soils, the water levels in them equalize with river levels, resulting in the oxbows becoming very shallow or completely dewatered after flood waters recede.

The Corps' proposal involves modifying these oxbows to provide more surface area of water and greater water depths. By converting these lakes to hold more water, the Corps believes the lakes will provide greater habitat value for fish spawning and rearing, thus providing compensation for the loss of the fish habitat in the Floodway. Furthermore, the Corps states in the DRSEIS 2 that providing greater water depths in the oxbows after the river has receded will improve fish survival and contribute to recruitment of the river's fishery when they are re-flooded.

The Corps uses Riley Lake, located at the tip of Donaldson Point, to describe how the oxbows could be modified to compensate for the loss of fish spawning and rearing habitat. A weir structure would be placed in Riley Lake that would impound water at a specific elevation after flood waters recede. For instance, under normal conditions, Riley Lake contains 36 acres of permanent water surrounded by bottomland hardwood forest and farmland. If a weir were constructed with the control elevation set at 285 feet NGVD, 112 acres of bottomland hardwood forest and 97 acres of farmland would be inundated, along with the original 36 acres of the lake, providing a total of 245 acres of permanent water and 399 AAHUs of fish rearing habitat. With a weir set at an elevation of 289 feet NGVD, 295 acres of hardwood forest and 349 acres of farmland would be converted, providing a total of 680 acres of permanent water and 1,290 AAHUs of fish rearing habitat (Table 2.4 of DRSEIS 2). The fish recruitment concept promoted by the Corps is that river fish trapped in the converted lake as flood waters recede would reproduce and some of these adults and their progeny would return to the river in the next flood event. This cycle would be repeated with

each flood event. In Table 2.3 of the DRSEIS 2 (page 40), the Corps identifies seven other oxbow lakes that could potentially be modified.

The Service considers the conceptual proposal for Riley Lake to be a conversion of valuable, existing habitat types to an alternative habitat type. The conversion of oxbow lakes to permanent water bodies will replace areas that currently provide fisheries habitat and Mississippi River ecological functions. In addition, the proposal for Riley Lake will result in the loss of valuable floodplain hardwood forests, with no compensatory mitigation proposed to offset this loss (page 40 of DRSEIS 2). The DRSEIS 2 does not indicate the acreage of hardwood forest that would be lost with the possible increase in surface area of permanent water at each of the other floodplain lakes identified in Table 2.3 as possible sites for such conversions.

Furthermore, there might be a major constraint in modifying areas like Riley Lake to provide more permanent water. Creating an impoundment through the use of a weir might not maintain greater water depths for an extended period if the alluvial soils underlying Riley Lake are highly permeable. If this is the case, water elevations will drop to equalize with the river's water surface elevation. This could be the case with most of the oxbows and chutes on the Mississippi River floodplain. Prior to committing to the possible use of this mitigation measure, the Corps (if it has not already done so) should determine if these floodplain lakes can maintain greater water depths for extended periods of time as water levels on the river fall.

USFWS FWCA Response 4: The Corps concurs with the statement concerning the value provided by floodplain lakes to the river's ecosystem. The LMRCC, through a series of state meetings, has identified restoration and enhancement of floodplain lakes, such as currently proposed for Riley Lake, as a primary goal of improving habitats in the Lower Mississippi River. The Corps believes that converting the existing degraded floodplain habitat into the historical high valued habitat, will provide greater value for fish spawning and rearing, thus providing compensation for the loss of the fish habitat in the Floodway.

The description of the restoration measures to Riley Lake described in the comment generally describes the approach in the RSEIS 2. Fish will not be trapped in the restored lake; they will have numerous opportunities for ingress and egress due to the pulsed hydrograph of the Mississippi River.

Local interests in the past dug a ditch in an attempt to drain the Riley Lake area to promote agriculture (RSEIS 2 Section 2.6.2). Mitigation measures are intended to restore Riley Lake to historical conditions (surface acres, depth, and habitat). Existing conditions are described in RSEIS 2 Table 2.4. Black willows are the predominate species in the bottomland hardwood cover type surround Riley Lake (RSEIS 2 Appendix

F, Attachment 1). The existing habitat value that the current black willow and cropland provides was accounted for in the calculation of mitigation benefits.

It is likely that restoring the lake to historical levels will kill these black willows that have overgrown the area. No additional compensatory mitigation would be required from the mortality of the existing black willows due to restoration of Riley Lake because this action would result in a net increase to mid-season fish rearing habitat.

The Corps recognizes that detailed plans and design work would be necessary prior to restoring a floodplain lake at this or any other location. An important part of this design work would entail geotechnical review, including soil borings. This work will be performed before the weir is built to ensure that the lake will function as designed. If soil borings reveal that the lake will not hold the levels of water envisioned without a substantial expenditure of additional resources, the Corps will consider restoration of other batture lakes. See RSEIS 2 Section 2.6.2.3.

USFWS FWCA Comment 5:

Reforestation of Batture Lands

For two of the mitigation scenarios in the DRSEIS 2 (Scenarios A and C), the Corps proposes that reforestation of batture lands will compensate for the loss of fish spawning and rearing habitat in the New Madrid Floodway. Under Scenario A, reforestation of 200 acres of batture lands would add 19 AAHUs. Under Scenario C, reforesting 1,050 acres would add 117 AAHUs for the New Madrid Floodway losses.

The Service acknowledges that the reforestation of batture lands could improve fishery habitat value of these areas and is not opposed to the Corps implementing this action. However, replanting trees on the batture lands cannot provide in-kind replacement or compensation for the loss of backwater spawning and rearing habitat in the Floodway. These are two separate areas and two different kinds of fishery habitat. The Service has repeatedly stressed throughout the multiple mitigation planning cycles for this project that restoring or enhancing the habitat value of the batture lands for Mississippi River fishes does not address compensation in the Floodway.

USFWS FWCA Response 5: The Corps agrees with the USFWS that batture land is valuable to a variety of fishes and other aquatic organisms. The conceptual basis of mitigation is embedded in the relationship among floodplain habitats. Backwaters are one of many habitat types on the floodplain that provide similar attributes to spawning and rearing fishes. Flooded bottomland hardwoods in the batture land will have physicochemical characteristics similar to forested areas in the Floodway: slackwater, structural diversity, and directly accessible. Swales, ridges, and various types of permanent waterbodies in the batture create habitat similar to the Floodway: deep, warm

water that persists after floodwaters recede and a corridor for movement within the floodplain. Batture land is also directly accessible to fish and has heterogeneous habitats suitable for fish spawning and rearing. In many cases, batture land is superior to the Floodway. The Floodway is man-made, trees have been cleared from most stream banks, high turbidity prevails for much of the year, and the adjacent floodplain is comprised mostly of agricultural fields. Conversely, batture land is more diverse, floods regularly, and with reforestation of frequently flooded agricultural land, can provide quality habitat for many fishes that are currently found in the New Madrid Floodway. Restoration efforts along the river or within the batture area are expected to significantly benefit multiple Lower Mississippi River Valley communities, including offsetting mid-season fish rearing habitat impacts from construction of the flood damage reduction project described in the RSEIS 2. For these reasons, the Corps believes that mitigation in the batture is suitable to mitigate impacts within the Floodway.

USFWS FWCA Summary and Recommendations Comment 6:
Throughout the years of our involvement with the planning of the St. Johns Bayou and New Madrid Project, the Service has placed special emphasis on the critical importance that the Mississippi River-New Madrid Floodway connection has in providing valuable fishery resources and ecosystem functions. This has remained our highest mitigation priority because this river-floodplain connection is absolutely vital to maintaining a healthy, sustainable fishery in this section of the Mississippi River. Completing the closure of the New Madrid Floodway will eliminate a major area of river-floodplain connectivity in this region of the River and the very last area of its kind in the State of Missouri.

USFWS FWCA Summary and Recommendations Response 6: The Floodway represents a minor portion of the active floodplain in the lower Mississippi River. The amount of batture land from Cape Girardeau to the Arkansas state line is approximately 127,000 acres, of which approximately 106,000 acres occur south of the confluence of the Ohio and Mississippi Rivers. This compares to approximately 132,000 acres of land within the entire Floodway, of which approximately 113,000 acres are cropland. In addition, the Floodway was formed by levees and the habitat is mostly agricultural lands. These conditions do not indicate that the Floodway is vital to maintaining ecosystem integrity. Mitigating batture lands and mitigation within the Floodway fully compensates for all significant unavoidable impacts to fish and wildlife resources.

As stated in the 2002 RSEIS Response to DOI Number 2 (page M-7), there are other connections within the state of Missouri and this region of the River.

USFWS FWCA Summary and Recommendations Comment 7:
The exceptional value of backwater areas of the Mississippi River to the River's regional fishery and the on-going threats to these backwater areas requires that we continue to explore and implement mitigation measures that avoid and minimize further losses. The Service is unaware of any feasible

mitigation techniques that can provide in-kind replacement to offset the permanent loss of this habitat and associated ecological processes. We appreciate the Corps' efforts in evaluating and presenting a variety of ideas to compensate for the fish habitat losses associated with the New Madrid Floodway closure. However, the Service cannot concur that the Corps' mitigation proposals presented in the DRSEIS 2 will sufficiently mitigate for the project-caused fish habitat losses in the New Madrid Floodway.

The Service's position on this issue has not changed from our previous FWCA Reports. We continue to recommend that the Corps and the project sponsor re-evaluate and formulate plans that involve measures to minimize, not attempt to compensate, the loss of the Floodway's fishery habitat and the river-floodway connection. We still believe that a setback closure levee could be constructed in a manner that meets the flood-reduction objectives of the projects; provides economic benefits to Floodway farmers, residents, and local communities; and minimizes the loss of the irreplaceable fishery resources. It is our hope that we can begin to collaboratively develop a set of plans that incorporates all of these important features.

USFWS FWCA Summary and Recommendations Response 7: The Service's position is noted. The Corps maintains that mitigation as presented in this RSEIS 2 will compensate impacts of the flood damage reduction project. Additionally, the Corps believes that restoration of bottomland hardwoods on 1,293 acres of cropland in the St. Johns Bayou Basin, restoration of bottomland hardwoods on 2,326 acres of cropland in the New Madrid Floodway, creation of 765 acres of moist soil units, restoration of 64 miles of riparian buffer strips, creation of a wildlife corridor that connects Big Oak Tree State Park with Ten Mile Pond Conservation Area, restoration of hydrology to Big Oak Tree State Park, and restoration of bottomland hardwoods on 1,800 acres of cropland surrounding Big Oak Tree State Park will result in an improvement to the overall highly degraded ecosystem that is comprised of over 85% cropland. Furthermore, construction of borrow pits, restoration of floodplain lakes such as Riley Lake, and the creation of a spawning and rearing pool will compensate for remaining impacts to mid-season fish rearing habitat that the above mitigation does not provide.

Previous NEPA analysis and this RSEIS 2 were based on economic and environmental principles as outlined by the Principles and Guidelines adopted by the Water Resources Council. The Federal objective of water and related land resources project planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable Executive Orders, and other planning requirements. The 2002 RSEIS analyzed a series of alternative plans in a systematic manner that ensured all reasonable alternatives were evaluated.

The Corps acknowledges that there are alternatives that alleviate flood damages in the project area with less of an environmental impact. While other alternatives may minimize or lessen impacts, they do not produce maximum benefits. These other

alternatives do not yield greater net economic benefits than the recommended plan. The recommended plan is the NED plan. The recommended plan both maximizes benefits and fully compensates, and in many cases over compensates, for all unavoidable impacts to fish and wildlife resources. However, the Economic and Environmental Principles for Water and Related Land Resources Implementation Studies (established pursuant to the Water Resources Planning Act of 1965, PL 89-80, as amended [42 U.S.C 1962a-2 and d-1]) specifically states that the plan recommending Federal action is to be the alternative plan with the greatest net economic benefit consistent with protecting the Nation's environment. This RSEIS 2 clarifies the compensatory mitigation and updates the economic analysis accordingly. The recommended flood damage reduction plan, as outlined in the 2002 RSEIS, and the compensatory mitigation, as clarified in this RSEIS 2, is the NED Plan.

USFWS FWCA Summary and Recommendations Comment 8:
We appreciate the opportunity for the Service to participate in this updated mitigation planning effort and look forward to working with the mitigation team in making progress in the development of a fully functional mitigation plan. We want to take this opportunity to provide specials thanks to two people on your staff, Danny Ward and Kevin Pigott. Mr. Ward and Mr. Pigott were always cooperative and timely in answering our questions, providing us with updated information, and assisting the mitigation team in other ways during our participation with this mitigation planning effort.

Please do not hesitate to contact me if you have any questions concerning any information presented in this Supplemental FWCA Report.

USFWS FWCA Response 8: Comment noted and appreciated. Likewise, the Corps looks forward to working with the Service as well as the entire interagency mitigation team in the development of compensatory mitigation features.

9.0 CONCLUSION

9.1 Relationship of Plan to Environmental Laws and Regulations

The relationship of the recommended plan to the requirements of environmental laws, executive orders (EO), and other policies are presented below (Institute for Water Resources, 1996):

Federal Policies and Acts	Compliance Status
Archaeological and Historic Preservation Act	Full Compliance[1]
Clean Air Act Amendments of 1970	Full Compliance
Clean Water Act of 1972, as amended	Full Compliance
Coastal Zone Management Act, as amended	Not Applicable
Endangered Species Act of 1973, as amended	Full Compliance
Farmland Protection Policy Act of 1984	Full Compliance

Fish and Wildlife Coordination Act of 1958	Full Compliance
Foods Security Act of 1985	Full Compliance
Land and Water Conservation Fund Act	Full Compliance
National Environmental Policy Act of 1969	Partial Compliance[2]
National Historic Preservation Act of 1966, as amended	Full Compliance[1]
Native American Graves Protection and Repatriation Act	Full Compliance[1]
Rivers and Harbors Appropriation Act of 1899	Full Compliance
Rivers and Harbor Flood Control Act of 1970	Full Compliance
Water Resources Planning Act of 1965	Full Compliance
Wild and Scenic Rivers Act, as amended	Full Compliance

[1]Additional cultural resources surveys would be conducted during the development and implementation of site-specific detailed mitigation plans.
[2]Full compliance would be met following the issuance of the Final RSEIS 2 and ROD.

Executive Orders

Floodplain Management (E.O. 11988)	Full Compliance
Protection, Enhancement of the Cultural Environment (E.O. 11593)	Full Compliance
Protection of Wetlands (E.O. 11990)	Full Compliance
Environmental Justice (E.O. 1298)	Full Compliance

Other Federal Policies

Prime and Unique Farmlands	Full Compliance
Water Resources Council, Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies	Full Compliance

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LIST OF PREPARERS/CONTRIBUTORS

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Figures
(Pages 177 to 194)
are available under the Graphics and Figures Link

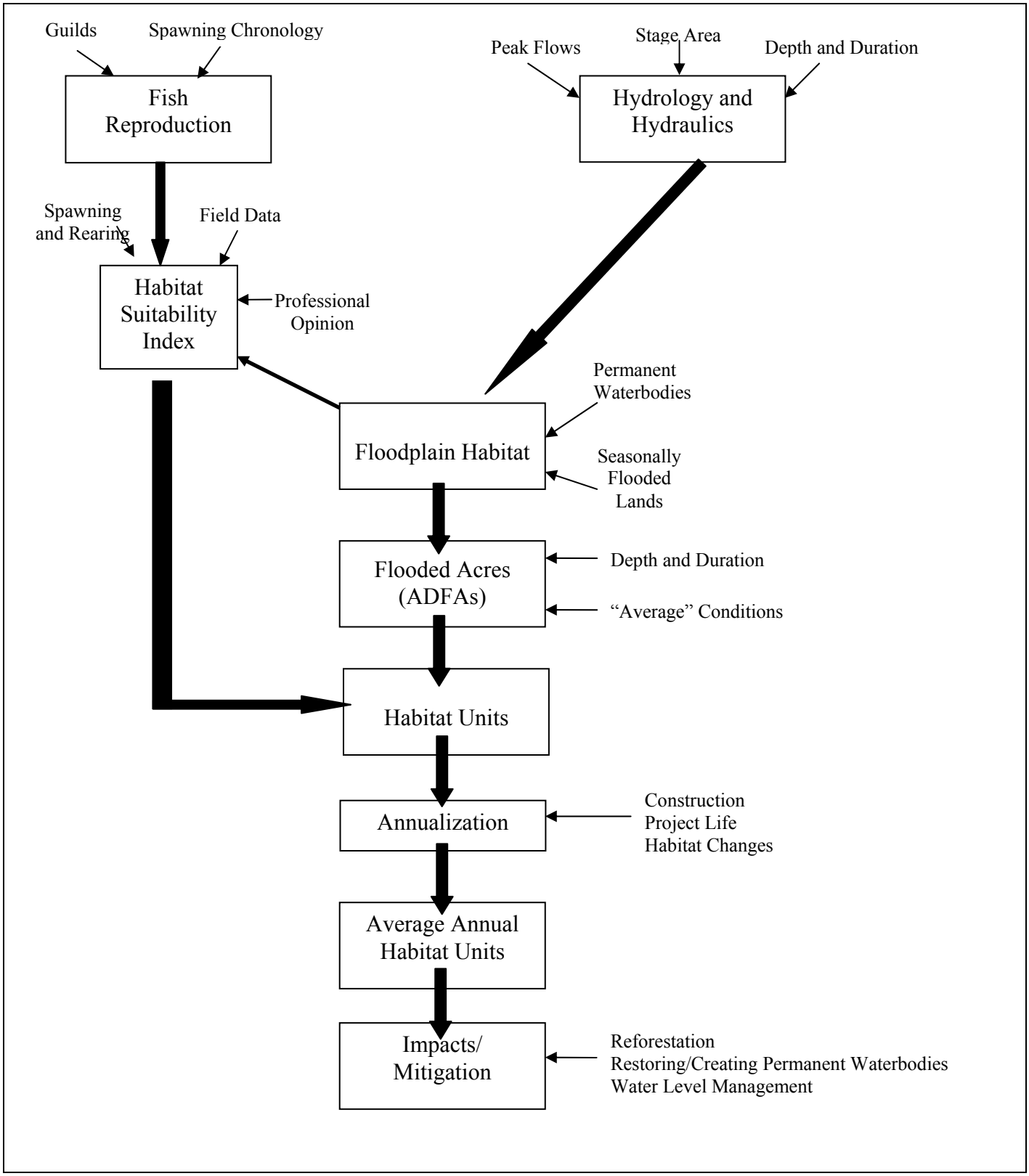
APPENDIX A

Summary and Application of EnviroFish

EnviroFish was developed to incorporate depth and duration to define suitable reproductive habitat. There are three main analytical components of EnviroFish: hydraulics and hydrology, land uses, and biological response variables (See conceptual model). EnviroFish calculates average daily flooded acres from stage-area relationships, separates spawning from rearing acres using depth and duration of flooding, and identifies the land use associated with each acre (*e.g.*, agricultural, fallow, bottomland hardwoods, permanent waterbodies). A Habitat Suitability Index score is then used to weight each acre to reflect the biological value of the flooded landscape. Parameterization of the model is based on existing data and professional opinion of the HEP Team. During meetings held with the interagency team, consisting of biologists, hydrologic engineers and ecologists from the Corps' Memphis District, Engineer Research and Development Center (ERDC), USFWS, MDC, MDNR, and local interests, environmentally conservative assumptions were developed to parameterize the model. These include:

1. The fish community is comprised of multiple guilds that have different modes of reproduction and exhibit variable spawning chronologies. As a result, three separate time periods were selected (early, mid, and late season spawning fish), and the period having the greatest level of impacts (mid-season in this case) was selected as the mitigation target.
2. Habitat Suitability Index values were assigned to each evaluation species by the HEP Team using the Delphi Technique, which in this case, was assigning the average of all scores as the final HSI value. Using professional opinion of trained biologist in deriving scores will usually result in environmentally conservative values to rate the importance of floodplain habitats to fishes.
3. The pattern of flooding in the New Madrid Floodway generally follows the primary streams and ditches, so the upper limit of the 2-year flood is a considerable distance from the Mississippi River. There were no attempts to reduce the value of flooded lands as a function of distance from river. All floodplain habitats within the 2-year peak flood frequency were considered of equal value, although most spawning fish moving from the Mississippi River onto the floodplain will spawn at the nearest suitable location to reduce travel time and energy expended, and ensure that eggs do not become desiccated during receding floods.

Appendix A Figure 1



Appendix A Figure 2.
Example of Impact and Mitigation Calculation Specific Scenario: New Madrid Floodway – Mid-Season Rearing.

IMPACT CALCULATION				
A	**B**	**C**	**D**	**E**
Landcover type	**ADFAs** [1]	**HSI** [2]	**Species** [3]	**HUs Lost** [4]
Agricultural	3,766 606 **3,160**	0.37	Smallmouth buffalo, crappie, drum	1,169
Fallow	332 -60 **272**	0.4	Smallmouth buffalo, crappie, drum	108
Bottomland Hardwood	1099 -204 **895**	0.7	Smallmouth buffalo, crappie, drum	626
Large Waterbodies	203 - 78 **125**	2.2	Smallmouth buffalo, crappie, drum	275
Small Waterbodies	213 - 87 **126**	1.2	Smallmouth buffalo, crappie, drum	151
Total	**4,576***			**2,329**

MITIGATION CALCULATION			
F	**G**	**H**	**I**
Landcover type change	**HUs Needed**	**HSI Gain**	**ADFAs Required** [5]
Agricultural to Fallow	**2,329**	**0.03** (0.4 - 0.37)	**77,633**
Agricultural to Bottomland Hardwood	**2,329**	**0.33** (0.7-0.37)	**7,058**
Agricultural to Large Waterbodies	**2,329**	**1.83** (2.2 – 0.37)	**1,273**
Agricultural to Small Waterbodies	**2,329**	**0.83** (1.2 – 0.37)	**2,806**

* The total **existing** ADFAs in the floodway is 5,613 acres (3,765.8 + 331.7 + 1,099.1 + 203.5 + 212.9) as opposed to the 2002 Recommended Plan mitigation of 7,058. The previous recommended plan with mitigation in ADFAs would actually be increased flooding from the perspective of ADFAs.

1. Page C-22, Table 12, Mid-season Rearing, Existing minus Option 1 (modified gate[3])
2. The HSI figures are the sum of the appropriate species HSI values on Table 6, page G-13.
3. These representative species provided in Table 3, page G-7.
4. Calculation is Column B (ADFAs) times Column C (HSI for landcover type)
5. Calculation is Column G (HUs needed) divided by Column H (HUs gain by that particular mitigation approach).

APPENDIX B

Coordination and Pertinent Correspondence

The Scoping process for the RSEIS 2 included preparing a Notice of Intent (NOI) published in the Federal Register; preparing scoping letters that were sent to applicable resource and regulatory agencies, government officials, Federally Recognized Indian Tribes, non-governmental organizations, and the general public; conducting an interagency meeting; and funding the USFWS for a Planning Aid Letter.

Notice of Intent

A NOI to prepare a revised supplemental environmental impact statement was published in the Federal Register on July 22, 2005 (Volume 70, Number 140, Page 42312 - 42313). The Notice of Intent also served as a National Environmental Policy Act Scoping Document. The purpose of the NOI was to inform project stakeholders of the intent to prepare a revised supplemental environmental impact statement and to solicit comments concerning relevant issues of concern. A copy of the NOI is included as Attachment 1.

Scoping Letters

Scoping Letters were prepared and sent to the following agencies and individuals:

Federal

Senator Christopher Bond
Senator James Talent
Congresswoman Jo Ann Emerson
Council on Environmental Quality
Environmental Protection Agency:
- NEPA Compliance Division, Washington, D.C.
- Regional Administrator, Kansas City
- NEPA Team Leader, Kansas City
- Wetlands Protection Section, Kansas City

Department of Interior:
- Denver Federal Center
- Office of Environmental Policy and Compliance, Washington, D.C.
- USFWS, Columbia, MO Field Office
- USFWS, Regional Office, Ft. Snelling

Natural Resources Conservation Service:
- District Conservationist, Benton, MO
- New Madrid Field Office
- Charleston Field Office
- State Conservationist
- State Biologist

Department of Agriculture:
USDA/RHS, Washington, D.C.
USDA-Rural Development, Columbia

Federally Recognized Tribes

Mr. Lee Edwards, Governor, Absentee-Shawnee Tribe, Shawnee, OK
Ms. Jennifer Makaseah, Tribal Representative, Absentee-Shawnee Tribe, Shawnee, OK
Mr. Theodore R. Watson, Jr., Tribal Representative, Absentee-Shawnee Tribe, Shawnee, OK
Ms. Augustine Asbury, Tribal Representative, Alabama-Quassarte Tribal Town, Wetumka, OK
Mr. Tarpie Yargee, Chief, Alabama-Quassarte Tribal Town, Wetumka, OK
Mr. Richard Allen, Tribal Representative, Cherokee Nation of Oklahoma, Tahlequah, OK
Mr. Chad Smith, Principal Chief, Cherokee Nation of Oklahoma, Tahlequah, OK
Mr. Bill Anoatubby, Governor, Chickasaw Nation of Oklahoma, Ada, OK
Ms. Virginia Nail, Tribal Historic Preservation Officer, Chickasaw Nation of Oklahoma, Ada, OK
Mr. Terry Cole, Director, Choctaw Nation of Oklahoma, Durant, OK
Mr. Gregory E. Pyle, Chief, Choctaw Nation of Oklahoma, Durant, OK
Ms. Tamara Francis, Tribal Representative, Delaware Nation, Anadarko, OK
Mr. Edgar Francis, President, Delaware Nation, Anadarko, OK
Mr. Charles Enyart, Chief, Eastern Shawnee Tribe of Oklahoma, Seneca, MO
Ms. Janie Roark, Tribal Representative, Eastern Shawnee Tribe of Oklahoma, Seneca, MO
Ms. Evelyn Bucktrot, MEKKO, Kialegee Tribal Town, Wetumka, OK
Mr. Raul Garza, Chairman, Kickapoo Traditional Tribe of Texas, Eagel Pass, TX
Mr. Steve Caude, Chairman, Kickapoo Tribe of Kansas, Horton, KS
Mr. Curtis Simon, Tribal Representative, Kickapoo Tribe of Kansas, Horton, KS
Mr. Kenneth H. Carleton, Tribal Historic Preservation Officer, Mississippi Band of Choctaw Indians, Choctaw, MS
Mr. Phillip Martin, Chief, Mississippi Band of Choctaw Indians, Choctaw, MS
Ms. Joyce A. Bear, Tribal Historic Preservation Officer, Muscogee (Creek) Nation, Okmulgee, OK
Mr. A. D. Ellis, Chief, Muscogee (Creek) Nation, Okmulgee, OK
Mr. Tim Thompson, Tribal Historic Preservation Officer, Muscogee (Creek) Nation, Okmulgee, OK
Mr. Jim Gray, Chief, Osage Nation of Oklahoma, Pawhuska, OK
Mr. Anthony Whitehorn, Tribal Representative, Osage Nation of Oklahoma, Pawhuska, OK
Mr. C. Michael Harwell, Tribal Chairman, Otoe-Missouria Tribe of Oklahoma, Red Rock, OK
Ms. Mildred Hudson, Tribal Representative, Otoe-Missouria Tribe of Oklahoma, Red Rock, OK
Mr. John P. Forman, Chief, Peoria Tribe, Miami, OK
Mr. Emmett E. Ellis, NAGPRA Representative Peroria Tribe, Tulsa, OK
Mr. Robert Thrower, Tribal Representative, Poarch Band of Creek Indians, Atmore, AL
Mr. Eddie L. Tullis, Tribal Chairman, Poarch Band of Creek Indians, Atmore, AL
Mr. Dwight Buffalohead, Chairman, Ponca Tribe of Oklahoma, Ponca City, OK

Ms. Joyce Greenwood, NAGPRA Representative, Ponca Tribe of Oklahoma, Ponca City, OK
Mr. John Berrey, Chairman, Quapaw Tribe of Oklahoma, Quapaw, OK
Ms. Carrie Wilson, Tribal Representative, Quapaw Tribe of Oklahoma, Fayetteville, AR
Ms. Deanne Bahr, Tribal Representative, Sac and Fox Nation of Missouri, Hiawatha, KS
Mr. Edmore Green, Tribal Representative, Sac and Fox Nation of Missouri, Hiawatha, KS
Ms. Sandra Keo, Chairwoman, Sac and Fox Nation of Missouri, Hiawatha, KS
Mr. Don Abney, Principal Chief, Sac and Fox Nation of Oklahoma, Stroud, OK
Ms. Sandra Massey, NAGPRA Representative, Sac and Fox Nation of Oklahoma, Stroud, OK
Principal Chief, Seminole Nation of Oklahoma, Wewoka, OK
Mr. Emman Spain, NAGPRA Representative, Wewoka, OK
Mr. Mitchell Cypress, Chairman, Seminole Tribe of Florida, Hollywood, FL
Mr. Willard Steel, Tribal Historic Preservation Officer, Ah-Tah-Thi-Ki Museum, Seminole Tribe of Florida, Clewiston, FL
Ms. Rebecca Hawkins, Tribal Representative, Shawnee Tribe, Miami, OK
Mr. Ron Sparkman, Chairman, Shawnee Tribe, Miami, OK
Mr. Charles Coleman, NAGPRA Representative, Thopthlocco Tribal Town, Weleetka, OK
Mr. Brian McGertt, Chief, Thopthlocco Tribal Town, Okemah, OK
Ms. Dawena Pappan, Chief, Tonkawa Tribe, Tonkawa, OK
Mr. Anthony Street, Executive Director, Tonkawa Tribe, Tonkawa, OK
Mr. Earl Barbry, Jr., Tribal Historic Preservation Officer, Tunica-Biloxi Tribe of Louisiana, Marksville, LA
Mr. Earl Barbry, Sr., Chairman, Tunica-Biloxi Tribe of Louisiana, Marksville, LA
Ms. Mary Tidwell, Historic Preservation Officer, United Keetoowah Band of Cherokee Indians of Oklahoma, Tahlequah, OK
Mr. George Wickliffe, Chief, United Keetoowah Band of Cherokee Indians of Oklahoma, Tahlequah, OK

State

Governor Matt Blunt
Senator Peter Kinder
Representative Denny Merideth
Representative Lannie Black
Representative Peter Myers
Missouri Department of Conservation:
- Office of the Director
- Planning Section
- Cape Girardeau Field Office
- Duck Creek Conservation Area
- Tenmile Pond Manager

Missouri Department of Natural Resources:
- Office of the Director
- Water Pollution Control Program
- State Historic Preservation Office
- Division of State Parks

Missouri Highway and Transportation Department
Missouri Department of Social Services, Mississippi County Director
Kentucky Department of Environmental Protection

Local

Mayor, City of Sikeston, MO
Mayor, Village of Pinhook, MO
Mayor, City of New Madrid, MO
Mayor, City of East Prairie, MO
Mayor, City of Charleston, MO
Manager, City of Sikeston, MO

Other Organizations and Individuals

Mr. Jack McIntosh, Superintendent, Reorganized School Dist No. 2, East Prairie, MO
Mr. David B. Brewer, Levee District No. 3, Mississippi County, Missouri, Wyatt, MO
Mr. John D. Story, Consolidated Drainage District, #1, Charleston, MO
Mr. Jim Blumenburg, President, Mississippi County Commission, Charleston, MO
Consolidated Drainage District No 1 of Mississippi County, Missouri, Charleston. MO
Mr. Garland Buck, Levee District #2 of Scott County, Charleston, MO
Mr. Lynn Bock, St John Levee and Drainage District, New Madrid, MO
Ms. Caroline Puffalt, Conservation Chair, Ozark Chapter Sierra Club, St. Louis, MO
Robin Mann, National Wetlands Working Group, Sierra Club, Rosemont, PA
Mr. Ken Midkiff, Program Manager, Ozark Chapter, Sierra Club, Columbia, MO
Mr. Timothy D. Searchinger, Senior Attorney, Environmental Defense Fund, Washington, D.C
Ms. Yvonne Homeyer, Conservation Chairperson, Webster Grove Nature Study Society, St Louis, MO
Mr. Jim Holsen, President, St. Louis Audubon Society, Kirkwood, MO
Ms. Bea Covington, Executive Director, Missouri Coalition for the Environment, St. Louis, MO
Ms. Liz Anderson, Editor, Enterprise-Courier, Charleston, MO
Mr. Dale R. Ludwig, Missouri Soybean Association, Jefferson City, MO
Mr. James E. French, President, French Implement Co., Charleston, MO
Mr. Charles E. Kruse, Missouri Farm Bureau Federation, Jefferson City, MO
Mr. Lonnie Thurmond, Enterprise Community, East Prairie, MO
Mr. Dwight Bird, Delta Growers Association, Charleston, MO
Dr. Martha Ellen Black, Enterprise Community, East Prairie, MO
Mr. Glenn Ault, Charleston, MO

Mr. David Brewer, Wyatt, MO
Dr. Christopher Barnhart, SW Missouri State University, Springfield, MO
Mr. John Besser, Columbia, MO
Ms. Celeste Koon, Jefferson City, MO
Ms. Mary Ratliff, NAACP, President, Missouri State Conference, Columbia, MO
Mr. Arthur Cassel, NAACP, Charleston Missouri Chapter, Charleston, MO
Ms. Terri Treacy, Carbondale, IL
Ms. Cheryl Delashmit, Leslie, MO
Mr. Alan Journet, SE Missouri State University, Cape Girardeau, MO
Mr. Rene DeKriek, French Implement Co., Charleston, MO
Dr. Mike Barnes, Superintendent Reorganized School District #1, Enlarged, New Madrid, MO
Mr. Ronnie Jimerson, New Madrid, MO
Mr. Donald Crawford, Harrisburg, AR
Mr. William Dee Dill, East Prairie, MO
Mr. Joe Sorrells, J-Mar Agri Group, East Prairie, MO
Mr. John E. Burke, Charleston, MO
Mr. Stephen T. Burke, Charleston, MO
Mr. Clyde Hawes, New Madrid County Commission, New Madrid, MO
Mr. Donald R. Dann, Highland Park, IL
Ms. Patsy Tisher, New Madrid, MO
Mr. Michael V. Ganey, Greenway Network, Inc., St. Charles, MO
Ms. Rhonda Monroe, Carbondale, IL
Mr. George C. Grugett, Mississippi Valley Flood Control Association, Collierville, TN
Mr. Ronald C. Gladney, Bartley, Goffstein, Bollato, and Lange, L.L.C., St. Louis, MO
Ms. Kathie Simpkins, East Prairie, MO
Mr. James Bogle, East Prairie, MO
Dr. Jack Grubaugh, The University of Memphis, Memphis, TN
Mr. William D. Levalle, New Madrid, MO
Ms. Linda Frederick, Rolla, MO
Mr. R. D. James, New Madrid, MO
Dr. Mary Byrd Davis, Eastern Old Growth Clearinghouse, Georgetown, KY
Ms. Laraine Wright, Director, Publications Office, Southern Illinois University, Carbondale, IL
Ms. Judy Lincoln, Columbia, MO
Mr. Randy Sutton, Ducks Unlimited, Ten Mile Pond Chapter, East Prairie, MO
Mr. Teddy Bennett, East Prairie, MO
Mr. Ricky Penrod, President, East Prairie Park Board, East Prairie, MO
Mr. James C. Moreton, President, Susanna Wesley Family Learning Center, East Prairie, MO
Ms. Brenda Brewer, Director, Retired Senior Volunteer Program, East Prairie, MO
Director, Mississippi County Health Department, East Prairie, MO
Ms. Silvey Barker, Chairperson, East Prairie Tourism Council, East Prairie, MO

Ms. Patsy Hutcheson, County Director, Missouri Department of Social Services, East Prairie, MO
Mr. Wendell Choate, East Prairie, MO

Responses

Missouri Coalition for the Environment and Environmental Defense

The Missouri Coalition for the Environment and Environmental Defense responded in correspondence dated August 4, 2005 (Attachment 2). The Missouri Coalition for the Environment and Environmental Defense have made an extensive presentation of alleged flaws with the St. Johns Bayou and New Madrid Floodway Project as planned, with the underlying analysis, and the choice of alternatives. This presentation is set forth in pleadings and evidence submitted to the Missouri Clean Water Commission and to the United States District Court for the District of Columbia. This presentation is incorporated by reference. The Missouri Coalition for the Environment and Environmental Defense stated that the Corps has not fundamentally reevaluated project purpose and alternatives.

Eastern Shawnee Tribe of Oklahoma

The Eastern Shawnee Tribe responded in an email dated August 5, 2005 (Attachment 3). The Eastern Shawnee Tribe of Oklahoma is currently unaware of any documentation directly linking Indian Religious Sites to the proposed construction. The Eastern Shawnee Tribe has no objection to the proposed construction. However, if any human skeletal remains and/or objects falling under NAGPRA are uncovered during construction, the construction should stop immediately, and the appropriate persons, including state and tribal NAGPRA representatives contacted.

Sac and Fox Nation of Oklahoma

The Sac and Fox Nation of Oklahoma responded by email dated August 9, 2005 (Attachment 4). The project area is outside the area of historic interest for the Sac and Fox Nation of Oklahoma and therefore they have no comment.

Osage and Quapaw Tribes

The Osage and Quapaw Tribes responded by email dated August 11, 2005 (Attachment 5). It is difficult for the Osage and Quapaw Tribes to comment because of the similarities and differences between this particular project and the operation of the New Madrid Floodway. A briefing on the St. Johns and New Madrid Project was conducted on October 19, 2005.

Interagency Meeting

A coordination meeting with state and Federal agencies occurred on July 15, 2005 between Corps, USFWS, MDC, and MDNR personnel. A Memorandum for Record is included as Attachment 6.

Coordination with the interagency mitigation team was maintained throughout the development of this RSEIS 2 by conducting additional meetings, teleconferences, and other correspondences.

U.S. Fish and Wildlife Service Planning Aid Letter

The U.S. Fish and Wildlife Service furnished a Planning Aid Letter on 11 August 2005 (Attachment 7). Responses to the Service's comments are found in Section 8.4 of this RSEIS 2.

ATTACHMENT 1

Notice of Intent

[Federal Register: July 22, 2005 (Volume 70, Number 140)]
[Notices]
[Page 42312-42313]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr22jy05-35]

[[Page 42312]]

DEPARTMENT OF DEFENSE

Corps of Engineers, Department of the Army

Intent To Prepare a Draft Revised Supplemental Environmental Impact Statement II (DRSEIS II), Flood Control, Mississippi River & Tributaries, St. Johns Bayou and New Madrid Floodway, MO, First Phase

AGENCY: U.S. Army Corps of Engineers, Memphis District.

ACTION: Notice of Intent and National Environmental Policy Act Scoping Document.

SUMMARY: The DRSEIS II will supplement the final Revised Supplemental Environmental Impact Statement (RSEIS) ``Flood Control, Mississippi River & Tributaries, St. Johns Bayou and New Madrid Floodway, MO, First Phase,'' prepared by the U.S. Army Corps of Engineers, Memphis District, filed with the Environmental Protection Agency (EPA) on 19 July 2002. The DRSEIS is being prepared to clarify the record and address concerns that have developed since the signing of the Record of Decision (ROD) on 23 August 2003. These clarifications relate primarily to the calculation of compensatory mitigation requirements for mid-season fish rearing habitat, but may include any other relevant subjects or information such as hypoxia, cost-benefit analysis, Swampbuster provisions, the applicable discount rate, cost-share issues for levee closure, and potentially other issues.

This Notice of Intent also serves as a National Environmental Policy Act Scoping Document.

FOR FURTHER INFORMATION OR COMMENT CONTACT: Mr. Danny Ward, telephone (901) 544-0709, CEMVM-PM-E, 167 N. Main, Room B202, Memphis, TN 38103, e-mail_daniel.d.ward@mvm02.usace.army.mil, or Mr. Kevin Pigott, telephone (901) 544-4309, address as above, e-mail_kevin.r.pigott@mvm02.usace.army.mil.

SUPPLEMENTARY INFORMATION:

1. Proposed Action

The Flood Control Act of 1954 authorized the closure of a 1,500-

foot gap and construction of a gated outlet in the Mississippi River levee at the lower end of the New Madrid Floodway. The Water Resources Development Act of 1986 authorized channel modifications and pumping stations for the St. Johns Bayou Basin and the New Madrid Floodway.

The First Phase of the St. Johns Bayou and New Madrid Floodway Project (Alternative 2, Authorized Project) consists of channel enlargement and improvement in the St. Johns Bayou Basin along the lower 4.5 miles of St. Johns Bayou, beginning at New Madrid, Missouri, then continuing 8.1 miles along the Birds Point New Madrid Setback Levee Ditch and ending with 10.8 miles along the St. James Ditch. The first item of work, consisting of selective clearing and snagging, has already been completed along a 4.3-mile reach of the Setback Levee Ditch beginning at the confluence with St. James Ditch.

The Authorized Project also includes a 1,000 cubic feet per second (cfs) pumping station that would be located a few hundred feet east of the existing gravity outlet at the lower end of St. Johns Bayou. The 1,500-ft gap in the Mississippi River levee at the lower end of the New Madrid Floodway would be closed. A 1,500 cfs pumping station and gravity outlet structure would be built in the levee closure at the lower end of the New Madrid Floodway. The channel enlargement work and both pumping stations are features of the St. Johns Bayou and New Madrid Floodway Project, and the levee closure is a feature of the Mississippi River Levees Project.

A final EIS, entitled Mississippi Rivers and Tributaries, Mississippi River Levees (MRL) and Channel Improvement, was prepared by the U.S. Army Corps of Engineers, Vicksburg District, in February 1976. This document was filed with the Council of Environmental Quality in April 1976. A final EIS, entitled St. Johns Bayou/New Madrid Floodway Project Final Supplemental Environmental Impact Statement, was filed in 1982. A Draft Supplemental Environmental Impact Statement (DSEIS) was prepared to supplement both of these previous documents. The DSEIS was submitted for public review and comment in April 1999. The Final Supplemental Environmental Impact Statement (FSEIS) was filed in September 2000.

The RSEIS documented the formulation and evaluation of additional alternatives to address concerns expressed by various resource agencies and environmental advocacy groups that environmental impacts were not acceptable. The RSEIS included alternative levee closure locations for the New Madrid Floodway; an array of pump and gate operation alternatives that increase connectivity of the floodway with the Mississippi River to minimize impacts on fish habitat; significant avoid and minimize measures to benefit fish and wildlife resources; and mitigation measures that compensate for impacts to wildlife habitat (bottomland hardwoods and agricultural areas), shorebird habitat, waterfowl habitat during February `` March, and mid-season (1 April to 15 May) fish rearing habitat. The final RSEIS was filed with EPA in July 2002.

The RSEIS expressed the Corps' analysis of unavoidable impacts to mid-season fish rearing habitat as Habitat Units (HU). The RSEIS used those HU lost to calculate the required acres of compensatory mitigation. The method set out in the RSEIS was reforestation of agricultural areas. Therefore, the RSEIS stated that reforestation of 8,375 acres of agricultural areas (1,317 acres in the St. Johns Bayou Basin and 7,058 in the New Madrid Floodway) would mitigate for the unavoidable impacts to 4,213 mid-season fish rearing HU (1,884 HU in

the St. Johns Basin and 2,329 HU in the New Madrid Floodway).

An inconsistency over required mitigation existed in the previous Record of Decision, State of Missouri 401-Water Quality Certification, and the Administrative Record. Therefore, the purpose of this DRSEIS II is to clarify the mitigation required in terms of HU and Average Daily Flooded Acres (ADFA). Additional mitigation features would also be investigated to ensure that the ADFA compensatory mitigation requirement, or its equivalent, is met and all habitat impacts for each respective resource (e.g., wildlife, shorebird, waterfowl, and mid-season fish rearing) are adequately compensated.

Other matters for the DRSEIS II may include, but are not limited to, a review of: hypoxia, the cost-benefit analysis, Swampbuster provisions, the 2.5% discount rate, cost-share issues for levee closure, and other relevant subjects or information.

2. Reasonable Alternatives

The recommended flood damage reduction features as outlined in the RSEIS would not be addressed in this DRSEIS. Therefore, no additional flood damage reduction alternatives would be analyzed in the St. Johns Bayou Basin or the New Madrid Floodway. In addition to clarifying the inconsistency concerning the required amount of mitigation, the DRSEIS II would also address additional mitigation features to compensate for the unavoidable impacts to fish and wildlife resources.

Reforestation of frequently flooded agricultural land remains one means of providing the required 8375 ADFA of compensatory mitigation. If reforestation of agricultural lands were the only compensatory mitigation method employed, then the actual acres

[[Page 42313]]

required would be no less than 8375 acres (assuming each acre is an ADFA), and could conceivably be more in order to assure that the ADFA equivalent habitat requirement is also met.

In addition to reforestation of agricultural areas, other compensatory mitigation measures would also be formulated. These measures include but are not limited to calculating expected benefits to mid-season fish rearing habitat from the creation of shorebird areas (moist soil units) and the Big Oak Tree State Park water supply feature, creation and/or enhancement of permanent waterbody features, and creation and/or enhancement of backwater flooding events. Measures that provide the highest duration of flooding during the mid-season fish rearing period (1 April to 15 May) offer the highest potential benefits.

Other matters such as hypoxia, the cost-benefit analysis, Swampbuster provisions, the 2.5% discount rate, cost-share issues for levee closure, and other relevant subjects or information, may also be explored in the DRSEIS II.

3. The Corps Scoping Process

Coordination with appropriate resource and regulatory agencies would be maintained throughout the formulation of this DRSEIS II. Comments and concerns that have been expressed since the signing of the ROD will be used to identify significant issues. This Notice of Intent

also serves as a scoping document. The purpose of this notice is to advise all interested parties of the intent to supplement the RSEIS and to solicit comments and information concerning compensatory mitigation, hypoxia, the cost-benefit analysis, Swampbuster provisions, the 2.5% discount rate, cost-share issues for levee closure, and other relevant subjects or information. Comments would be used to determine opportunities to develop additional compensatory mitigation strategies and other strategies that relate to, but are not limited to, hypoxia, the cost-benefit analysis, Swampbuster provisions, the 2.5% discount rate, cost-share issues for levee closure, and any other relevant subject or information, and to evaluate the probable impact (including cumulative impacts) of compensatory mitigation, as well as the probable impacts of such issues that may include, but are not limited to, hypoxia, the cost-benefit analysis, Swampbuster provisions, the 2.5% discount rate, cost-share issues for levee closure, and any other relevant subjects or information. This notice is being circulated to Federal, State, and local environmental resource and regulatory agencies; Indian Tribes; non-governmental organizations, and the general public.

Comments to this Notice of Intent are requested by 5 August 2005 at the above address. It is anticipated that the DRSEIS II will be available for public review in August 2005.

Vincent D. Navarre,
Major, Corps of Engineers, Deputy District Engineer, Memphis District.
[FR Doc. 05-14165 Filed 7-21-05; 8:45 am]

BILLING CODE 3710-KS-P

ATTACHMENT 2

Missouri Coalition for the Environment and Environmental Defense

MISSOURI COALITION FOR THE ENVIRONMENT

4267 Delmar Blvd. 2-E • St. Louis MO 63108 • 314-727-3400 Fax: 314-727-1653 • mcenviron@mcenviron.org • www.mcenviron.org

August 4, 2005

VIA EMAIL

Danny Ward
CEMVM-PME
167 N. Main, Room B202
Memphis, TN 38103

Re: Scoping Notice for St. Johns/New Madrid Bayou Project

Dear Mr. Ward:

The Missouri Coalition for the Environment and Environmental Defense offer these comments in response to the Corps' recent scoping notice on the above referenced project. Over the past several years, we have made an extensive presentation of flaws with the above project as planned, with the underlying analysis, and the choice of alternatives. This presentation is set forth in pleadings and evidence submitted to the Missouri Clean Water Commission and to the United States District Court for the District of Columbia, which we hereby incorporate by reference.

The Corps has indicated in its latest scoping notice that it does not intend to reevaluate its choice of project purpose nor its selection of alternatives. Environmental Defense and the Missouri Coalition for the Environment have presented in our previous papers serious flaws with the Corps' selection of alternatives and definition of project purposes. The mathematical error that led the Corps to seriously underestimate mitigation requirements and costs exacerbates the significance of these errors and strengthens the case for focusing on alternatives that truly address the needs of people rather than agricultural drainage. The Corps is therefore in error in not fundamentally reevaluating project purposes and alternatives.

Thank you for considering these comments.

Very truly yours,

Edward J. Heisel
Executive Director

Effective Citizen Action Since 1969

ATTACHMENT 3

Eastern Shawnee Tribe of Oklahoma

From: Eastern Shawnee Tribe Chief Enyart
Sent: Friday, August 05, 2005 3:26 PM
To: Ward, Daniel D MVM
Subject: REVISED SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (RSEIS 2)

August 5, 2005

RE: REVISED SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT NUMBER 2 (RSEIS 2) ON THE ST. JOHNS BAYOU/NEW MADRID FLOODWAY PROJECT LOCATED IN SOUTHEASTERN MO

To Whom It May Concern:

Thank you for notice of the referenced project(s). The Eastern Shawnee Tribe of Oklahoma is currently unaware of any documentation directly linking Indian Religious Sites to the proposed construction. In the event any items falling under the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered during construction, the Eastern Shawnee Tribe request notification and further consultation.

The Eastern Shawnee Tribe has no objection to the proposed construction. However, if any human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, the construction should stop immediately, and the appropriate persons, including state and tribal NAGPRA representatives contacted.

Sincerely,
Jo Ann Beckham, Administrative Assistant
Eastern Shawnee Tribe of Oklahoma

ATTACHMENT 4

Sac and Fox Nation of Oklahoma

From: Sandra
Sent: Tuesday, August 09, 2005 3:34 PM
To: Ward, Daniel D MVM
Subject: Project in SE MO

Dear Mr. Ward,

My apologies for not responding sooner. I realize this answer arrives after the deadline date of August 5, 2005.

The project area is outside the area of historic interest for the Sac and Fox Nation of Oklahoma and therefore we have no comment on this project.

Thank you!

Sincerely,

Sandra Kaye Massey
NAGPRA Representative
Sac and Fox Nation of Oklahoma

ATTACHMENT 5

Osage and Quapaw Tribes

-----Original Message-----
From: Carrie V. Wilson
Sent: Thursday, August 11, 2005 4:40 PM
To: Roemer, Erwin J MVM
Subject: St. John's

Re: reply to NEPA Notice of Intent
Please forward this to the appropriate parties.
Without having a good understanding of the St. John's project, and its similarities and differences to the to the Bird's Point-St. John's project it is really hard for me to comment. It would be most appreciated if the MVM would make a presentation / briefing with regards to the overall project in the near future. If you have any questions or need to call please feel free to do so.
--
Carrie V Wilson
Osage and Quapaw Cultural Resources
223 E. Lafayette St.
Fayetteville, AR 72701
phone: 479-442-7576
fax: 479-575-5453

ATTACHMENT 6

Memorandum For Record

To: **MEMORANDUM FOR RECORD**
From: Kevin Pigott, USACE-MVM-PM-E
Date: 17 July 2005, revised after receiving input from participating agencies 08 August 2005

1. On 15 July 2005, Danny Ward and Kevin Pigott of the Memphis District met with personnel from MDNR (Gail Wilson, Ken McCarty, Aimee Davenport), MDC (Rob Vinson, Dawn Henderson, Janet Sternburg), and USFWS (Jane Ledwin, Charlie Scott) in Jefferson City, Missouri.
2. The meeting was held to primarily discuss additional fishery mitigation measures and monitoring issues for the NEPA document being prepared to clarify mitigation for St. Johns/New Madrid Floodway Project.
3. The Water Quality (WQ) Certification (23 June 2003) required the Corps to provide 8,375 Average Daily Flooded Acres (ADFAs) of mitigation if the sole technique employed was reforestation of frequently flooded cropland with bottomland hardwoods. The 2002 RSEIS calculated that within the St. Johns Bayou Basin and closure of the New Madrid Floodway would impact 1,884 and 2,329 HUs of mid-season fish rearing habitat, respectively. Impacts and mitigation are enumerated as HUs, and the difference between pre-and post project HUs are defined as the impacts of the project. Therefore, mitigation must compensate for lost HUs, and the amount of mitigation acreage to fully compensate impacts depends on the techniques used and their associated habitat value (*i.e.*, HSI value) in the mitigation plan. HUs, not ADFAs, are the "currency" used to determine mitigation requirements. Impacted HUs that were calculated in the 2002 RSEIS were the product of HSI times ADFAs. Therefore, mitigation credit (HUs gained) must also be expressed in the same terms (HSI times ADFAs):

   Habitat Gains = HU tract with mitigation features – HU tract without mitigation features

   Where HU is calculated by,

   HU = HSI x ADFA

   ADFA = acres x % average duration of post project flooding during 1 Apr to 15 May.

   Due to the potential difficulty in acquiring acreage flooded from April 1 to May 15 on average every year (an ADFA), additional mitigation techniques are required to provide the full number of fishery habitat units. These techniques were briefly discussed in the 2002 RSEIS in various locations and included creating or improving permanent waterbodies. Concerns have been expressed and legal challenges were filed over the amount of mitigation acreage required in terms of ADFA. An inconsistency over required mitigation in the ROD, State of Missouri WQ Certification, and the Administrative Record was recognized.

4. Major issues brought forth in the meeting by participants were related to fish passage, fish access, and monitoring issues.
    a. The 70% Red Oak survival issue was brought up by the Corps. It was agreed by all participants that Red Oaks would probably not survive in mitigation areas that will be flooded for fishes and that more suitable tree species would be used. The use of different species and how this would affect the overall mitigation numbers would need to be addressed in the NEPA document.
    b. There was some concern by USFWS and MDC that the Big Oak Tree Water Management Plan would not allow Mississippi River fish access. The Corps will provide fish access from the Mississippi River via ditches and culverts as requested by MDC in previous interagency meetings.
    c. There is no direct evidence that Lower Mississippi River fishes can or cannot pass through culverts as designed in the New Madrid Floodway. Therefore, the USFWS has taken the position that mitigation measures undertaken within the New Madrid Floodway would not offer any mid-season fish rearing habitat. However, the fact that no studies have been performed on culverts of this size is significant. On the St. Johns Bayou side, it appears Mississippi River species do readily pass through culverts.
    d. An independent fish research project to monitor fish usage of the floodway and Mississippi River was suggested by FWS and MDC with a workshop of different agencies (USACE, USFWS, and MDC) to develop this monitoring plan. Additional monitoring of reference sites should utilize the use of reference sites, *e.g.,* Bogle Woods, Big Oak Tree State Park, WRP sites, and/or other sites across the river in Kentucky could provide a representative biological community for comparison. Monitoring will be addressed in the Coordination Act Report.
    e. It was pointed out that fishery mitigation credits cannot be finalized without monitoring on a tract by tract basis. A proposal was suggested by USFWS and MDC to get feedback from the working group with the various agencies input to develop this monitoring plan. Corps personnel stated monitoring of tracts would be addressed in future specific detailed mitigation plans.
5. A question was raised about verifying mitigation commitments for the life of the project. How the Corps plans to address long term monitoring needs to be addressed in the NEPA document being prepared.
6. MDNR asked the Corps about its progress in acquiring lands around Big Oak Tree State Park. MDNR re-emphasized the importance of obtaining 1,800 acres early on in the mitigation process before land prices continued to escalate.
7. The group discussed the 8,375 acres ADFA mentioned in the Section 401 Water Quality Certification. MDNR explained that the 8,375 ADFA in the 401 Certification applies to impacted wetlands. MDNR further explained that fisheries mitigation could be credited towards the 8,375 figure if wetland functions were also achieved by the particular project.

a. The Corps explained that impacts to mid-season fish rearing drove the mitigation requirements. The Corps stated that the 8,375 figure was based solely on impacts to the fishery resource. The Corps stated the direct construction impact to wetlands was about 100 acres. The Corps stated that the mitigation plan for fisheries impacts would also more than compensate for the impact to *potential* indirect wetland loss. In addition, the WQ Certification conditions still required the Corps to monitor and mitigate for those potential.
b. There needs to be a break down of mitigation requirements-wetlands, fisheries, etc. in the NEPA document and a discussion of how the Corps plans to address these mitigation requirements.

8. The additional fishery mitigation ideas were of two main categories: outside the levee and inside the levee system. No one at the table had major concerns with the St. Johns mitigation, the focus of the discussions was on the New Madrid mitigation measures.
    a. Outside the Floodway (levee)
        i. Donaldson Point/Batture Land. The USFWS stated that batture land do not provide additional fishery benefits.
        ii. Riley Lake. USFWS had concerns over fish passage in and out of the lake due to the construction of the weir.
        iii. Seven Island Restoration. This option has already been pursued by the Corps and it is not economically feasible. However, possible open water disposal of dredge spoil needs to be addressed with MDNR (for possible Section 401 requirements) and MDC (manager of the land) or possible using dredge spoil for a levee between the lake and the Mississippi River will be analyzed by the Corps.
        iv. In-River Measures. Notching Dikes, creating Round Points, or creating Chevrons in the Mississippi River as a tradeoff was discussed. The USFWS acknowledged that these measures were beneficial and encouraged the Corps to continue constructing them, but these measures could not be used as mitigation for this project.
        v. Black Island WRP. A suggestion was made by MDC, which would need further internal MDC review due to distance from project area, was to enhance areas adjacent to Black Island WRP (~2,100 acres) near Caruthersville, MO (or possibly other WRP sites). Some of these sites have low elevations that could flood from the Mississippi River if the connection is restored. However, if there is a deed restriction placed on the land, this is not an option (especially true if on MDC land). Additionally, further discussion would be required by the interagency team to discuss the suitability of mitigation outside the immediate project area.
        vi. LMRCC list. The Corps will also look at LMRCC areas. The Corps will look at options both within the state and outside the

State of Missouri. However, before going forward with these options, the group thought additional discussion would be necessary.

b. Inside the Floodway (levee)
    i. Existing or potential mitigation tracts should be assessed for connection for Mississippi River fishes.
    ii. The USFWS maintains there is no proof of fish passage through structures in the levee system; therefore the USFWS believes there is no connection to the Mississippi River.
    iii. If land is purchased adjacent to existing managed lands, *i.e.* state lands, then the Service maintains fishery mitigation credit cannot be counted for those lands. For example, according to the Service, mitigation credits cannot be calculated for BOTSP under its new water management plan because it is already being managed. The Corps pointed out the water management plan will re-connect the park with the Mississippi River and create a potential for a fishery.
    iv. There was a suggestion by the Service and MDC to re-evaluate other levee closure locations further up the floodway or move the frontline levee back. This was suggested to possibly reduce fishery impacts and thus fishery mitigation the Corps must acquire.
    v. MDC suggested a gate manipulation option 3.1.c as noted in the 2002 RSEIS, which would leave the gate open to 288 feet every third year. This gate operation would possibly reduce fishery impacts and therefore the fishery mitigation acreage that the Corps must acquire.
    vi. Modify interior ditches (deepen holes making them more like permanent waterbodies). This proposal was decided against primarily because it would not count towards fishery mitigation.
    vii. A suggestion by MDNR was made to improve historic lakebeds. The Corps said this would be examined.
    viii. MDNR stated that creation and or enhancement of permanent waterbodies can not compensate for wetland impacts form project construction.

9. Kevin Pigott will type a Memo for Record and pass to meeting participants for comments. This MFR will be added to the NEPA document being created.
10. Draft sections of the NEPA document will be forwarded to the Agencies by the end of July for their input.

ATTACHMENT 7

U.S. Fish and Wildlife Service Planning Aid Letter

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Columbia Ecological Services Field Office
101 Park DeVille Drive, Suite A
Columbia, Missouri 65203-0057
Phone: (573) 234-2132 Fax: (573) 234-2181

August 11, 2005

Mr. David Reece Chief
Environmental Analysis Branch
U.S. Army Corps of Engineers
167 N. Main Street
B202 Clifford Davis Building
Memphis, Tennessee 38103-1894

Dear Mr. Reece:

The U.S. Fish and Wildlife Service (Service) is providing this preliminary Planning Aid letter (PAL) for your use in preparing the Draft Revised Supplemental Environmental Impact Statement II by the U.S Army Corps of Engineers (Corps) for the St. Johns Bayou and New Madrid Floodway Project, Mississippi and New Madrid Counties, Missouri. Information used by the Service in preparing these comments includes: 1) your July 22, 2005, Federal Register Notice of Intent; 2) information exchanges during a July 15, 2005, interagency meeting; 3) a July 17, 2005, draft Memorandum for the Record of that meeting; 4) the Corps' summary of the three options for project implementation and mitigation; 5) our June 3, 2005, comments on the Corps draft Mitigation Plans; and 6) previous documents related to this project. The Service submits this PAL pursuant to its authorities and responsibilities under the Fish and Wildlife Coordination Act (FWCA)(16 U.S.C. 661 et seq.) and the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321-4347).

At the July 15 interagency meeting, the Corps explained that the purpose of the current re-evaluation is three-fold: 1) to clarify inconsistencies relating to fish mitigation and model results presented in the 2002 Revised Supplemental Environmental Impact Statement (RSEIS) and to explore additional fisheries mitigation measures; 2) to address hypoxia concerns related to the project; and 3) to re-evaluate the benefit/cost implications of any necessary modifications to the proposed compensatory mitigation plan. At that interagency meeting, the Corps summarized its revised approach to mitigation needs based on a more accurate interpretation of the Habitat Evaluation Procedures (HEP) model results used in project impact assessment and mitigation planning. Those models measure habitat by factoring in both the quantity of flooded land and quality (reflected by the basic cover type) for a particular species or group of species and are detailed in the

2002 RSEIS. Although habitat function is traditionally quantified as annual average habitat units in keeping with the Corps' project accounting system, the assessment methodology for this project measured habitat value based on Average Daily Flooded Acres (ADFA). Therefore, to derive mitigation habitat value, potential mitigation sites must be analyzed using the same methodology to ensure they will produce the needed average daily flooded acres (i.e., fisheries mitigation would need 8,375 ADFA).

The Corps is proposing two approaches to provide the necessary ADFA to mitigate for impacts to fisheries resources, which represents the largest loss from the project. Reforestation of frequently flooded lands is the primary mitigation strategy recommended by the resource agencies as detailed in the 2002 SEIS. The first approach would increase the number of acres reforested to fully offset fish habitat losses. The Corps' re-evaluation of the hydrologic requirements for fish mitigation, consistent with fish HEP model assumptions, indicates that up to three times more reforested acres (i.e., 24, 000) than the 8,375 acres noted in the RSEIS could be needed to adequately offset habitat losses. That figure is based on the Corps' estimate of an average 30% inundation frequency on potential mitigation sites in the Floodway once the project is built. The second approach is to increase the duration of flooding on potential mitigation sites through water manipulation or other construction methods. (i.e., borrow pits and other constructed permanent waterbodies) to provide the additional ADFA.

The Corps summarized several specific mitigation proposals at our July 15 meeting and in a July 29, 2005, email. The Corps' July 17, 2005, Memorandum for the Record summarized the Service's position on those proposals. The following comments provide further clarification of several points that should be considered in the re-evaluation of this project.

The Corps grouped potential mitigation measures into two categories: inside and outside the project area (i.e., St. Johns and New Madrid Basins). Inside the project area, the Corps proposes to use redesigned borrow pits to provide increased habitat value for fish, and thereby reduce the acreage that would need to be reforested to offset fisheries habitat losses. Throughout the previous planning and NEPA processes, resource agencies and the Corps agreed that borrow pits would be appropriate only to mitigate for losses of permanent water bodies. Even then, borrow pits can only provide comparable floodplain habitats if they permit *full fish access* (including Mississippi River fishes) and have slack water conditions.

Another fish mitigation measure being considered by the Corps uses the shorebird mitigation areas to provide fisheries habitat. Such a proposal has two important considerations. First, use of shorebird habitat to replace reforestation for fish would not contribute to the significant forested wetland mitigation needs considered during mitigation planning and as detailed in the Service's previous Fish and Wildlife Coordination Act reports. Second, many of the shorebird areas would be actively managed for shallow water and wetted edge, minimizing suitable open water habitat available for fish reproduction and rearing. Active water management through water

control structures, dikes, culverts and other artificial means (i.e., pumps) greatly reduces opportunities for successful fish ingress and egress.

The fish HEP model used for the EIS focuses entirely on the value of an area to support fish reproduction and does not measure fish access. Selected species used in project impact analysis of the New Madrid Floodway include both Mississippi River and floodplain fish. The unique value of the New Madrid Floodway as an open access backwater habitat is universally recognized. Therefore, using the fish HEP model to estimate habitat value is valid *only if* mitigation sites provide comparable access for Mississippi River fish, as well as resident floodway fish. Closure of the floodway during the spawning and rearing season will significantly reduce, and potentially eliminate, this seasonal access. As proposed, the culverts will be closed when fish normally move into the Floodway, thus blocking access to the Floodway when habitat should be available and is most needed by fish. In addition, the ability of Mississippi River fish to access the Floodway and specific mitigation sites therein through open culverts is unknown. Eliminating or reducing the movement of many species of fish through structures is well documented in fisheries literature (Warren and Pardue 1998, Coffman 2005, Behlke et al. 1991 (as cited in Coffman 2005)), and is a predictable outcome of water control projects. Mitigation sites landward of other levees would have comparable problems with meaningful fish access.

Providing accessible habitat for Mississippi River fishes at Big Oak Tree State Park (BOTSP) presents a greater biological and engineering challenge. To access the Park, fish will have to traverse a mile or more of pipe; in addition, it is unknown how fish will return to the Mississippi River as floodwaters recede. The objectives for BOTSP mitigation focus on greater ability to manipulate water within the Park to restore and enhance the native plant communities. The measures proposed to restore ecological functions to BOTSP do not compensate for fishery losses.

As stated in the Corps' list of potential additional fish mitigation options, adequate fish passage is a requirement for sites to qualify for fish mitigation. Therefore, a technically sound fish passage evaluation must be completed for each alternative mitigation measure and site. We recommend that the Corps, Service, and Missouri Department of Conservation collectively identify a panel of fish passage experts to conduct these reviews during continued project planning. Furthermore, the draft RSEIS II should fully discuss the critical issue of fish passage and access, including how the Corps will rectify the current lack of information on this topic for previous and future proposed fish mitigation measures. The Service will provide additional input addressing mitigation monitoring needs pending the results of those analyses.

The Corps is exploring a number of potential enhancement projects outside the Floodway as compensatory mitigation. Because this area has been highly modified through previous flood control, navigation, and agricultural projects, opportunities exist to improve fisheries habitat along the river and batture lands. However, the measures proposed by the Corps would not offset project-related fisheries losses in the floodplain. Main stem riverine habitats are inherently different than floodplain habitats and both

serve critical, yet complementary, roles in supporting fish and wildlife resources in the project area. On the floodplain, these conditions include low velocity water that warms relatively early in the spring because it is shallower and off the main channel. In addition, the floodplain provides a variety of macro and microhabitats that include diverse depths, temperatures, substrates, vegetation, forage, and refuge, interspersed with a stream/ditch network that fish can use to access the floodplain and can recede into as floodwaters recede. At the same time, the potential riverine mitigation areas proposed by the Corps currently provide significant fisheries habitat value without further enhancement. Proposed enhancement features appear to be a conversion of existing, valuable habitat to an alternative habitat, rather than a net increase in habitat value.

All alternative fish mitigation measures must be fully evaluated at the planning stage through an independent scientific peer review to ensure that many of the underlying presumptions, suppositions, and hypotheses driving mitigation for this project are indeed valid. A key component of this peer review must be validation of the assumptions pertaining to fish use and access to each area proposed for compensatory mitigation credit. In consideration of the quality and quantity of fish habitat lost, especially the magnitude of these impacts on the regional and national significance of the Mississippi River fishery, such an independent peer review is justified. That review would further the success of the Corps in meeting its resource responsibilities and may help direct future mitigation efforts, particularly for multiple species and habitats.

At our July 15 meeting and in accompanying informational materials, you provided us with conceptual alternative measures to mitigate for the fisheries impacts resulting from this project. In this PAL we have tried to provide to you our technical recommendations on this alternative mitigation.

If you have any questions regarding our comments, or if I can be of further assistance please contact me at the number above.

Sincerely,

Rick L. Hansen, Acting

for Charles M. Scott
Field Supervisor

cc: MDC, Jefferson City, MO (Sternburg)
MDNR, Jefferson City, MO (Butin)

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APPENDIX C

Quantification of Mid-season Fish Rearing Habitat

And

Mitigation Calculations

Quantification of Mid-Season Fish Rearing Habitat

Benefits to mid-season fish rearing habitat from mitigation measures would be calculated by the following equation:

Habitat Gains = AAHUs per tract with mitigation – AAHUs per tract without mitigation

Where AAHUs are calculated by (50-year project life),

AAHUs = Cumulative HUs/50 years

and Cumulative HUs are calculated by,

$$\text{Cumulative HUs} = \sum_{n=1}^{3} \left[(T_{n+1} - T_n) * (\text{ADFA}) * \left[\frac{HSI_{n+1} + HSI_n}{2} \right] \right]$$

For n from 1 (existing conditions at initial time) to 3 (condition at end of project life)

where

T_n = first target year of time interval
T_{n+1} = last target year of time interval
ADFA = acres * % average duration of post project flooding from April 1 to May 15.
HSI_n = HSI at beginning of time interval (Table 1)
HSI_{n+1} = HSI at end of time interval (Table 1)

Table 1
Mid-Season Rearing HSI Values for Respective Habitat Types

Species	Agriculture		Fallow		BLH		Large Water		Small Water	
	SJ	NM	SJ	NM	SJ	NM	SJ	NM	SJ	NM
Smallmouth Buffalo	0.17	0.17	0.10	0.10	0.10	0.10	1.00	1.00	0.50	0.50
Pirate Perch	0.00	N/A	0.25	N/A	1.00	N/A	1.00	N/A	1.00	N/A
White Crappie	0.10	0.10	0.10	0.10	0.10	0.10	1.00	1.00	0.50	0.50
Largemouth Bass	0.15	N/A	0.25	N/A	0.25	N/A	1.00	N/A	1.00	N/A
Freshwater Drum	0.10	0.10	0.20	0.20	0.50	0.50	0.20	0.20	0.20	0.20
Cumulative HIS	**0.52**	**0.37**	**0.90**	**0.40**	**1.95**	**0.7**	**4.20**	**2.20**	**3.20**	**1.20**

Agriculture Habitat to Bottomland Hardwoods Habitat

The following assumptions were made to account for the transition period from agricultural habitat to bottomland hardwood habitat:

- The life of the project is 50 years.
- It would take one year for agricultural habitat to transition to fallow habitat following BLH planting.
- It would take 9 years for fallow habitat to transition to BLH habitat for fast growing BLH species (cottonwood, black willow).
- It would take 19 years for fallow habitat to transition to BLH habitat for slower growing BLH species (red oaks, cypress).

General Calculations (Assume 100% duration of flooding from April 1 to May 15)

St. Johns Bayou Basin

10-Year Transition Period

Without Reforestation: (0.52)*(50) = 26.00 HUs
With Reforestation Transition Period:
Transition from Ag to Fallow: ((0.52+0.90)/2)*1 yr = 0.71 HUs
Transition from Fallow to BLH: ((0.90+1.95)/2)*9 yrs = 12.83 HUs
BLH for remainder of Project Life: 1.95*40 yrs = 78.00 HUs
Cumulative HUs with Reforestation: 0.71+12.83+78.00 = 91.54 HUs
Net Cumulative Habitat Unit Value: 91.54 (with) - 26.00 (without) = 65.54 HUs
Annualized:
AAHUs: 65.54 HUs/50 years = 1.31 AAHUs per acre

20-Year Transition Period

Without Reforestation: (0.52)*(50) = 26.00 HUs
With Reforestation Transition Period:
Transition from Ag to Fallow: ((0.52+0.90)/2)*1 yr = 0.71 HUs
Transition from Fallow to BLH: ((0.90+1.95)/2)*19 yrs = 27.08 HUs
BLH for remainder of Project Life: 1.95*30 yrs = 58.50 HUs
Cumulative HUs with Reforestation: 0.71+27.08+58.50 = 86.29 HUs
Net Cumulative Habitat Unit Value: 86.29(with)-26.00(without) = 60.29 HUs
Annualized:
AAHUs: 60.29 HUs/50 years = 1.21 AAHUs per acre

New Madrid Floodway

10-Year Transition

Without Reforestation: (0.37)*(50 yrs) = 18.50 HUs
With Reforestation Transition Period:
Transition from Ag to Fallow: ((0.37+0.40)/2)*1 yr = 0.39 HUs
Transition from Fallow to BLH: (0.40+0.70)/2*9 yrs = 4.95 HUs
BLH for remainder of Project Life: 0.70*40 yrs = 28.00 HUs
Cumulative HUs with Reforestation: 0.39+4.95+28.00 = 33.34 HUs
Net Cumulative Habitat Unit Value: 33.34 (with)-18.50 (without) = 14.84 HUs
Annualized:
AAHUs: 14.84 HUs/50 years = 0.30 AAHUs per acre

20-Year Transition

Without Reforestation: (0.37)*(50 yrs) = 18.50 HUs
With Reforestation Transition Period:
Transition from Ag to Fallow: ((0.37+0.40)/2)*1 yr = 0.39 HUs
Transition from Fallow to BLH: (0.40+0.70)/2*19 yrs = 10.45 HUs
BLH for remainder of Project Life: 0.7*30 yrs = 21.00 HUs
Cumulative HUs with Reforestation: 0.39+10.45+21.00 = 31.84 HUs
Net Cumulative Habitat Unit Value: 31.84 (with)-18.50 (without) = 13.34 HUs
Annualized:
AAHUs: 13.34 HUs/50 years = 0.27 AAHUs per acre

Specific Calculations

Calculation 1: Reforesting 100 acres of cropland, Section 2.6.2.2

Ten Mile Pond Area

The duration of flooding between April 1 and May 15 in the Ten Mile Pond Area is approximately 5%.

Without Mitigation:
Cumulative: (50yrs)*(100 acres*0.05)*[(0.37+0.37)/2] = 92.50 HUs
Annualized: 92.50 HUs/50 years = 1.85 AAHUs

With Mitigation: (20-year transition period)
crop to fallow: (1 year)*(100 acres*0.05)*[(0.37+0.40)/2] = 1.93 HUs
fallow to forest: (19 years)*(100 acres*0.05)*[(0.40+0.70)/2] = 52.25 HUs
forested: (30 years)*(100 acres*0.05)*[(0.70+0.70)/2] = 105.00 HUs
Cumulative: 1.93 + 52.25 + 105.00 = 159.18 HUs
Annualized: 159.18 HUs/50 years = 3.18 AAHUs

Mitigation Credit: AAHUs With Mitigation – AAHUs Without Mitigation
= 3.18 AAHUs – 1.85 AAHUs= 1.33 AAHUs

Eagles Nest Area

The duration of flooding between April 1 and May 15 in the Eagles Nest Area is approximately 37%.

Without Mitigation:
Cumulative: (50 years)*(100 acres*0.37)*[(0.37+0.37)/2] = 684.50 HUs
Annualized: 684.50 HUs/50 years = 13.69 AAHUs

With Mitigation: (20-year transition period)
crop to fallow: (1 year)*(100 acres*0.37)*[(0.37+0.40)/2] = 14.25 HUs
fallow to forest: (19 years)*(100 acres*0.37)*[(0.40+0.70)/2] = 386.65 HUs
forested: (30 years)*(100 acres*0.37)*[(0.70+0.70)/2] = 777.00 HUs
Cumulative: 14.25 + 386.65 + 777.00 = 1,177.90 HUs
Annualized: 1,177.90 HUs/50 years = 23.56 AAHUs

Mitigation Credit: AAHUs with mitigation – AAHUs without mitigation
= 23.56 AAHUs – 13.69 AAHUs = 9.87 AAHUs

Calculation 2: Reforesting 100 acres of cropland and increasing flood duration, Section 2.6.2.2

Reforest 100 acres of cropland in the New Madrid Floodway and increase duration of flooding from 5% to 31% through mitigation.

Without Mitigation:
Cumulative: (50 years)*(100 acres*0.05)*[(0.37+0.37)/2] = 92.50 HUs
Annualized: 92.50 HUs/50 years = 1.85 AAHUs

With Mitigation: (20-year transition period)
Crop to fallow: (1 year)*(100 acres*0.31)*[(0.37+0.40)/2] = 11.94 HUs
Fallow to forest: (19 years)*(100 acres*0.31)*[(0.40+0.70)/2] = 323.95 HUs
Forested: (30 years)*(100 acres*0.31)*[(0.70+0.70)/2] = 651.00 HUs
Cumulative: 11.94 + 323.95 + 651.00 = 986.89 HUs
Annualized: 986.89 HUs/50 years = 19.74 AAHUs

Mitigation Credit: AAHUs with mitigation – AAHUs without mitigation
= 19.74 AAHUs – 1.85 AAHUs = 17.89 AAHUs

Calculation 3: Fish benefits of modified moist soil units, Section 5.4.2.2

St. Johns Basin

Convert 105 acres of cropland to flooded fallow habitat and increase duration of flooding from 27% to 95%.

The duration of flooding between April 1 and May 15 in lower portion of St. Johns Bayou is approximately 27%.

Without Mitigation:
Cumulative: (50 years)*(105 acres*0.27)*[(0.52+0.52)/2] = 737.10 HUs
Annualized: 737.10 HUs/50 years = 14.74 AAHUs

With Mitigation: (fallow transition period of 1 year)
crop to fallow: (1 years)*(105 acres*0.95)*[(0.52+0.90)/2] = 70.82 HUs
fallow: (49 years)*(105 acres*0.95)*[(0.90+0.90)/2] = 4,398.98 HUs
Cumulative: 70.82+4,398.98 = 4,469.80 HUs
Annualized: 4,469.80 HUs/50 years = 89.40 AAHUs

Mitigation Credit: AAHUs with mitigation – AAHUs without mitigation
= 89.40 AAHUs – 14.74 AAHUs = 74.66 AAHUs

New Madrid Floodway

Convert 660 acres of cropland to fallow habitat and increase duration of flooding from 5% to 95%.

The duration of flooding between April 1 and May 15 in the Ten Mile Pond Area is approximately 5%.

Without Mitigation:
Cumulative: (50 years)*(660 acres*0.05)*[(0.37 + 0.37)/2] = 610.50 HUs
Annualized: 610.50 HUs/50 years = 12.21 AAHUs

With Mitigation: (fallow transition period of 1 year)
crop to fallow: (1 years)*(660 acres*0.95)*[(0.37 + 0.40)/2] = 241.40 HUs
fallow: (49 years)*(660 acres*0.95)*[(0.40 + 0.40)/2] = 12,289.20 HUs
Cumulative: 241.40 + 12,289.20 = 12,530.60 HUs
Annualized: 12,530.60 HUs/50 years = 250.61 AAHUs

Mitigation Credit: AAHUs with mitigation – AAHUs without mitigation
= 250.61 AAHUs – 12.21 AAHUs = 238.40 AAHUs

Calculation 4: Convert 671 acres of cropland to vegetated buffer strips, New Madrid Floodway, Section 5.4.2.3

Duration of flooding is approximately 5%.

Without Mitigation:
Cumulative: (50 years)*(671 acres*0.05)*[(0.37+0.37)/2] = 620.68 HUs
Annualized: 620.68 HUs/50 years = 12.41 AAHUs

With Mitigation: (20-year transition period)
crop to fallow: (1 year)*(671 acres*0.05)*[(0.37+0.40)/2] = 12.92 HUs
fallow to forest: (19 years)*(671 acres*0.05)*[(0.40+0.70)/2] = 350.60 HUs
forested: (30 years)*(671 acres*0.05)*[(0.70+0.70)/2] = 704.55 HUs
Cumulative: 12.92 + 350.60 + 704.55 = 1,068.06 HUs
Annualized: 1,068.06 HUs/50 years = 21.36 AAHUs

Mitigation Credit: AAHUs with mitigation – AAHUs without mitigation
= 21.36 AAHUs – 12.41 AAHUs = 8.95 AAHUs

Calculation 5: Convert 266 acres of cropland to wildlife corridor, New Madrid Floodway, Section 5.4.2.4

Duration of flooding is approximately 5%.

Without Mitigation:
Cumulative: (50 years)*(266 acres*0.05)*[(0.37+0.37)/2] = 246.05 HUs
Annualized: 246.05 HUs/50 years = 4.92 AAHUs

With Mitigation: (20-year transition period)
crop to fallow: (1 year)*(266 acres*0.05)*[(0.37+0.40)/2] = 5.12 HUs
fallow to forest: (19 years)*(266 acres*0.05)*[(0.40+0.70)/2] = 138.99 HUs
forested: (30 years)*(266 acres*0.05)*[(0.70+0.70)/2] = 279.30 HUs
Cumulative: 5.12 + 138.99 + 279.30 = 423.41 HUs
Annualized: 423.41 HUs/50 years = 8.47 AAHUs

Mitigation Credit: AAHUs with mitigation – AAHUs without mitigation
= 8.47 AAHUs – 4.92 AAHUs = 3.55 AAHUs

Calculation 6: Reforesting 2,640 acres of cropland in the batture, with 10-year transition trees, Section 5.4.3.1

Duration of flooding is approximately 31% and New Madrid Floodway HSI values used.

Without Mitigation:

Cumulative: (50 years)*(2,640 acres*0.31)*[(0.37+0.37)/2] = 15,140.40 HUs
Annualized: 15,140.40 HUs/50 years = 302.81 AAHUs

With Mitigation: (10-year transition period used)

crop to fallow: (1 year)*(2,640 acres*0.31)*[(0.37+0.40)/2] = 315.08 HUs
fallow to forest: (9 years)*(2,640 acres*0.31)*[(0.40+0.70)/2] = 4,051.08 HUs
forested: (40 years)*(2,640 acres*0.31)*[(0.70+0.70)/2] = 22,915.20 HUs
Cumulative: 315.08 + 4,051.08 + 22,915.20 = 27,281.36 HUs
Annualized: 27,281.36 HUs/50 years = 545.63 AAHUs

Mitigation Credit: AAHUs with mitigation – AAHUs without mitigation
= 545.63 AAHUs – 302.81 AAHUs = <u>242.82 AAHUs</u>

APPENDIX D

Hydrogeomorphic Analysis

St. Johns Bayou-New Madrid Floodway Project

Functional Assessment of Farmed and Forested Wetlands Proposed as Impact and Mitigation Areas Using the Hydrogeomorphic Approach (HGM)

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INTRODUCTION

This document contains an assessment of anticipated project impacts to wetland functions due to hydrologic changes within farmed wetlands, and direct construction effects on forested wetlands. In addition, this analysis includes an estimate of the effectiveness of the proposed compensatory mitigation for those impacts, also in terms of changes in wetland function. The assessment approach used to conduct this work is the Hydrogeomorphic Approach to Assessment of Wetland Functions, commonly known as HGM. Assessments conducted using the HGM Approach are based on regionally-specific guidebooks – in this instance, the recently published guidebook developed in the Delta Region of Arkansas (Klimas et al. 2004) was the reference work.

BACKGROUND: THE HGM ASSESSMENT APPROACH

The HGM assessment approach is described in detail in various documents (*e.g.* Smith et al. 1995) and the Arkansas Delta Regional Guidebook (Klimas et al. 2004) provides specifics relevant to the models and reference data that are used in this report. However, the brief overview below may be helpful for anyone unfamiliar with the terminology and process of the HGM approach.

The HGM approach incorporates several components. Wetlands are first grouped into regional subclasses based on functional similarities, as represented by hydrogeomorphic setting. Thus, wetlands in isolated depressions function differently than wetlands on river floodplains in various respects. For example, a functional riverine wetland exports organic materials to downstream aquatic systems during floods, whereas a depression that lacks a surface connection to a stream does not perform that function. Therefore, a group of functions can be identified for each regional subclass, and other regional subclasses may not perform those functions, or may perform them to different degrees.

In order to estimate the degree to which a wetland performs a particular function, HGM represents each function in terms of a simple logic model made up of variables that can be measured in the field or derived from existing information sources. Thus, for the example above, the ability of a riverine wetland to export organic carbon can be represented by the equation below.

$$FCI = V_{FREQ} \times \frac{\left[\frac{(V_{LITTER} + V_{OHOR} + V_{WD} + V_{SNAG})}{4}\right] + \left[\frac{V_{TBA} + V_{SSD} + V_{GVC}}{3}\right]}{2}$$

In this case, a relative measure of functionality, the Functional Capacity Index (FCI), is determined by 3 primary model terms.

1. Flood frequency (V_{FREQ}) which represents how often the wetland is inundated by overflow from a stream system, and provides the export mechanism for delivering organic carbon to the stream;

2. Detrital pools, comprising litter (V_{LITTER}), O-horizon thickness (V_{OHOR}), woody debris (V_{WD}), and snags (V_{SNAG}), represent the current and future availability of mobile particulate organic matter and sources of dissolved organic matter; and

3. Organic production sources, represented by tree basal area (V_{TBA}), shrub and sapling density (V_{SSD}), and ground vegetation cover (V_{GVC}), which represent the major sources of material that will replenish the detrital pools.

In order to run the models, the variable values must be determined or estimated. The flood frequency component can be estimated for a specific site based on gauge data, flood zone mapping, and similar sources. Information on living and dead vegetation can be obtained using standard forest sampling methods. Models used to assess all of the other functions use similarly obtained information as model variables.

The FCI value generated by the assessment model is an index between zero and 1.0, where a value of 1.0 represents a fully functional condition. Under HGM methodology, the FCI is multiplied by a measure of the area of the wetland (*e.g.*, acreage) to calculate the Functional Capacity Units (FCU) present for the Carbon Export function. This is essentially the same process used in the Habitat Evaluation Procedures (HEP) (U.S. Fish and Wildlife Service 1980), where indicators of habitat quality are combined into simple models to calculate a Habitat Suitability Index (HSI) and multiplied by a measure of area to produce Habitat Units (HU). There is one fundamental difference between these two assessment approaches, however. Whereas the indicators employed in HEP models are calibrated based on literature and expert opinion, the calibration curves for HGM indicators are derived from extensive field sampling of reference wetlands.

The variables employed in the assessment models are calibrated based on field data collected in the applicable wetland subclass. The calibration curve (also called the "subindex curve") for each variable in each subclass relates the variable value to an index between zero and 1.0, where the maximum value is that found in wetlands that represent the least-disturbed examples of the wetland subclass within the region. The shape of the calibration curve is established by sampling a set of wetlands that represent a range of condition classes between least-disturbed and severely disturbed. Figure 1 presents the calibration curves developed for the variables used in the production component of the Organic Carbon Export model discussed above, for the Riverine Backwater subclass in the Arkansas Delta Region. Similar sets of curves were developed for the other variables and wetland subclasses in the region (Klimas et al. 2004), based on sampling of more than 100 field sites.

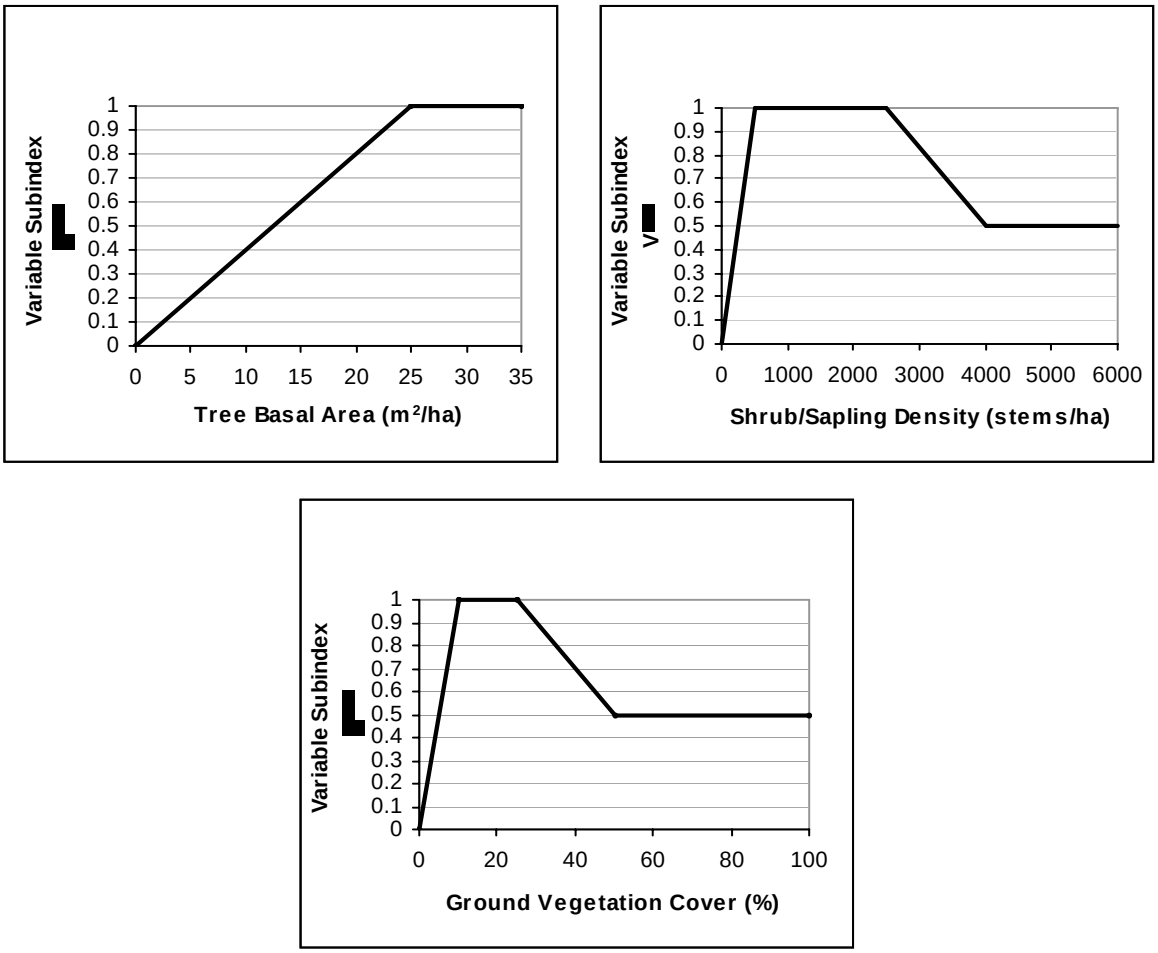

Figure 1. Subindex curves for 3 field indicators used as variables in the Organic Carbon Export functional assessment model.

As with all of the HGM guidebook development efforts, the Delta Region models, calibration curves, and application tools such as sampling methods and data summary spreadsheets were developed by a team of regional experts. Users of the guidebooks apply this information to specific assessment tasks, and can use the same models and reference data on various projects throughout the region. The models and calibration curves are applied in an assessment scenario by following detailed guidance presented in the Delta HGM Guidebook. The user collects field data from the assessment area, and compares that data to the calibration curve to derive a subindex. The subindex values are inserted into the model, generating an FCI for the function being assessed. Multiplying the FCI by acreage generates FCUs, which represent the functional units associated with the assessment area, and which can be compared among assessment areas of the same regional subclass. Pre- and post-project FCUs can be compared to determine impacts, and project alternatives can be compared to help identify the alternative that will have the least impact. However, in order to take into account the time required to recover functions following an impact or restoration actions an additional set of curves representing recovery trajectories is

required. Recovery trajectories were developed based on field studies and published as part of the Delta Region Guidebook (Klimas et al. 2004) and their use is discussed in detail in Klimas (2004). Figure 2 presents example recovery trajectory curves for the same three model variables represented in Figure 1.

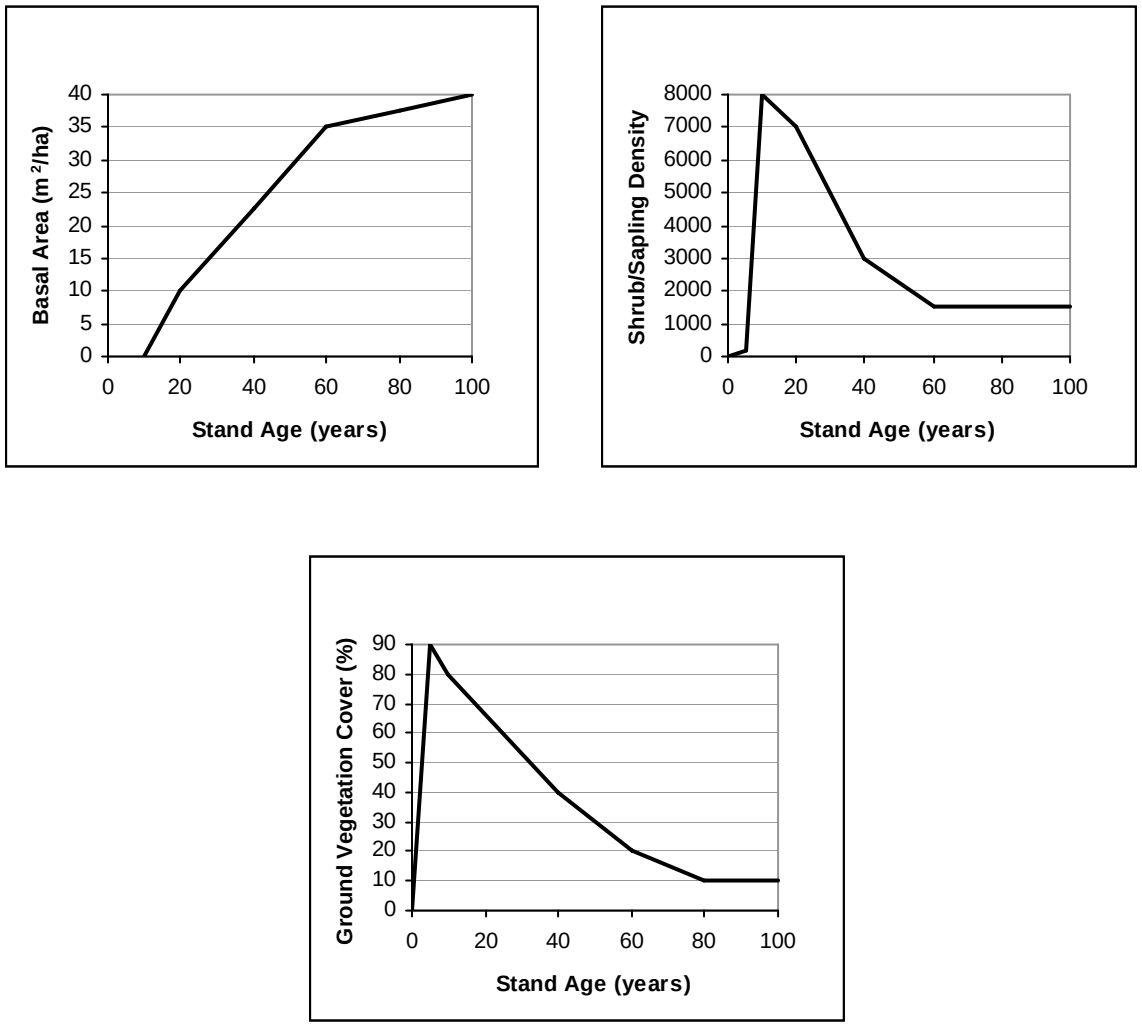

Figure 2. Recovery trajectories for 3 field indicators used as variables in the Organic Carbon Export functional assessment model.

ASSESSMENT PROCEDURE

For the purposes of this study, the assessment was strictly limited to certain types of anticipated impact and mitigation sites, the characteristics of which are described below. Because no field work was performed, the site conditions were assumed to be uniform, and where they are likely to be variable, the most conservative estimate of condition was adopted. In other words, the pre-project condition of potential impact sites was assumed to be as functional as reasonably possible, and the post-project condition assumed complete loss of function – both of these assumptions

likely overstate the actual situation. This approach assured that calculated mitigation ratios would be sufficient to offset all possible losses.

The assessment was developed in terms of a generic unit area (*e.g.*, a "typical acre") for each impact and mitigation category. This allows calculation of mitigation ratios that can be applied across a variety of potential impact and mitigation scenarios, as long as the sites affected meet the criteria and assumptions enumerated below.

Assumptions adopted for this assessment are as follows:

1. The HGM Guidebook to the Delta Region of Arkansas is applicable for use in the project area.

Generally, HGM guidebooks are considered to be applicable only to the areas where they were developed, in this case the Delta Region of Arkansas. However, it is reasonable to extend the applicability of the guidebook to the project area, which is near the state border, and within the same general geomorphic settings as the majority of the Arkansas Delta (that is, Pleistocene outwash and Holocene meander belt deposits). The age and origins of most of the deposits are the same as those in the nearby St. Francis Basin of Arkansas (Saucier 1994).

2. Pre-project condition: farmed wetland *impact* areas as well as the areas to be reforested (*mitigation* areas) are assumed to have the following initial characteristics:

a. They are essentially bare fields without significant native vegetation, but with native soils in place for the most part.

b. They have been significantly leveled, at least to the point where they no longer contain major sand pond complexes, vernal pools, or microtopographic storage.

c. They currently flood during the growing season at a frequency and growing-season duration sufficient to meet the criteria for jurisdictional wetlands. The flooding is primarily backwater, flows in and out of the farmed wetlands are generally at low velocity, and the floodwaters mostly originate in and return to stream channels.

Note that these assumptions, while they may not be universally true (*e.g.*, there may be some ponding in areas, or some fields may be pasture rather than rowcrops), are applied equally to impact and mitigation areas to offset any associated error.

3. Pre-project condition: The forested wetland *impact* areas will be assumed to have the following characteristics:

a. They are mature forests that meet all of the criteria (intact soils and microtopography, complex vegetation structure, intact detrital storage compartments) of fully-functional forested wetlands.

b. They currently flood at a frequency and duration sufficient to meet the criteria for jurisdictional wetlands.

Note that the first assumption is conservative, in that the impact forests may well be in a degraded condition, but the assessment will assume that they are in good condition, which translates into maximum functional loss due to project impacts.

4. Post-Project condition:

a. The impact areas (forested and farmed wetlands) will be assumed to have lost all jurisdictional status, and therefore all wetland functions.

b. The mitigation areas will remain flooded at a frequency and duration sufficient to qualify as jurisdictional wetlands. The pattern of flooding will be predominantly backwater, or low-velocity flows if headwater, as described for the impact sites.

c. Mitigation areas that will be reforested will be assumed to start as bare fields with the same characteristics as the farmed wetland impact sites. They will be site-prepared to create microdepressional water storage at target levels established in the Arkansas Delta HGM guidebook (the percent ponding under natural conditions varies with the age and origin of the geomorphic surface – *e.g.*, modern meander belt features are more ponded than older Pleistocene outwash features), and be planted with appropriate native tree species (again, the initial composition must conform to the reference data presented in the Arkansas Guidebook). Planting densities, monitoring, and maintenance procedures will follow commonly accepted practices for wetland mitigation projects in the Memphis District, CE.

d. The composition variable (Vcomp) for the planted mitigation sites is assumed to be less than optimal even though the sites will be planted with appropriate species. This is based on experience, where relatively short-lived or understory species (*e.g.* box elder, dogwood) tend to invade and co-dominate with the planted species in the early years. Over time, the Vcomp score improves, and by the time trees are present, the replacement variable (Vtcomp) is assumed to be fully functional (*i.e.* all dominants are target species for the site).

e. Mitigation proposals other than reforestation of farm fields, such as development of moist soil units and the establishment of shallow-water perimeter wetlands in borrow pits, are not included in this assessment.

5. Spatial characteristics

a. Based on a review of the willing-seller shapefile, it appears that two distinct spatial patterns of mitigation are likely. In HGM terms, this influences the Wildlife Habitat function with respect to 3 spatial variables, Tract Size, Connectivity, and Core Area. In the vicinity of Big Oak Tree State Park, the targeted acreage, if most or all of it is acquired, will form a large block of forest. Examination of the pattern of distribution relative to the existing forests produced an estimate of Tract Size at 1500ha, Connectivity at 50%, and Core Area at 50%. Elsewhere, in the project area, willing-seller mitigation consists mostly of smaller, isolated tracts. An estimate of average conditions indicated that, in these cases, Tract Size is approximately 100ha, and Connectivity and Core Area will be approximately 10%. Note that these estimates affect only the Wildlife Habitat model, and that they account for only a portion of the overall FCI for that function. Therefore, if actual conditions vary from these general estimates, they will have only a small effect on the overall FCI score.

b. For the forested impact sites, because no field sampling was conducted, a fully functional condition was assumed for all functions except the Wildlife Habitat function. Examination of the intersection of the proposed project footprint (shapefile: Construction_meters.shp) indicated that the forests that will be eliminated consist of small, narrow strips for the most part. The tract size of the impact area was estimated at 40 ha (based on information from Memphis District, CE), Connectivity was estimated at 20%, and Core Area was estimated as 0%.

The assumptions enumerated above were used to establish initial (pre-project) scores for the impact and mitigation sites for each of the seven functions assessed, using the Riverine

Backwater models and reference data from the Arkansas Delta HGM Guidebook (Klimas et al. 2004). The trajectory curves presented in that guidebook were then used to calculate model variable scores at intervals over the 50-year life of the project (years 0, 1, 10, 20, 30, 40, and 50). Those scores were used to re-run the models for each function at each interval. The results are expressed as an Annualized FCI for each function, which is the same thing as Annualized FCU for one acre (or any other unit of area). Annualized FCIs were calculated using the basic HEP formula (U.S. Fish and Wildlife Service 1980), which is also specified as the method for calculation of compensatory mitigation in the Draft RSEIS II (section 2.3.4).

RESULTS

Table 1 summarizes the results of the HGM assessment for the farmed wetland and forested impact sites for the pre-project condition, in terms of Functional Capacity Indices (FCI) for each function.

The post-project condition is zero for all functions, because the farmed wetland impact sites are assumed to become non-wetlands (and therefore have no wetland functions) and the forested wetlands will be destroyed. The assessment indicates that the farmed wetland sites are minimally functional, or non-functional, except for the "Remove Elements and Compounds" function, which is present at approximately 50% of potential, according to the HGM model. This level of functionality is attributable primarily to the fact that native soils are present, and that they flood regularly, allowing interaction between the soil particles and floodwaters. The forested impact sites are assessed as fully functional for all but one function, based on the assumption that they are all mature, intact systems. The only function that is assessed as less than optimal is the "Provide Wildlife Habitat" function. The lower FCI for that function is due to the small size of the forested tracts affected by the project, which is an important consideration in the assessment of habitat conditions.

Note that the values presented in Table 1 reflect the pre-project condition, but are also the same values that would be generated as the annualized loss under post-project conditions. This is because neither the farmed wetlands nor the forested sites would be expected to change over the life of the project.

The FCI values presented in Table 1 for the farmed wetland impact sites are also the initial (year 0) values for the proposed mitigation sites, because restoration of forests on farmed wetlands is the planned mitigation approach. Using those initial conditions and applying the published recovery trajectories (Klimas et al. 2004) to the mitigation sites allowed calculation of change in FCI over time for each function (Figure 3).

Each of the response curves in Figure 3 is shaped differently, depending on the model variables and how they are affected by the planned restoration. For example, The "Remove Elements and Compounds" function, which has an initial condition of 0.5 FCI, rises slowly following restoration as organic matter gradually accumulates on the site and in the soil to increase the interaction between the substrate and dissolved materials in floodwaters. The "Detain Precipitation" function, which is nearly non-existent prior to restoration, immediately responds to restoration because this function is largely dependent on the presence of microtopographic depressions, which will be restored as part of the initial site preparation on mitigation lands. For most functions, however, the recovery curves are gradual, because they are dependent to some degree on the growth of vegetation over time. Note that one function – "Provide Wildlife Habitat" – is represented by two recovery curves reflecting different spatial patterns (tract sizes) as discussed previously.

TABLE 1: FUNCTIONAL CAPACITY INDICES OF IMPACT SITES (PRE-PROJECT)							
	DETAIN FLOODWATER	DETAIN PRECIPITATION	CYCLE NUTRIENTS	EXPORT ORGANIC CARBON	REMOVE ELEMENTS AND COMPOUNDS	MAINTAIN PLANT COMMUNITIES	PROVIDE WILDLIFE HABITAT
FARMED WETLAND IMPACT SITES	0.000	0.025	0.075	0.013	0.533	0.0	0.0
FORESTED IMPACT SITES (CONSTRUCTION FOOTPRINT)	1.0	1.0	1.0	1.0	1.0	1.0	0.761

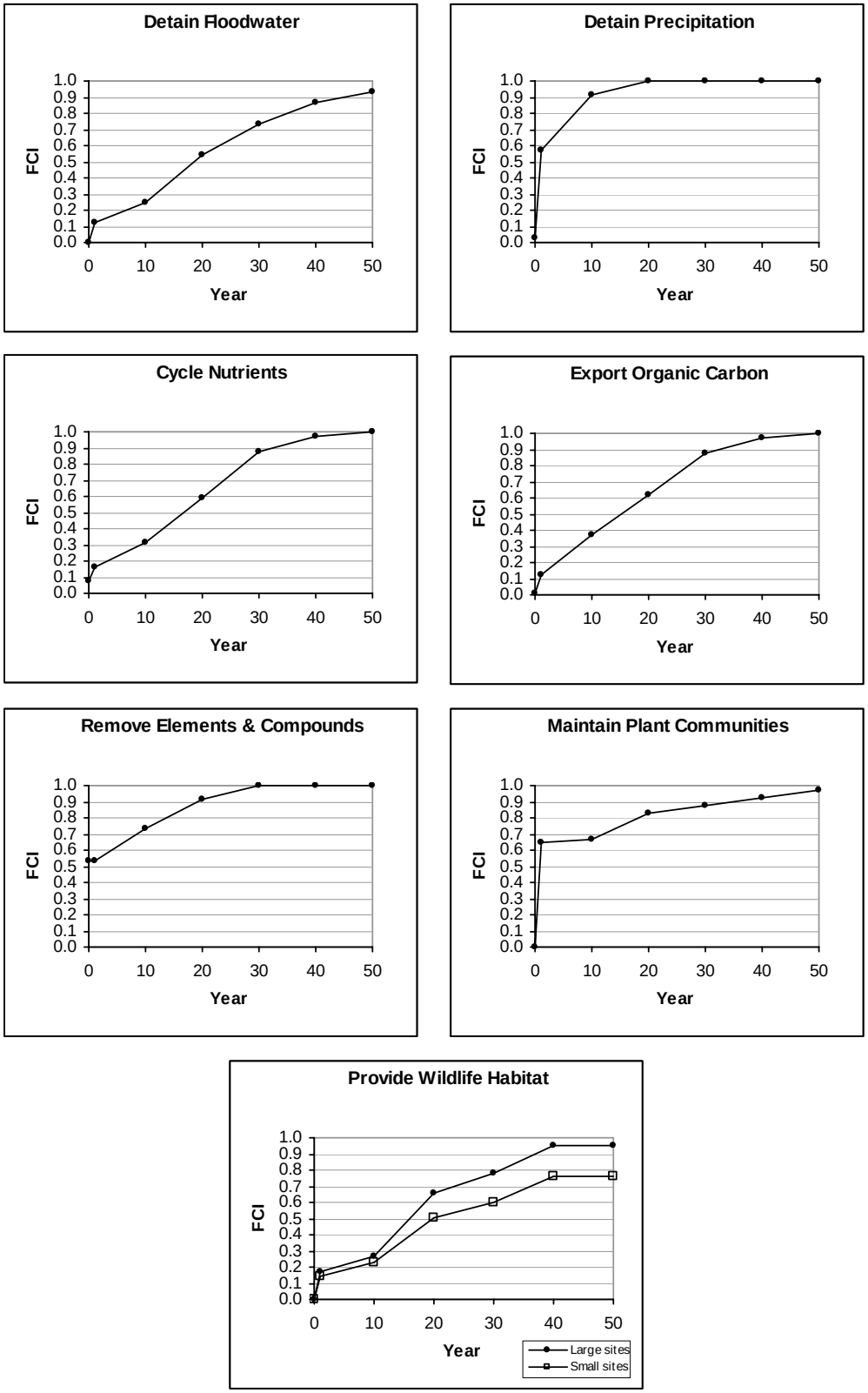

Figure 3. Changes in FCI on mitigation sites for each assessed function over the 50-year life of the project.

Table 2 presents the results of the entire assessment in terms of Annualized FCIs for each function and mitigation scenario. The analysis indicates that, in order to offset losses of the most-impacted function ("Remove Elements and Compounds"), mitigation ratios for forested wetlands should be approximately 3:1, and for farmed wetlands approximately 1.5:1. However, mitigation ratios for all other functions are less than 60% of the ratio for the most-impacted function for forested wetlands, and less than 10% of the ratio for the most-impacted function for farmed wetlands. In other words, any mitigation that offsets losses for the most-impacted function will greatly over-compensate for losses of all other functions.

Tables 3 and 4 are alternative ways to illustrate the magnitude of the functional losses and gains for farmed and forested wetlands. They present the mitigation ratios in terms of Functional Capacity Units (FCUs) calculated for 1000 acres of impact and 1000 acres of mitigation. Thus, Table 3 shows that a loss of 1000 acres of farmed wetland would cause a loss of 533 FCUs for the "Remove Elements and Compounds" function, while 1000 acres of mitigation would recover only 348 of those FCUs, thereby requiring a 1.5:1 mitigation ratio. However, for all other functions, restoration of 1000 acres would result in net gains ranging from 507 to 876 FCUs after deducting the losses due to a 1000 acre impact. A 1.5:1 mitigation ratio increases those gains by 50%. For the forested impact sites (Table 4) 1000 acres of mitigation provides no net gains over 1000 acres of impact, but the calculated 3:1 mitigation ratio fully offsets all losses.

SUMMARY

The St. Johns Bayou - New Madrid Floodway Project will have direct and indirect effects on wetlands. The principal method proposed to offset those losses is reforestation of farmed wetlands within the project area. An assessment of functional losses and gains associated with the proposed actions was conducted using the Hydrogeomorphic Approach (HGM) to assessing wetland functions. The specific locations of potential impact and mitigation sites have not been determined; therefore, a generic HGM assessment was employed where annualized functional losses and gains were calculated for a "typical acre" of impact and mitigation.

The HGM analysis of impacts to farmed wetlands indicated that only one of the seven assessed functions is being performed to a significant degree on those sites under pre-project conditions. A mitigation ratio of approximately 1.5:1 will fully offset the loss of that function due to indirect project impacts, and produce large net gains in other functions over the life of the project. A mitigation ratio of approximately 3:1 will offset all losses of function due to construction impacts to forested wetlands.

A variety of assumptions were made in order to conduct this analysis without conducting field studies. Most of those assumptions were intended to over-compensate for potential errors, and prevent underestimation of mitigation requirements. However, HGM is designed to be a rapid assessment technique, and where detailed field studies exist (*e.g.*, the extensive fish investigations completed previously), those results should supersede the HGM analysis for the particular functions that they address.

TABLE 2: MITIGATION RATIOS FOR IMPACTS TO FARMED WETLANDS AND FORESTED WETLANDS							
	DETAIN FLOODWATER	**DETAIN PRECIPITATION**	**CYCLE NUTRIENTS**	**EXPORT ORGANIC CARBON**	**REMOVE ELEMENTS AND COMPOUNDS**	**MAINTAIN PLANT COMMUNITIES**	**PROVIDE WILDLIFE HABITAT**
FARMED WETLAND S	0 (no impact)	0.03 :1	0.13:1	0.02 : 1	1.53 : 1	0 (no impact)	0 (no impact)
FORESTED WETLANDS	1.7 : 1	1.1 : 1	1.7 : 1	1.5 : 1	2.9 : 1	1.2 : 1	1.5 : 1 (small mitigation tracts – 250 acres average) 1.3 : 1 (large tracts – 3000 acres average)

TABLE 3: LOSS AND GAIN OF FUNCTIONAL CAPACITY UNITS PER 1000 ACRES OF IMPACT AND MITIGATION

FARMED WETLAND IMPACT AREAS

	DETAIN FLOODWATER	DETAIN PRECIPITATION	CYCLE NUTRIENTS	EXPORT ORGANIC CARBON	REMOVE ELEMENTS AND COMPOUNDS	MAINTAIN PLANT COMMUNITIES	PROVIDE WILDLIFE HABITAT
FCUs lost per 1000 acres of impact	0	25	75	13	533	0	0
FCUs gained per 1000 acres of mitigation	582	906	589	663	348	814	507 (small mitigation tracts) 640 (large mitigation tracts)

TABLE 4: LOSS AND GAIN OF FUNCTIONAL CAPACITY UNITS PER 1000 ACRES OF IMPACT AND MITIGATION

FORESTED WETLAND IMPACT AREAS

	DETAIN FLOODWATER	DETAIN PRECIPITATION	CYCLE NUTRIENTS	EXPORT ORGANIC CARBON	REMOVE ELEMENTS AND COMPOUNDS	MAINTAIN PLANT COMMUNITIES	PROVIDE WILDLIFE HABITAT
FCUs lost per 1000 acres of impact	1000	1000	1000	1000	1000	1000	761
FCUs gained per 1000 acres of mitigation	582	906	589	663	348	814	507 (small mitigation tracts) 640 (large mitigation tracts)

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APPENDIX E

Cost Estimates

Cost estimates for the four scenarios in this RSEIS 2 are provided in this appendix. The basis for these costs is as described in Section 5.8 Economics

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Corps of Engineers, Memphis District
Mitigation Scenario A
22-Nov-05

ITEM DESCRIPTION	ACRES	ST. JOHNS FEATURE	MRL CLOSURE FEATURE	PURPOSE TOTAL	COMMENT
FLOOD CONTROL FEATURES					
St. Johns Bayou Basin		$ 30,638,000			
New Madrid Floodway		$ 15,014,000	$23,838,000		
NMF Fishery Easements			$2,481,000		
Total Flood Control		**$ 45,652,000**	**$26,319,000**	**$71,971,000**	
	-				
BASIC MITIGATION FEATURES					
SJBB Reforestation	1293	$ 3,914,000			
NMF Reforestation*	4126		$11,029,000		Includes $3,900,000 for 1657 ac of NM
Total Reforestation		$3,914,000	$11,029,000	$14,943,000	mitigation purchased Jul 04
SJBB Shorebird Areas	105	$ 453,000			
NMF Shorebird Areas	660		$2,909,000		
Total Shorebird Features		$453,000	$2,909,000	$3,362,000	
SJBB Waterfowl Easements		$2,835,000			
NMF Waterfowl Easements			$2,628,000		
Total Waterfowl Features		$2,835,000	$2,628,000	$5,463,000	
SJBB Modified Borrow Pits	387	$ 593,000			
Total Modified Borrow Pits		$ 593,000	$0	$593,000	
NMF Vegetated Buffer & Wildlife Corridor			$3,004,000	$3,004,000	
Total Buffer & Wildlife Corridor			$3,004,000	$3,004,000	
Total Basic Mitigation	**6571**	**$ 7,795,000**	**$ 19,570,000**	**$ 27,365,000**	
BIG OAK TREE STATE PARK					
BOTSP Water Supply			$2,838,000		Entry to west of park, Fish AAHU's TBD
Total BOTSP Water Supply			**$2,838,000**	**$2,838,000**	
ADDITIONAL MITIGATION FEATURES					
Batture Reforestation	200		$505,000	$505,000	
Riley Lake Restoration to 286	430		$1,782,000	$1,782,000	
NMF 283.4 Fish Pool Fee Puchase	2000		$2,636,000	$2,636,000	Ponding to 283.4 1 Apr thru 15 May
Total Additional Mitigation Features		**$0**	**$4,923,000**	**$4,923,000**	
TOTAL	**8384**	**$ 53,447,000**	**$ 53,650,000**	**$ 107,097,000**	

* Includes preservation of 901 ac of existing woodlands and 1800 ac in the vicinity of BOTSP. Fish AAHU's for 1800 ac TBD.
Total acres purchased in fee excludes permanent water bodies, including the SJBB modified borrow pits.

Corps of Engineers, Memphis District
Mitigation Scenario B
22-Nov-05

ITEM DESCRIPTION	ACRES	ST. JOHNS FEATURE	MRL CLOSURE FEATURE	PURPOSE TOTAL	COMMENT
FLOOD CONTROL FEATURES					
St. Johns Bayou Basin		$ 30,638,000			
New Madrid Floodway		$ 15,014,000	$23,838,000		
NMF Fishery Easements			$2,481,000		
Total Flood Control		**$ 45,652,000**	**$26,319,000**	**$71,971,000**	
	-				
BASIC MITIGATION FEATURES					
SJBB Reforestation	1293	$ 3,914,000			
NMF Reforestation*	4126		$11,029,000		Includes $3,900,000 for 1657 ac of NM
Total Reforestation		$3,914,000	$11,029,000	$14,943,000	mitigation purchased Jul 04
SJBB Shorebird Areas	105	$ 453,000			
NMF Shorebird Areas	660		$2,909,000		
Total Shorebird Features		$453,000	$2,909,000	$3,362,000	
SJBB Waterfowl Easements		$2,835,000			
NMF Waterfowl Easements			$2,628,000		
Total Waterfowl Features		$2,835,000	$2,628,000	$5,463,000	
SJBB Modified Borrow Pits	387	$ 593,000			
Total Modified Borrow Pits		$ 593,000	$0	$593,000	
NMF Vegetated Buffer & Wildlife Corridor			$3,004,000	$3,004,000	
Total Buffer & Wildlife Corridor			$3,004,000	$3,004,000	
Total Basic Mitigation	**6571**	**$ 7,795,000**	**$ 19,570,000**	**$ 27,365,000**	
BIG OAK TREE STATE PARK					
BOTSP Water Supply			$2,838,000		Entry to west of park, Fish AAHU's TBD
Total BOTSP Water Supply			**$2,838,000**	**$2,838,000**	
ADDITIONAL MITIGATION FEATURES					
NMF 284.4 Fish Pool Fee Puchase	2850		$4,189,000	$4,189,000	Pond to 284.4 1-30 Apr; Pond to 283.4 1-15 May
Total Additional Mitigation Features		**$0**	**$4,189,000**	**$4,189,000**	
TOTAL	**9034**	**$ 53,447,000**	**$ 52,916,000**	**$ 106,363,000**	

* Includes preservation of 901 ac of existing woodlands and 1800 ac in the vicinity of BOTSP. Fish AAHU's on 1800 ac TBD.

Total acres purchased in fee excludes permanent water bodies, including the SJBB modified borrow pits.

Corps of Engineers, Memphis District
Mitigation Scenario C
22-Nov-05

ITEM DESCRIPTION	ACRES	ST. JOHNS FEATURE	MRL CLOSURE FEATURE	PURPOSE TOTAL	COMMENT
FLOOD CONTROL FEATURES					
St. Johns Bayou Basin		$ 30,638,000			
New Madrid Floodway		$ 15,014,000	$23,838,000		
NMF Fishery Easements			$2,481,000		Fish AAHU's reflected in impact reduction
Total Flood Control		**$ 45,652,000**	**$26,319,000**	**$71,971,000**	
	-				
BASIC MITIGATION FEATURES					
SJBB Reforestation	1293	$ 3,914,000			
NMF Reforestation*	4126		$11,029,000		Includes $3,900,000 for 1657 ac of NM
Total Reforestation		$3,914,000	$11,029,000	$14,943,000	mitigation purchased Jul 04
SJBB Shorebird Areas	105	$ 453,000			
NMF Shorebird Areas	660		$2,909,000		
Total Shorebird Features		$453,000	$2,909,000	$3,362,000	
SJBB Waterfowl Easements		$2,835,000			
NMF Waterfowl Easements			$2,628,000		
Total Waterfowl Features		$2,835,000	$2,628,000	$5,463,000	
SJBB Modified Borrow Pits	387	$ 593,000			
Total Modified Borrow Pits		$ 593,000	$0	$593,000	
NMF Vegetated Buffer & Wildlife Corridor			$3,004,000	$3,004,000	
Total Buffer & Wildlife Corridor			$3,004,000	$3,004,000	
Total Basic Mitigation	**6571**	**$ 7,795,000**	**$ 19,570,000**	**$ 27,365,000**	
BIG OAK TREE STATE PARK					
BOTSP Water Supply			$2,838,000		Entry to west of park, Fish AAHU's TBD
Total BOTSP Water Supply			**$2,838,000**	**$2,838,000**	
ADDITIONAL MITIGATION FEATURES					
Batture Reforestation	1050		$2,651,000	$2,651,000	
Riley Lake Restoration to 288	700		$2,784,000	$2,784,000	
SJB 283 Fish Pool Fee Puchase	1154		$2,260,000	$2,260,000	Ponding to 283 1 Apr thru 15 May
Total Additional Mitigation Features		**$0**	**$7,695,000**	**$7,695,000**	
TOTAL	**8388**	**$ 53,447,000**	**$ 56,422,000**	**$ 109,869,000**	

* Includes preservation of 901 ac of existing woodlands and 1800 ac in the vicinity of BOTSP. Fish AAHU's on 1800 ac TBD.

Total acres purchased in fee excludes permanent water bodies, including the SJBB modified borrow pits.

Corps of Engineers, Memphis District
Mitigation Scenario D
22-Nov-05

ITEM DESCRIPTION	ACRES	ST. JOHNS FEATURE	MRL CLOSURE FEATURE	PURPOSE TOTAL	COMMENT
FLOOD CONTROL FEATURES					
St. Johns Bayou Basin		$ 30,638,000			
New Madrid Floodway		$ 15,014,000	$23,838,000		
NMF Fishery Easements			$2,481,000		Fish AAHU's reflected in impact reduction
Total Flood Control		**$ 45,652,000**	**$26,319,000**	**$71,971,000**	
	-				
BASIC MITIGATION FEATURES					
SJBB Reforestation	1293	$ 3,914,000			
NMF Reforestation*	4126		$11,029,000		Includes $3,900,000 for 1657 ac of NM
Total Reforestation		$3,914,000	$11,029,000	$14,943,000	mitigation purchased Jul 04
SJBB Shorebird Areas	105	$ 453,000			
NMF Shorebird Areas	660		$2,909,000		
Total Shorebird Features		$453,000	$2,909,000	$3,362,000	
SJBB Waterfowl Easements		$2,835,000			
NMF Waterfowl Easements			$2,628,000		
Total Waterfowl Features		$2,835,000	$2,628,000	$5,463,000	
SJBB Modified Borrow Pits	387	$ 593,000			
Total Modified Borrow Pits		$ 593,000	$0	$593,000	
NMF Vegetated Buffer & Wildlife Corridor			$3,004,000	$3,004,000	
Total Buffer & Wildlife Corridor			$3,004,000	$3,004,000	
Total Basic Mitigation	**6571**	**$ 7,795,000**	**$ 19,570,000**	**$ 27,365,000**	
BIG OAK TREE STATE PARK					
BOTSP Water Supply			$2,838,000		Entry to west of park, Fish AAHU's TBD
Total BOTSP Water Supply			**$2,838,000**	**$2,838,000**	
ADDITIONAL MITIGATION FEATURES					
SJB 283 Fish Pool Fee Puchase	1154		$2,260,000	$2,260,000	Ponding to 283 from 1 Apr thru 15 May
NMF 282 Fish Pool Fee Purchase	1215		$1,519,000	$1,519,000	Ponding to 282 from 1 Apr thru 15 May
Total Additional Mitigation Features	2369	**$0**	**$3,779,000**	**$3,779,000**	
TOTAL	**8553**	**$ 53,447,000**	**$ 52,506,000**	**$ 105,953,000**	

* Includes preservation of 901 ac of existing woodlands and 1800 ac in the vicinity of BOTSP. Fish AAHU's on 1800 ac TBD.

Total acres purchased in fee excludes permanent water bodies, including the SJBB modified borrow pits.

Corps of Engineers, Memphis District
St. Johns Bayou Basin Alternative 3-1B
7-Sep-05

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	CONTING.	Oct. 2005 PRICE LEVEL TOTAL	COMMENT
01 LANDS AND DAMAGES (w/ contin.)					**21.3%**		
Item 1, Already Completed	0	AC				$0	
Item 2, New Madrid Pumping Station		AC				$187,200	Reflects sponsor appraisal on 3 tracts for closure
Item 3, St Johns Bayou, Mile 0-3*		AC				$412,000	These Real estate Estimates are derived from
Item 4a, St. Johns Bayou Mile 3-4.5*		AC				$161,000	LRR, Appendix D, and merely Adjusted to
Item 4b, BDNM Levee Ditch mile 0-8.1*		AC				$524,000	October 2005 Levels with some Channel
Item 5, St. Johns Pumping Station*		AC				$661,000	Adjustments due to 200 foot to 120 foot and
Item 6, St. James Mile 0-7*		AC				$772,000	Deletion of upper St. James (See markup of individual
Total 01 Lands and Damages					**Total Cost**	**$2,717,000**	items from Appendix D)
02 RELOCATIONS					**25%**		
Item 4, St. Johns Bayou Mile 3-4.5	1	LS	$748,804	$749,000	$187,000	$936,000	
Item 4, BPNM Levee Ditch Mile 0-8.1	1	LS	$65,053	$65,000	$16,000	$81,000	
Item 5, Highway WW	1	LS	$144,221	$144,000	$36,000	$180,000	
Item 6, St. James Ditch Mile 0-7	1	LS	$2,476,925	$2,477,000	$619,000	$3,096,000	
Total Relocation 02				**$3,435,000**	$858,000	**$4,293,000**	
09 CHANNEL IMPROVEMENTS							
Item 1, BPNM Mile 8.1-12.4 Complete							
Item 3, Lower St. Johns Bayou Excavation	1	Contract	$763,846	$764,000	$76,000	$840,000	
Item 3, Lower St. Johns Other tasks	1	Contract	$863,252	$863,000	$129,000	$992,000	
Item 4a, Upper St. Johns, Excavation	1	Contract	$178,412	$178,000	$18,000	$196,000	
Item 4a, Upper St. Johns other tasks	1	Contract	$230,046	$230,000	$35,000	$265,000	
Item 4b, BPNM Mile 0-8.1, Excavation	1	Contract	$540,626	$541,000	$54,000	$595,000	
Item 4b, BPNM Mile 0-8.1, Other Tasks	1	Contract	$297,840	$298,000	$45,000	$343,000	
Item 6, St. James Ditch, Excavation	1	Contract	$447,044	$447,000	$67,000	$514,000	Based on 80% of LRR amount x 1.189 x 1.12
Item 6, St. James Ditch, Other Tasks	1	Contract	$297,560	$298,000	$45,000	$343,000	Based on 66% of LRR amount x 1.189 x 1.12
Total 09 Channel Items				**$3,321,000**	$424,000	**$3,745,000**	
13 PUMPING PLANTS							
St. Johns Pumping Station 1000 CFS							
Pumps	1	EA	$1,810,430	$1,810,000	$272,000	$2,082,000	
General	1	EA	$47,396	$47,000	$7,000	$54,000	
Sitework	1	EA	$6,732,453	$6,732,000	$1,010,000	$7,742,000	
Concrete	1	EA	$2,492,336	$2,492,000	$374,000	$2,866,000	
Masonry, Metals, Woods, Plastics	1	EA	$603,023	$603,000	$90,000	$693,000	
Doors/Finishes/Windows/Glass	1	EA	$85,944	$86,000	$13,000	$99,000	
Thermal Protection	1	EA	$55,594	$56,000	$8,000	$64,000	
Furnishings	1	EA	$1,460	$1,000	$0	$1,000	
Mechanical	1	EA	$2,290,127	$2,290,000	$344,000	$2,634,000	
Electrical	1	EA	$1,127,543	$1,128,000	$169,000	$1,297,000	
Total 13-St. Johns Station				**$15,245,000**	$2,287,000	**$17,532,000**	
30 PLANNING, E&D	1	LS	3.5%				
Phase 1 St. Johns PED				**$895,000**		**$895,000**	
31 CONSTRUCTION MANAGEMENT	1	LS	5.5%				02, 09, & 13 Accounts indexed from Oct 03 to Oct 05
Phase 1 St. Johns S&A				**$1,456,000**		**$1,456,000**	price levels using index in H 47 unless otherwise
							noted
TOTAL PROJECT COSTS (Oct 05)	1	LS				**$30,638,000**	1.12

New Madrid Floodway Alternative 3-1B
22-Nov-05

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	CONTING.	TOTAL	PUMP STATION FEATURE	MRL CLOSURE FEATURE	COMMENT
01 LANDS AND DAMAGES (w/ contin.)									
Lands and Damages	15	AC	$ 2,000	$ 30,000	$ 8,000	$ 38,000		$ 38,000	ROW for Levee Closure Construction
Lands and Damages	197	AC	$ 2,000	$ 394,000	$ 99,000	$ 493,000		$ 493,000	ROW for Setback Levee Grade Raise (Basic borrow only)
Non-Federal Acquisition	6	TR	$ 5,600	$ 34,000	$ 9,000	$ 43,000		$ 43,000	
Federal Acquisition	6	TR	$ 2,400	$ 14,000	$ 4,000	$ 18,000		$ 18,000	
Total 01				$ 472,000	$ 120,000	**$ 592,000**	**$ -**	**$ 592,000**	Decrease in mitigation shown on Pump Station as a negative cost
02 RELOCATIONS									
Roads & Bridges	1	LS	$ -	$ -	$ -	$ -	$ -		
Utilities	1	LS	$ -	$ -	$ -	$ -	$ -		
Total 02				$ -	$ -	**$ -**	**$ -**		
13 PUMPING PLANTS									
New Madrid Pumping Station 1500 CFS & Gravity Outlet	1	EA	$ 25,194,080	$ 25,194,080	$ -	$ 25,194,000	$ 13,101,000	$ 12,093,000	This row reflects the bid price for the NM PS & gravity outlet; sum of rows 20 & 24-27 is total bid price + 6% escalation.
Total 13				$ 25,194,080	$ -	**$ 25,194,000**	**$ 13,101,000**	**$ 12,093,000**	
11 LEVEES and FLOODWALLS									
Clearing & Grubbing	9	AC	$ 265	$ 2,000	$ 1,000	$ 3,000		$ 3,000	
Levee Embankment	356,240	ECY	$ 3.71	$ 1,322,000	$ 331,000	$ 1,653,000		$ 1,653,000	Closure + Adjacent Frontline Levee Grade Raise.
Aggregate Surfacing	1,500	CCY	$ 29	$ 43,000	$ 11,000	$ 54,000		$ 54,000	Levee gravel roads, 12' wide, 6" compacted.
Turfing	9	AC	$ 1,272	$ 11,000	$ 3,000	$ 14,000		$ 14,000	Bermuda grass.
Setback Levee									$1,724,000
Clearing & Grubbing	387	AC	$ 280	$ 108,000	$ 27,000	$ 135,000		$ 135,000	Borrow + Levee ROW
Levee Embankment, Grade Raise	2,054,524	ECY	$ 2.80	$ 5,753,000	$ 1,438,000	$ 7,191,000		$ 7,191,000	Borrow pits within 1 mile.
Turfing	200	AC	$ 1,344	$ 269,000	$ 67,000	$ 336,000		$ 336,000	Bermuda grass.
Total 11				$ 7,508,000	$ 1,878,000	$ 9,386,000	**$ -**	**$ 9,386,000**	
30 PLANNING, E&D	1	LS	3.5%	$ 1,145,000	$ 286,000	$ 1,431,000	$ 744,000	$ 687,000	E&D accounts for work already done on New Madrid Pump Station.
Total 30				$ 1,145,000	$ 286,000	**$ 1,431,000**	**$ 744,000**	**$ 687,000**	
31 CONSTRUCTION MANAGEMENT	1	LS	5.5%	$ 1,799,000	$ 450,000	$ 2,249,000	$ 1,169,000	$ 1,080,000	
Total 31				$ 1,799,000	$ 450,000	**$ 2,249,000**	**$ 1,169,000**	**$ 1,080,000**	02, 09, & 13 Accounts indexed from Oct 03 to Oct 05
									price levels using index in J 45 unless otherwise
TOTAL PROJECT COSTS (Oct 05)				$ 36,118,080	$ 2,734,000	**$ 38,852,000**	**$ 15,014,000**	**$ 23,838,000**	1.12

Appendix F – Public Comments on Draft RSEIS 2
(Pages 261 to 494)
are available under the Public Comment Link

APPENDIX G

Pertinent Correspondences

1. State of Missouri Water Quality Certification

2. U.S. Fish and Wildlife Service Supplemental Fish and Wildlife Coordination Act Report

3. NRCS Correspondences

ATTACHMENT 1

State of Missouri Water Quality Certification

Matt Blunt, Governor • Doyle Childers, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

March 9, 2006

Colonel Charles O. Smithers III
Army Corps of Engineers
Memphis District
167 N. Main St., B-202
Memphis, TN 38103-1894

New Madrid County
St. John's Bayou/
New Madrid Floodway Project
Updated

Dear Colonel Smithers:

The Missouri Department of Natural Resources' Water Protection Program has updated the Water Quality Certification for the St. John's Bayou/New Madrid Floodway Project to reflect the information contained in the Revised Supplemental Environmental Impact Statement 2 (RSEIS2). In the original application, the Memphis District of the Army Corps of Engineers (Corps) proposed to construct a 1,500-foot levee to close a gap in the existing levee system within the New Madrid Floodway, add pumping stations within this area, and a pumping station within the St. John's Bayou area, and modify 27.6 miles of jurisdictional waters within the St. John's Bayou area.

The enclosed updated certification is proposed in conjunction with a Settlement Agreement (Agreement) in which both parties agreed to the terms of the certification, including the method by which the Corps will provide additional mitigation acreage should monitoring reflect a reduction in jurisdictional wetlands or that the project has impacted more acreage than was predicted. The Agreement further defined the process to be followed if such conditions are not met.

For your proposed project to proceed, the enclosed conditions shall apply.

If you have any questions, please contact me at (573) 751-1300 or by mail to Missouri Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, MO 65102-0176.

Sincerely,

WATER PROTECTION PROGRAM

Refaat Mefrakis, P.E.
NPDES Storm Water Permit Unit Chief

RM:pc

Enclosures

c: Mr. David L. Reece, Army Corps of Engineers, Memphis District
Mr. Daniel D. Ward, Army Corps of Engineers, Memphis District
DNR - SERO

St. John's Bayou/ New Madrid Floodway Project
Water Quality Certification
Conditions and Provisions

Issued by the Missouri Department of Natural Resources
March 9, 2006

1. To compensate for the effects of reduced Mississippi River flooding on the natural resources and environment within Big Oak Tree State Park, the applicant and the Missouri Department of Natural Resources (department) have agreed to the "Memorandum of Understanding (MOU) for the Protection of Big Oak Tree State Park as it Relates to the St. John's Bayou/New Madrid Floodway Project." All provisions of the MOU are incorporated into this certification by reference (Appendix A). Consistent with the MOU, the applicant shall meet the following conditions:

   a. Acquire from willing sellers the approximately 1800 acres of land immediately surrounding Big Oak Tree State Park which are identified on the enclosed map. These will be a priority focus of the project mitigation plan and among the first areas pursued for acquisition.

   b. Reforest these mitigation acres with a variety of Bottomland Hardwood species (2002 Revised Supplemental Environmental Impact Statement (RSEIS), Appendix L, Section 8.1 and 2006 RSEIS2), in general accordance with guidelines established in the 1998 Final SEIS for the Mississippi River Levees Project, with consideration of modification as may be recommended by department land managers. All tree species will be those known to naturally occur in the park, and the planting stock will be from native genotypes. Tree plantings will be monitored once a year for five years to assess survival rates. Plantings will be considered successful if survival is equal to or greater than 70 percent at the end of five years. If survival rates fall below 70 percent additional plantings will be made to achieve the required survival rate.

   c. Design and construct the proposed Big Oak Tree State Park hydrology project, modified per U.S. Army Corps of Engineers (Corps) specifications to ensure engineering stability. At a minimum, this must be sufficient to transport Mississippi River water inside the park via gravity feed, inundate the park during periods of high water to at least the elevation 291 feet National Geodetic Vertical Datum (NGVD), and drain the park via gravity feed down to at least the elevation 288 feet NGVD. This includes:

      1) Acquire the lands alongside the park (including the new land acquisitions) that will be necessary to build and maintain the berms and water control structures. The berms, if necessary, will be constructed on acquired lands or Corps obtained easements along the existing park boundaries. These shall be outside the existing park boundary so that no existing timber or wetlands are sacrificed for the construction (provided there are willing sellers for the necessary lands).

2) Providing a direct connection to supply surface water as a water source for the park from the Mississippi River. This shall be by gated culvert to allow river water to flow through the frontline levee at times of higher stages, to mimic natural flooding.

3) Providing the necessary design work and construction for the berms and water control structures. Berms shall not be constructed until all acquisition is complete in order to maximize effective park hydrologic unit area.

2. This certification is issued using the Corps method of wetland delineation contained in the 2002 RSEIS and additional detailed hydrogeomorphic (HGM) analysis contained in the 2006 RSEIS2, provided that monitoring as described in condition number five (5) validates that current jurisdictional wetlands remain jurisdictional wetlands after completion of the project. If the monitoring reflects a further reduction in current jurisdictional wetlands than has been anticipated in the 2002 RSEIS/2006 RSEIS2 or if additional jurisdictional wetlands have been adversely impacted by the project, the Corps shall within its authority and funding capability, acquire additional mitigation lands to compensate for those wetlands. If monitoring reflects that additional mitigation is necessary, the Corps shall provide additional mitigation in accordance with this certification and the terms and conditions in the Settlement Agreement filed with the Missouri Clean Water Commission (CWC) on June 10, 2003, in CWC Appeal No. 380, Case No. 03-002 DNR.

3. Pursuant to the CWC's order in Appeal Number 362 and 10 CSR 20-6.060(5), the applicant must submit a preliminary mitigation plan for the project before a certification is issued. No net loss of jurisdictional waters shall occur as a result of this project. A detailed mitigation plan must be submitted for each tract of land purchased for mitigation (currently estimated by the Corps to be in the range of 8,384 acres to 9,034 acres, inclusive of 765 acres of herbaceous lands, as specified in Table 2.8 of the 2006 RSEIS2, plus any additional wetland areas identified using the monitoring in condition number five (5) and approved by the department before any current jurisdictional wetlands as defined in the June 2002 RSEIS are impacted through loss of hydrology due to any operation of any component of the New Madrid Floodway portion of the project. A detailed mitigation plan must be submitted and approved for any current jurisdictional wetlands directly impacted by the footprint of the closure of the 1500-foot mainline levee before any fill material can be deposited into those jurisdictional wetlands.

Similarly, a detailed mitigation plan must be submitted and approved for any streams adversely impacted by this project (currently estimated at 27.6 miles) before any component of the St. John's Bayou portion of the project has impacts on any current jurisdictional waterbodies.

The final mitigation plan shall include:

a. Clear statement of objectives;

b. Description of the wetland functions and fish and wildlife resources that require mitigation and how those functions and resources will be replaced;

c. Statement of the location and description of elevation and hydrology of the mitigation site;

d. Detailed construction plan with post-construction contour map, detailed location map and as built drawings;

e. Plans for establishment of vegetation including what, where and when if planting is proposed. Also, detailed drawings of planting plan and any proposed structures;

f. Detailed description of a mitigation monitoring program;

g. Performance standards for site grading, hydrology and plant community establishment, composition and survival;

h. Contingency plan;

i. Guarantee that the work will be performed as planned; and

j. Provisions for long-term management and maintenance.

4. A minimum of 8,384 acres of mitigation lands shall be purchased in fee. The Corps anticipates providing mitigation in the range of 8,384 acres to 9,034 acres for wetland, wildlife, fisheries and shorebird mitigation (expressed in Table 2.8 of the 2006 RSEIS2 as average annual habitat units). The applicant shall work with the department toward timely identification and prioritization of suitable mitigation acreage for purchase. In accordance with federal law, mitigation shall be implemented concurrently with construction of the project feature that requires mitigation. The New Madrid Floodway portion of the project or the St. John's Bayou portion of the project shall not be operated until all mitigation lands to satisfy the specific mitigation requirements for that respective portion of the project are acquired and the Missouri Department of Natural Resources, Missouri Department of Conservation, U.S. Environmental Protection Agency and U.S. Department of Interior have had an opportunity to review their suitability. By law, most mitigation lands purchased in fee will be turned over to the U.S. Department of Interior. The U.S. Department of Interior may license those lands out to state resource agencies for management.

   Any mitigation lands not purchased in fee and managed by a state or federal resource agency for the protection of natural resources shall have a permanent conservation restriction. The restriction covering this tract shall reserve this area for aquatic habitat protection, wetland protection, and wildlife purposes exclusively, and shall be filed and recorded as a deed restriction on the property in perpetuity. For mitigation lands not purchased in fee, deed restrictions on such mitigation areas must be acquired before fill material is placed in jurisdictional waters within the component portion of the project area where such mitigation is utilized. If the department does not approve the detailed mitigation plan, or if the mitigation proves to be unsuccessful, the department shall review, suspend, modify or withdraw this certification.

5. The applicant shall submit a monitoring plan and receive department approval for this plan prior to the deposition of any fill material into jurisdictional waters. The applicant shall submit to the department for review any subsequent revisions to the monitoring plan and must receive approval from the department of those revisions prior to their implementation. The monitoring plan must include the following components:

   a. Current jurisdictional wetlands within the New Madrid Floodway and St. John's Bayou basin below 295 NGVD shall be monitored for 5 years after the project is completed to validate the Corps' modeling and to ensure all wetlands retain their jurisdictional status or are appropriately mitigated. Monitoring shall include a comprehensive network of water level monitoring device nestings and physical site evaluations to fully characterize temporal and spatial variation of surface and subsurface water levels in the project area (or within the area having ground surface elevations below 295 feet NGVD) at least to the extent that project operation impacts can be determined for all wetlands within the project area. The exact number and location of the monitoring stations will be determined in the approved monitoring plan. No net loss of jurisdictional wetland acres shall occur within the project area. Additionally, any drainage improvements shall not degrade or reduce adjacent wetlands. If monitoring reflects that any additional wetland acres are impacted by the project (other than those already planned for mitigation), additional mitigation shall be required.

   b. The natural biological community within St. John's Bayou and New Madrid Floodway waterways shall not be adversely impacted beyond those impacts identified in the June 2002 RSEIS. The applicant shall conduct monitoring of aquatic biological populations in St. John's Bayou and New Madrid Floodway waterways and tributaries to St. John's Bayou and New Madrid Floodway in accordance with the approved monitoring plan for at least 5 years after construction impacts to ensure the re-establishment of similar aquatic populations indigenous to the waterways prior to impact.

      The applicant shall submit monitoring results to the department by January 1 of each year. If, two years after restoration, the populations differ significantly from the original waterways or existing reference streams, successful remedial mitigation must be undertaken and approved by the department and the degradation of the resource must be corrected. Populations will not be significantly different from the original streams or existing reference streams if monitoring reflects the development of aquatic macroinvertebrate communities with taxonomic structure and feeding function classes as good as or better than the 25th percentile of reference criteria. Successful mitigation and correction of the degradation will be subject to final determination by the department.

   c. The Corps shall also carefully monitor the jurisdictional acres that are proposed to remain jurisdictional wetlands after the project is complete to ensure that any future conversion of these acres will be done only after the 404 permitting and 401 certification process is complete. If the Corps finds that the 404/401 process has been evaded in the conversion of these acres, the Corps shall take immediate enforcement action.

6. The Corps shall submit a detailed analysis that addresses the relative impacts of options a-f below before condition seven (7) may be pursued:

   a. Construction of a 120 foot bottom width "high flow" channel adjacent to the existing St. John's Bayou waterways that would be excavated to an elevation lower than existing grade of the croplands, but higher than the existing streambed. The majority of the existing riparian corridor should be spared;

   b. Construction of a "by-pass" channel, similar to above, in areas outside the corridor of the existing St. John's Bayou waterways;

   c. Acquiring land or easements along all or part of the existing St. John's Bayou waterways, and grading these lands to increase conveyance/storage of floodwaters;

   d. Floodproofing East Prairie through improving storm water conveyance, construction of berms, construction of detention basins, or selective buyouts of properties;

   e. The recommended alternative as outlined in the June 2002 RSEIS; and

   f. A combination of the aforementioned options.

7. If there are no other feasible alternatives, as agreed upon by the department and the Corps, to modifying the St. John's Bayou waterways and the portion of the project is constructed according to the June 2002 RSEIS preferred alternative number 3.1B, the following conditions shall apply:

   a. Any material to be sidecast along the impacted St. John's Bayou waterway will be disposed in accordance with the June 2002 RSEIS. Excavated materials shall be utilized to the maximum extent feasible in other components of this project. No dredged material shall be deposited into jurisdictional waters except those identified in the 2002 RSEIS and mitigated for as required.

   b. Artificial structures (including, but not limited to weirs, current deflectors, rock barbs) shall be installed to create a sinuous low-flow channel.

   c. Any excavation shall be limited to one bank only in order to preserve riparian corridor and aquatic organism habitat.

   d. Work shall be conducted during low flow whenever possible.

8. The Clean Water Act, Section 402, requires a permit for land disturbance activities impacting one or more acres of total area for the entire project. The general permit requires the development of a Storm Water Pollution Prevention Plan (SWPPP). The contents of the SWPPP are specified in the permit. The Corps shall submit a copy of the site-specific SWPPP developed for compliance with this permit prior to the initiation of any regulated activities. Clearing of vegetation shall be the minimum necessary to accomplish the activity, and shall be done in a manner outlined in the SWPPP.

9. If monitoring shows that additional degradation of jurisdictional waters results from this project, the applicant must either implement modifications to operations to avoid impacts or undertake additional mitigation to ameliorate impacts. The applicant shall consult the department throughout this process. If the department determines that the project has resulted in additional degradation of jurisdictional wetlands which cannot be corrected or avoided by modifying operations or undertaking additional mitigation to ameliorate these impacts, the department may review, suspend, modify or withdraw the 401 Water Quality Certification.

10. Care shall be taken to keep machinery out of the waterways. Fuel, oil, other petroleum products, equipment and any solid waste shall not be stored below the ordinary high water mark at any time. All precautions shall be taken to avoid the release of wastes, fuel or any toxic or harmful material to streams and other adjacent water bodies as a result of this operation. Petroleum products spilled into any water body or on the banks where the material may enter waters of the state shall be immediately cleaned up and disposed of properly. Spills of petroleum must be reported as soon as possible to the department's 24-hour Environmental Emergency Response number at (573) 634-2436 and in accordance with federal and state laws and rules regarding petroleum projects.

If the applicant does not comply with any of the conditions of this certification the department may review, suspend, modify, or withdraw this certification.

This certification is being issued under Section 401 of the Clean Water Act. This certification does not relieve the applicant from its duty to comply with all other federal, state or local laws, regulations or permits. For this certification to remain effective, the applicant must obtain all necessary permits required under federal and state law. This certification is only valid for impacts as expressly described above. If there should be modification of this project that may have water quality impacts, including any failure to successfully mitigate as described in the application, this certification may be reviewed, suspended, modified, or withdrawn.

This department may review this certification every 5 years to assure that the project has not caused and apparently will not cause the general or numeric criteria to be exceeded nor impair beneficial uses established in Water Quality Standards, 10 CSR 20-7.031. This review may include but is not limited to on-site inspections, document reviews and requests for additional information to be provided by the applicant as necessary to make this determination.

If the department obtains or is made aware of any information indicating that this project may adversely affect water quality, including the natural biological community, or that mitigation is unsuccessful, the department shall review, suspend, modify or withdraw the certification.

Pursuant to the Missouri Clean Water Law, RSMo Section 644.052.9, this 401 Water Quality Certification shall be valid only upon payment of a fee of seventy-five dollars ($75.00). The enclosed invoice contains the necessary information on how to submit your fee. Payment must be received within ten (10) days of receipt of this certification. Upon receipt of the fee, a copy of the certification will be mailed to the applicable office of the Corps to inform them the certification is now in effect.

MEMORANDUM OF UNDERSTANDING
For the Protection of Big Oak State Park as it relates to the St. John's Bayou/New Madrid Floodway Project

THIS MEMORANDUM OF UNDERSTANDING is entered into by the Missouri Department of Natural Resources (MDNR) and the Memphis District, United States Army Corps of Engineers (USACE).

WITNESSETH:

NOW THEREFORE, in consideration of mutual convenants, promises and representations, the parties agree as follows:

1) PURPOSE: The purpose of this Memorandum of Understanding (MOU) is to:

A) Compensate for the effects of reduced Mississippi River flooding on the natural resources and environment within Big Oak Tree State Park; and,

B) Maintain and enhance the value of the park as a regional biological preserve and National Natural Landmark; and,

C) Facilitate operation of the Big Oak Tree State Park hydrology project by acquisition of adjacent low-lying areas as part of the project mitigation; and,

D) Assure a continued source of Mississippi River water to Big Oak Tree State Park, and the capacity to manipulate Mississippi River water by purposeful flooding or drainage to mimic a natural hydrology for this mesic bottomland forest and swamp.

The United States Army Corps of Engineers shall:

1) ACQUISITION: Acquire from willing sellers approximately 1800 acres of land immediately surrounding Big Oak Tree State Park which are conceptually identified on the attached map. These will be a priority focus of the project mitigation plan and among the first areas pursued for acquisition.

2) RESTORATION OF ACQUIRED LANDS: Reforest these frequently flooded agricultural lands with a variety of Bottomland Hardwood species (Revised supplemental Environmental Impact Statement Dated July 2002, Appendix L, Section 8.1), in general accordance with guidelines established in the 1998 Final SEIS for the Mississippi River Levees Project with consideration of modifications as may be recommended by MDNR land managers. All tree species will be those known to naturally occur in the park, and the planting stock will be from native genotypes. Tree plantings will be monitored once a

year for five years to assess survival rates. Plantings will be considered successful if survival is equal to or greater than 70 percent. If survival rates fall below 70 percent additional plantings will be made to achieve the required survival rate.

3) DESIGN AND CONSTRUCT HYDROLOGY PROJECT: Design and construct the proposed Big Oak Tree State Park hydrology project, modified per USACE specifications to ensure engineering stability. At a minimum, this must be sufficient to deliver Mississippi River water inside the park via gravity feed, inundate it during periods of high water to at least elevation 291 feet NGVD, and drain the park via gravity feed down to at least elevation 288 feet NGVD. This includes:

A) Acquiring the easements alongside the park (including the new acquisitions) that will be necessary to build and maintain the berms and water control structures. The berms, if necessary, will be constructed on acquired lands or Corps obtained easements along the existing park boundaries.

B) Provide a direct connection to supply surface water as a water source for the park from the Mississippi River. This will be by gated culvert to allow river water to flow through the frontline levee at times of higher stages, to mimic natural flooding.

C) Provide the necessary design work and construction for the berms, and water control structures; and include all new acquisitions within the perimeter of the berms. Berms shall not be constructed until all acquisition is complete in order to maximize effective park hydrologic unit area.

4) TIME FRAME: Although acquisition efforts may continue for some time, the Big Oak Tree hydrology project shall be constructed concurrently with other floodway features of the Corps project. The hydrology project shall be completed prior to operation of the proposed New Madrid Floodway project.

The Missouri Department of Natural Resources shall:

1) OPERATE AND MAINTAIN THE HYDROLOGY PROJECT. The Corps and the MDNR shall work together on all engineering features to minimize adverse impacts to the park.

Both the Missouri Department of Natural Resources and the United States Army Corps of Engineers shall:

1) MODIFICATIONS: Modifications to the terms of this MOU shall be made through letter agreements which shall be made a part of this MOU and which have been signed by both agencies.

2) INCORPORATE INTO RECORD OF DECISION: These requirements of this Memorandum of Understanding shall become a part of the Record of Decision through

the Water Quality Certification conditions for the New Madrid Floodway/St. John's Bayou project.

3) PENALTIES: Failure to meet the conditions of this MOU is grounds for reviewing, suspending, modifying or withdrawing water quality certification for the project.

IN WITNESS WHEREOF, the parties have entered into this MOU on the date last written below.

Executed by MDNR this 9th day of June, 20 02.

Executed by USACE this 5 day of June, 20 03.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

By: _____

SCOTT TOTTEN, Director
Division of Water and Soil Conservation

U.S. ARMY CORPS OF ENGINEERS

By: _____

JACK V. SCHERER, Colonel
District Engineer, Memphis District

ATTACHMENT 2

U.S. Fish and Wildlife Service Supplemental Fish and Wildlife Coordination Act Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Columbia Ecological Services Field Office
101 Park DeVille Drive, Suite A
Columbia, Missouri 65203-0057
Phone: (573) 234-2132 Fax: (573) 234-2181

March 15, 2006

Colonel Charles O. Smithers III, District Engineer
U.S. Army Corps of Engineers
167 North Main Street B-202
Memphis, Tennessee 38103-1894

Dear Colonel Smithers:

This constitutes the U.S. Fish and Wildlife Service's (Service) Supplemental Fish and Wildlife Coordination Act (FWCA) Report for the St. Johns Bayou and New Madrid Floodway Project, Missouri. This Supplemental FWCA Report pertains to revised fish and wildlife mitigation measures proposed by the Corps of Engineers (Corps) in its December 2005 Draft Revised Supplemental Environmental Impact Statement 2 (DRSEIS 2). This Report supplements the analyses and recommendations provided by the Service in previous FWCA reports, planning aid letters, and comments on prior environmental impact statements.

Since July 2005, the focus of the Corps' planning efforts for this project, as reflected in the DRSEIS 2, has involved a major re-evaluation of measures to compensate for project caused fishery losses in the New Madrid Floodway. In June 2005, the Corps decided to withdraw its 2003 Record of Decision for the project and conduct this re-evaluation due to an error in how it addressed fishery impacts and mitigation needs in the 2002 Revised Supplemental Environmental Impact Statement (RSEIS).

Early in the planning process for this project, the Habitat Evaluation Procedures (HEP) Team, which consists of the Corps, Service, and Missouri Department of Conservation (MDC), agreed upon a fish model to be used in evaluating the project's impacts and mitigation needs for fish rearing. Using this model, the HEP Team determined that 8,375 Average Daily Flooded Acres (ADFAs) were needed to compensate for fish rearing losses. This mitigation benchmark was subsequently addressed in the Service's FWCA Reports. However, as a basis for determining mitigation requirements in the 2002 RSEIS, the Corps used 8,375 acres instead of 8,375 ADFAs. Due primarily to the drainage and flood damage reduction objectives of the project, more than 8,375 acres are needed to achieve 8,375 Average Daily Flooded Acres. Thus, the mitigation needs for the project were underestimated in the 2002 RSEIS.

To address this deficiency in fishery compensation, the Corps identifies additional conceptual mitigation measures in the DRSEIS 2. Among the measures the Corps proposes are four categories of measures to add ADFAs and Average Annual Habitat Units (AAHUs) for fishery compensation: (1) modification of the design of construction borrow pits; (2) modification of gate operations; (3) creation, restoration, or enhancement of large permanent water bodies -

primarily existing Mississippi River floodplain lakes (oxbows) located on batture lands, such as Riley Lake; and (4) reforestation of batture lands. These proposed mitigation categories can be further categorized as those occurring inside the project area (Nos. 1 and 2) and those outside the project area (Nos. 3 and 4).

The measure involving modification of the design of construction borrow pits is incorporated by the Corps into a "basic mitigation feature," which includes most of the mitigation features presented in the 2002 RDEIS and stipulated in the section 401 Water Quality Certification issued by Missouri Department of Natural Resources. The measures in the remaining three categories are identified by the Corps as additional measures to compensate for fishery losses remaining in the New Madrid Floodway. These three categories are presented by the Corps in the DRSEIS 2 in four "mitigation scenarios," with varying costs and acreages, with the "basic mitigation feature" being a part of each scenario.

The Corps provides a brief description of two other measures to compensate for the loss of fish rearing habitat in the New Madrid Floodway: (1) increasing flood duration on reforested areas from April 1 to May 15; and (2) restoration of small, permanent water bodies within the project area. However, neither in its presentation of the four mitigation scenarios discussed above nor in other descriptions of these measures in the DRSEIS 2 does the Corps define any values (AAHUs) for these other measures in compensating for New Madrid Floodway fish rearing losses. The Service focuses its analysis and comments provided below on the four categories of measures where the Corps has assigned compensation values.

Modification of the Design of Construction Borrow Pits

The Corps plans to construct 387 acres of borrow pits in the lower area of the St. Johns Bayou as it borrows material for levee construction. The Corps now proposes to modify the design of these pits to improve fishery habitat by providing a diversity of water depths and sinuous shorelines, establishing islands, and placing structures (i.e., trees). According to the Corps, the borrow pits will increase the compensation for lost fish rearing habitat because they will provide permanent water bodies during the fish rearing season and will be designed to allow free ingress and egress of Mississippi River fishes during flood events. The Corps believes these modified borrow pits will provide high quality habitat supporting a high density of fish and diversity of fish species and could provide an additional 1,571 fish rearing AAHUs.

During all previous mitigation planning efforts for this project, the Corps, Service, and MDC agreed that modified borrow pits would only be considered as compensation for project-caused losses of other permanent water bodies – not as compensation for the loss of river-floodplain connectivity and fish rearing habitat in the New Madrid Floodway. The Corps presents no information in the DRSEIS 2 concerning how these borrow pits would be designed to provide access for Mississippi River fishes. Furthermore, anecdotal information, not scientific documentation or predicative models, is used in the DRSEIS 2 to describe the ability of Mississippi River fishes to use these structures in completing their reproductive life cycle. The Service acknowledges that there is limited movement of fishes through the gates in the St. Johns Bayou. However, the extent of fish movement into the St. Johns Bayou is considerably less than the unrestricted access that River fishes currently have into and out of the New Madrid Floodway.

Modification of Gate Operations

The Corps is proposing to modify the gate operations in the New Madrid and St. Johns Bayou to provide compensation for the loss of fish rearing habitat caused by the closure of the New Madrid Floodway. In the 2002 RSEIS, the Corps proposed a compensation measure that left the gates in the New Madrid Floodway open to an elevation of 284.4 feet NGVD when the Mississippi River is flooding during the period April 1 to May 15. When river flood levels drops below 284.4 feet NGVD, the gates would be opened to allow for the draining of water that had pooled inside the Floodway. The new proposed gate operation would still have the gates open until river flooding reached 284.4 feet NGVD, at which time they would be closed. The proposed change involves leaving the gates closed after river levels drop, thereby creating a pool behind the gates until May 15, at which time the gates would be opened and the pooled water would be drained.

The Corps presents four different scenarios for gate operations for the New Madrid Floodway. Three of the scenarios involve holding the pool elevation constant at 284.4 feet, 283.4 feet, or 282 feet NGVD over the entire period of April 1 to May 15. In the fourth scenario, the pool elevation would be at 284.4 feet from April 1 to April 30 and 283.4 feet from May 1 – May 15. The ponded area in the New Madrid Floodway created by the modified gate operations corresponds to the project sump area, as described in the 2002 RSEIS. The size of the sump area is approximately 2,000 acres, of which 800 acres is currently enrolled in the Wetland Reserve Program (WRP). The sump area is the lower elevation portion of the Floodway where the new pumps would operate to evacuate interior drainage water when the river is in flood stage and the gates are closed. Under the current proposal, the pumps would be used to remove interior water to an elevation of 284.4 feet NGVD (or to the elevation described in the other three gate scenarios). In the DRSEIS 2, the Corps also provides a similar modified gate operation for the St. Johns Bayou, although with only one elevation (283 feet) for the entire period.

The Corps believes the ponded area created by these modified gate operations would provide fish spawning and rearing habitat that is comparable to the habitat that currently exists in the Floodway during flood events. The Corps states that fish will enter the Floodway and the pooled area while the gates are open, complete spawning and rearing in the impounded pool, and return to the river when the gates are re-opened. For the New Madrid Floodway, the Corps identifies the following range of fish rearing compensation values for this measure: 2,000 acres (at 284.4 feet NGVD) to 853 acres (at 282 feet NGVD) of spawning and rearing habitat; 1,531 ADFAs (at 284.4 feet) to 707 ADFAs (at 282 feet); and a gain in AAHUs ranging from 2,699 (at 284.4 feet) to 1,145 (at 282 feet).

The importance of the Floodway in providing Mississippi River fishes open access to valuable backwater habitat to complete reproductive and early life stages has been well documented by the Service, MDC, Corps, and several researchers. To qualify as in-kind compensation, a mitigation measure must allow river fishes to enter and leave the Floodway unabated. Such mitigation measures must ensure successful fish recruitment – otherwise, the mitigation will fail to achieve its intended purpose. Factors that should be considered include the natural timing of fish movements in relation to their reproductive cycles and river stages, water temperature and other water chemistry, and habitat that allows young fish to avoid predators.

The Corps has not provided information indicating that it has consulted with fish-passage engineering experts or that it has conducted any fish-passage studies to scientifically evaluate the ability of river fishes to freely access the Floodway through the gates. On several occasions, the Service has requested such an evaluation, including in our August 11, 2005, Planning Aid Letter. Furthermore, information is needed to determine if such artificially created habitats would provide the other necessary features (e.g., timing, temperature) for successful fish recruitment. Without conclusive information on this issue, the Service maintains its position that in-kind compensation of fish spawning and rearing habitat cannot be achieved inside of the Floodway with the proposed project. The Service recommends that the proposal to modify gate operations to pond water for fish spawning and rearing be withdrawn from consideration as a fishery mitigation measure until these studies have been completed.

Creation, Restoration, or Enhancement of Large, Permanent Water Bodies

With this category of mitigation measures, the Corps is proposing to compensate for the loss of New Madrid Floodway fish spawning and rearing habitat by modifying oxbow lakes and chutes that occur on the Mississippi River floodplain (batture lands). A number of such floodplain lakes exist in the batture. These lakes are an integral component of the river's ecosystem. There are now fewer of these oxbows lakes and chutes due to the restriction of the Mississippi River floodplain by extensive levees and training dikes. Typically, during normal river flows, these depressional areas of the floodplain are not directly connected to the river. Some river fishes remain in these oxbow lakes after flood waters recede. However, because the substrates of these oxbows consist of permeable, alluvial soils, the water levels in them equalize with river levels, resulting in the oxbows becoming very shallow or completely dewatered after flood waters recede.

The Corps' proposal involves modifying these oxbows to provide more surface area of water and greater water depths. By converting these lakes to hold more water, the Corps believes the lakes will provide greater habitat value for fish spawning and rearing, thus providing compensation for the loss of the fish habitat in the Floodway. Furthermore, the Corps states in the DRSEIS 2 that providing greater water depths in the oxbows after the river has receded will improve fish survival and contribute to recruitment of the river's fishery when they are re-flooded.

The Corps uses Riley Lake, located at the tip of Donaldson Point, to describe how the oxbows could be modified to compensate for the loss of fish spawning and rearing habitat. A weir structure would be placed in Riley Lake that would impound water at a specific elevation after flood waters recede. For instance, under normal conditions, Riley Lake contains 36 acres of permanent water surrounded by bottomland hardwood forest and farmland. If a weir were constructed with the control elevation set at 285 feet NGVD, 112 acres of bottomland hardwood forest and 97 acres of farmland would be inundated, along with the original 36 acres of the lake, providing a total of 245 acres of permanent water and 399 AAHUs of fish rearing habitat. With a weir set at an elevation of 289 feet NGVD, 295 acres of hardwood forest and 349 acres of farmland would be converted, providing a total of 680 acres of permanent water and 1,290 AAHUs of fish rearing habitat (Table 2.4 of DRSEIS 2). The fish recruitment concept promoted by the Corps is that river fish trapped in the converted lake as flood waters recede would reproduce and some of these adults and their progeny would return to the river in the next flood event. This cycle would be repeated with each flood event. In Table 2.3 of the DRSEIS 2 (Page 40), the Corps identifies seven other oxbow lakes that could potentially be modified.

The Service considers the conceptual proposal for Riley Lake to be a conversion of valuable, existing habitat types to an alternative habitat type. The conversion of oxbow lakes to permanent water bodies will replace areas that currently provide fisheries habitat and Mississippi River ecological functions. In addition, the proposal for Riley Lake will result in the loss of valuable floodplain hardwood forests, with no compensatory mitigation proposed to offset this loss (Page 40 of DRSEIS 2). The DRSEIS 2 does not indicate the acreage of hardwood forest that would be lost with the possible increase in surface area of permanent water at each of the other floodplain lakes identified in Table 2.3 as possible sites for such conversions.

Furthermore, there might be a major constraint in modifying areas like Riley Lake to provide more permanent water. Creating an impoundment through the use of a weir might not maintain greater water depths for an extended period if the alluvial soils underlying Riley Lake are highly permeable. If this is the case, water elevations will drop to equalize with the river's water surface elevation. This could be the case with most of the oxbows and chutes on the Mississippi River floodplain. Prior to committing to the possible use of this mitigation measure, the Corps (if it has not already done so) should determine if these floodplain lakes can maintain greater water depths for extended periods of time as water levels on the river fall.

Reforestation of Batture Lands

For two of the mitigation scenarios in the DRSEIS 2 (Scenarios A and C), the Corps proposes that reforestation of batture lands will compensate for the loss of fish spawning and rearing habitat in the New Madrid Floodway. Under Scenario A, reforestation of 200 acres of batture lands would add 19 AAHUs. Under Scenario C, reforesting 1,050 acres would add 117 AAHUs for the New Madrid Floodway losses.

The Service acknowledges that the reforestation of batture lands could improve fishery habitat value of these areas and is not opposed to the Corps implementing this action. However, replanting trees on the batture lands cannot provide in-kind replacement or compensation for the loss of backwater spawning and rearing habitat in the Floodway. These are two separate areas and two different kinds of fishery habitat. The Service has repeatedly stressed throughout the multiple mitigation planning cycles for this project that restoring or enhancing the habitat value of the batture lands for Mississippi River fishes does not address compensation in the Floodway.

Summary and Recommendations

Throughout the years of our involvement with the planning of the St. Johns Bayou and New Madrid Project, the Service has placed special emphasis on the critical importance that the Mississippi River-New Madrid Floodway connection has in providing valuable fishery resources and ecosystem functions. This has remained our highest mitigation priority because this river-floodplain connection is absolutely vital to maintaining a healthy, sustainable fishery in this section of the Mississippi River. Completing the closure of the New Madrid Floodway will eliminate a major area of river-floodplain connectivity in this region of the River and the very last area of its kind in the State of Missouri.

The exceptional value of backwater areas of the Mississippi River to the River's regional fishery and the on-going threats to these backwater areas requires that we continue to explore and implement mitigation measures that avoid and minimize further losses. The Service is unaware

of any feasible mitigation techniques that can provide in-kind replacement to offset the permanent loss of this habitat and associated ecological processes. We appreciate the Corps' efforts in evaluating and presenting a variety of ideas to compensate for the fish habitat losses associated with the New Madrid Floodway closure. However, the Service cannot concur that the Corps' mitigation proposals presented in the DRSEIS 2 will sufficiently mitigate for the project-caused fish habitat losses in the New Madrid Floodway.

The Service's position on this issue has not changed from our previous FWCA Reports. We continue to recommend that the Corps and the project sponsor re-evaluate and formulate plans that involve measures to minimize, not attempt to compensate, the loss of the Floodway's fishery habitat and the river-floodway connection. We still believe that a setback closure levee could be constructed in a manner that meets the flood-reduction objectives of the projects; provides economic benefits to Floodway farmers, residents, and local communities; and minimizes the loss of the irreplaceable fishery resources. It is our hope that we can begin to collaboratively develop a set of plans that incorporates all of these important features.

We appreciate the opportunity for the Service to participate in this updated mitigation planning effort and look forward to working with the mitigation team in making progress in the development of a fully functional mitigation plan. We want to take this opportunity to provide specials thanks to two people on your staff, Danny Ward and Kevin Pigott. Mr. Ward and Mr. Pigott were always cooperative and timely in answering our questions, providing us with updated information, and assisting the mitigation team in other ways during our participation with this mitigation planning effort.

Please do not hesitate to contact me if you have any questions concerning any information presented in this Supplemental FWCA Report.

Sincerely,

Charles M. Scott

Charles M. Scott
Field Supervisor

cc: RD, FWS, Ft. Snelling, MN (ES)
Director, MDC, Jefferson City, MO (Policy Coordination)

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ATTACHMENT 3

NRCS Correspondences

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
Parkade Center, Suite 250, 601 Business Loop 70 West
Columbia, Missouri 65203

October 5, 2005

Larry A. Sharpe, Project Manager
St. John's Bayou/New Madrid Floodway
167 North Main Street, B202
Memphis, TN 38103-1894

Dear Mr. Sharpe:

As requested, NRCS has evaluated the St. John's Bayou/ New Madrid Floodway project for its effect upon wetland conservation provisions of the Food Security Act. A copy of our report is attached.

If you have any questions, please call Harold Deckerd, 573-876-0912.

Sincerely,

ROGER A. HANSEN
State Conservationist

Attachment

cc: Merlin Bartz, RAC, NRCS
Senator Christopher Bond, Cape Girardeau, MO
Representative Jo Ann Emerson, Cape Girardeau, MO
Ron Darden, AC, Jackson, NRCS
Mike Wells, Deputy Director, MDNR
Jennifer McCarthy, NRCS, Washington DC

USDA – Natural Resources Conservation Service's Farmed Wetland Evaluation for the U. S. Army Corps of Engineer's St. John's Bayou/New Madrid Floodway Project

Pat Graham, Biologist
Clayton Lee, Soil Scientist
Nancy Ayers, Wetland Team Coordinator (SE-MO)
September 29, 2005

Background Information:
The Missouri NRCS conducted its original Food Security Act wetland inventory (non-certified determinations) using remote sensing techniques that referenced 1984-1989 Farm Service Agency compliance slides, 1980 base photography, color infrared photography, Fish & Wildlife Service National Wetland Inventory Maps, and soil surveys.

The COE's St. John's Bayou/New Madrid Floodway Project, Environmental Impact Statement included an estimate of impacts to wetlands [including those that meet the NRCS Farmed Wetland (FW) definition].

Since the project would impact wetlands (including FWs), questions about USDA program participant eligibility arose. NRCS and the Farm Service Agency make program eligibility determinations based on certified wetland determinations. Because of this, Missouri NRCS was advised to review the original wetland inventory (non-certified wetland determinations) for accuracy.

Follow-up Actions:
NRCS assembled a three person team and evaluated the original wetland inventory (within the COE's project area) from September 26-29, 2005 for its use in this project's planning stage.

The COE estimated/identified impacted farmed wetlands (backwater flooding in the New Madrid floodway and headwater flooding in the St. John Bayou) using an elevation of 290.5 feet. This elevation was chosen as a conservative level and is noted in narratives in the impact statement.

Staff assembled remote sensing resource materials and noted the climatic conditions:

A. Mississippi County – Farm Service Agency "compliance slides," we used three (3) wet and two (2) dry/normal years. Aerial photos: 1975 soil survey (dry), 1980 wetland inventory (dry), March 1988 Farm Service Agency base maps (dry), and June 2003 color infrared.

B. New Madrid County – Farm Service Agency "compliance slides," we used two (2) wet and two (2) dry/normal years. Aerial photos: 1974 soil survey (normal), 1980 wetland inventory (dry), March 1992 Farm Service Agency base maps (dry), and June 2003 color infrared.

We selected three one-mile wide transects/sample areas to evaluate the accuracy and applicability to the Wetland Conservation provisions (the sample areas represent ~20% of the project area as outlined by the COE):

1. Transect #1 – East edge starts at: T. 24 N., R. 14 E., Section 11 and ends at T. 24 N., R. 17 E., Section 10 (~17 ½ miles).
2. Transect #2 – East edge starts at: T. 23 N., R. 15 E., Section 6 and ends at T. 23 N., R. 17 E., Section 2 (~17 miles).
3. Transect #3 – East edge starts at: T. 23 N., R. 14 E., Section 35 and ends at T. 23 N., R. 17 E., Section 35 (~7 miles).

Findings:
Our sampling shows the original wetland inventory to be adequate for delineating farmed wetlands (FW) for planning purposes in the project area.

None of the slides available for our sample showed any wide spread effects of backwater flooding or river level stages that would initiate gate closure for the St. John's Bayou (no headwater flooding was observed). Most wetland signatures were due to inundation or moisture due to precipitation & local flooding events.

NRCS reviewed the difference between NRCS and the COE in elevations used for determining FWs. NRCS' elevation (281.0 feet) was completed in 1989 by determining a 2 year 15 day elevation at the Chester, Illinois and Memphis, Tennessee gages; profiles were plotted between these points by paralleling COE profiles on the Mississippi river.

The COE elevation (290.5 feet) represents a 2 year peak discharge elevation. Since the COE is more conservative, NRCS used it to outline the greatest possible area affected; this area was then spot checked using remote sensing techniques as outlined above. For planning purposes, NRCS supports the COE's elevation.

Summary:
This sampling procedure verified that the original Food Security Act wetland inventory is adequate for estimating FWs in the project area. The most reliable method is to conduct an acre by acre analysis with current mapping conventions to obtain exact data. Due to the lack of landowner requests, this method is not possible at this point.

The observation that the use of new mapping conventions would yield greater amounts of wetlands did not hold true in our sample. Wetland kinds and acres provided in previous NRCS correspondence are valid.

The COE's projections of the affected wetlands and the resulting mitigation are more than adequate for NRCS wetland conservation provisions of the Food Security Act.

USDA United States Department of Agriculture

Natural Resources Conservation Service

Parkade Center, Suite 250
601 Business Loop 70 West
Columbia, Missouri 65203

May 17, 1999

Commander
Memphis District Corps of Engineers
ATTN: CEMVM-PM-E
167 North Main Street, B-202
Memphis, TN 38103-1894

The Natural Resources Conservation Service (NRCS) offers the following comments in response to your April 9, 1999 letter concerning the St Johns Bayou and New Madrid Floodway Draft Supplemental Environmental Impact Statement (SEIS). We have restricted our comments to the wetland portion of this document.

NRCS would like to clarify that the wetland determinations conducted under 1985 Farm Bill were done correctly according to mapping conventions in use at that time. The 1985 mapping conventions were developed with a multi-agency team of the U.S. Fish and Wildlife Service, Missouri Department of Conservation and NRCS.

Current Farm Bill (1996) policy requires NRCS to utilize the wetland mapping conventions developed in response to the January, 1994 Memorandum of Agreement (MOA) among the Department of Agriculture, the Environmental Protection Agency, the Department of the Interior, and the Department of the Army Concerning the Delineation of Wetlands for Purposes of Section 404 of the Clean Water Act and Subtitle B of the Food Security Act. As stated in the SEIS, use of the current mapping conventions for agricultural wetlands would result in an increase in the area designated as farmed wetlands (FW). NRCS wetland policy also requires an on-site verification of all wetland determinations conducted under current procedure.

Farmed wetlands are those areas that were manipulated prior to December 23, 1985 making the production of an agricultural commodity production possible; an agricultural commodity was produced at least once prior to December 23, 1985; are not abandoned; and have a 50% chance of being seasonally ponded or flooded for at least 15 consecutive days during the growing season, or 10% of the growing season, whichever is less, under normal conditions. The difference in the COE 5% growing season requirement and the 10% growing season Farm Bill guideline would lead to some differences in farmed wetland acres identified.

NRCS did offer for your use in this project the current MOA mapping conventions. The use of these conventions with on-site verification would provide the most accurate listing of farmed wetlands in the project area.

NRCS Response

NRCS will provide any USDA participant a certified wetland determination only on a request basis. County or project wide wetland determinations and distribution to USDA program participants are no longer done due to a change in NRCS guidance received in 1995 from the Secretary of Agriculture. However, any wetland information generated by the COE for this project will be used by NRCS as reference material in any future wetland determinations requested by USDA program participants.

As stated in our April 7, 1999 letter to you, we feel that the information you have developed on agricultural wetlands in the project is good for project planning and impact analysis.

It should be noted that landowners with areas meeting FW criteria may be affected by project activities. Removal of wetland hydrology could result in a designation of converted wetlands and could affect USDA program participation. If project impacts to farmed wetlands are mitigated adequately and a 404 permit is issued for the project, NRCS will consider mitigation appropriate for Farm Bill activities and work with affected landowners on a request basis to ensure USDA program compliance.

We appreciate the opportunity to provide input. Please contact Pat Graham or Clayton Lee (573-876-0908) of my staff if you need further information.

ROGER A HANSEN.
State Conservationist

cc. Ron Darden, ASTC-FO, NRCS, Cape Girardeau, MO

NRCS Response
98

United States Department of Agriculture

Natural Resources Conservation Service

Parkade Center, Suite 250
601 Business Loop 70 West
Columbia, Missouri 65203

May 29, 1998

Colonel Gregory Bean
Memphis District Corps of Engineers
167 North Main St., Suite 159
Memphis, TN 38103

Dear Colonel Bean:

This letter is to provide wetland data for the St. John's Bayou – New Madrid Floodway Project. The data was compiled from the Natural Resources Conservation Service's (NRCS) wetland inventory maps.

Wetland delineation for the St. John's Bayou starts at the New Madrid flood gates and includes all land between the Farenburg Levee and the Birds Point – New Madrid Levee, north to Highway P in New Madrid County. Wetland delineation for the New Madrid Floodway starts at the New Madrid Levee opening and includes lands between the Birds Point – New Madrid Levee and Mississippi River Levee, north to Township 25.

The following is a breakdown of wetland (land use) types by percentage:

	St. John's Bayou	New Madrid Floodway
Prior Converted Cropland (PC)	85.3%	90.9%
Wetlands	14.7%	8.7%
- Converted Wetlands (CW)	0.0%	0.4%
- Wetland (shrub) (WS)	0.4%	0.3%
- Wetland (Open) (WO)	0.7%	0.2%
- Farmed Wetlands (FW)	0.4%	0.4%
- Wooded Wetlands (WW)	9.2%	6.4%
- Wetland (Emerged) (WE)	0.2%	0.2%
- Artificial Wetland (AW)	4.0%	0.7%
Nonhydric Soils (NH)	0.0%	0.4%

Please direct questions regarding this data to either Mike Wells, Assistant State Conservationist, at (573) 876-0900, or Clayton Lee, FSA Soils Specialist, at (573) 876-0908.

Sincerely,

ROGER A. HANSEN ACTING
State Conservationist

COPY

cc: Ron Darden, Area Conservationist, NRCS, Cape Girardeau, MO

USDA NRCS
Natural Resources Conservation Service

Parkade Center, Suite 250
601 Business Loop 70 West
Columbia, Missouri 65203

Subject: CPA – COE/NRCS Wetland Maps
St. Johns Basin-New Madrid Floodway

Date: April 7, 1998

To: Chris Mills, Biologist
Environmental Analysis Branch
Memphis COE District
167 N. Main Street
Memphis, TN 38103

File code: 180-12-11-6

As requested, this letter provides comments on your wetland maps for the St. Johns Basin-New Madrid Floodway project. It is noted that this COE map was produced using satellite image of the project area and identifies wetland areas at elevations at 290 feet or less [inundated 5% of the growing season (20 Mar-12 Nov)]. Our comments focus on the relationship of this map to the Natural Resources Conservation Service (NRCS) county level wetland inventory maps and determinations.

This map and the NRCS county level wetland inventory maps were both developed by remote sensing techniques and have had limited ground truths. Currently, both COE and NRCS complete onsite investigations for site specific data. The NRCS completes wetland determinations on request only.

Our wetland mapping conventions were developed by an interagency workgroup. I have enclosed a copy for your review.

Basic interpretation of your map:

A) Three criteria are used for identification of wetlands (hydric soils, wetland hydrology, and hydrophytic vegetation).
B) Hydric soils criteria can be used to interpret this map by grouping them into three major categories:
   1) Histosols except Folists (identified in Stoddard County only).
   2) Soils that meet hydric criteria by saturation only (water table).
   3) Soils that meet hydric criteria by frequently flooding or ponding for long or very long duration.
C) Current soil survey mapping does not include any Histosols in the project area.
D) The project area does include soils that meet hydric criteria by saturation only. The Food Security Act (as amended), provides that: Any wetland area with soils that meet hydric criteria by saturation only, were manipulated [alteration of hydrology and/or removal of woody vegetation (including stems and stumps)], and cropped at least one time prior to December 23, 1985, would meet the definition of Prior Converted Cropland (PC). All other areas would be designated as a wetland (W). Abandonment of PC will only be considered if the land does not remain in agricultural use. There will be areas that meet both PC and W that are not on your map. We do have published soil surveys and county hydric soils lists that can be referenced in conjunction to your land cover map. Since we do not have a digital soil survey product for the project area, the review would be quite tedious.
E) The project area does include soils that meet hydric criteria by frequently flooded or ponded for long or very long duration. I believe your map does a good job of representing those areas. Possible wetland determinations in these areas: W, PC, Farmed Wetland (FW), Farmed Wetland Pasture (FWP), Converted Wetland (CW), Other Waters (OW), and several other exemption designations.

1) W= areas where land covers include sandbar, bottomland hardwood (blh), marsh, cypress/tupelo, riparian, and scrub/shrub marsh.
2) PC= areas protected (COE levee) from flooding/ponding or other significant alteration of hydrology (drainage ditches that remove flood/pond water) and land covers such as corn, cotton, soybeans and potatoes.
3) FW= areas still meet frequently flooded/ponded for long or very long duration, have some alteration of hydrology and land covers such as corn, cotton, soybeans and potatoes.
4) FWP= areas still meet frequently flooded/ponded for long or very long duration, have some alteration of hydrology and land covers such as heb.veg. and pasture.
5) CW= extremely limited extent, but could exist in any setting with agricultural type land covers.
6) OW= areas identified with open water.

Overall, the map looks good. There are some areas with nonagricultural land cover that would meet wetland criteria (see item "D"). With a review of soil mapping and the county hydric soils list, those areas could be identified.

Also, there will be other small areas that our remote sensing techniques will not detect.

If you have any questions, please feel free to call (573) 876-9409.

CLAYTON E. LEE
Soil Scientist/FSA Soils Specialist

Attachment

cc: Ronald A. Darden, AC, NRCS, Cape Girardeau, MO
Allan R. Johnston, WETS/TL, NRCS, Cape Girardeau, MO
Darin W. Gant, DC, NRCS, Benton, MO
Randy Freeland, SRC, NRCS, Columbia, MO

INDEX OF USEFUL TERMS

Index of Useful Terms

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