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 As a result, the ROD was withdrawn on June 23, 2005, and a decision was made to prepare this Revised Supplemental Environmental Impact Statement Number 2 (RSEIS 2) to clarify and address issues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 (50th 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 25th 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.

<u>Comment:</u> 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.

<u>Response:</u> 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.

<u>Comment:</u> 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.

<u>Response:</u> 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.

<u>Comment:</u> 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).

<u>Comment:</u> 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.

<u>Response:</u> 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

<u>Modification of the Design of Construction Borrow Pits</u>

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:

<u>Reforestation of Batture Lands</u>

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 <u>Summary and Recommendations</u> 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 <u>Summary and Recommendations</u> 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 <u>Summary and Recommendations</u> 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 <u>Summary and Recommendations</u> 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 <u>Principles and Guidelines</u> 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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Shawn Phillips, P.E.	Engineer	15 years Environmental Engineering	Principal Author
Kevin Pigott	Fish and Wildlife Biologist	3 yrs USACE; 4 yrs MS Dept. of Env. Quality; 5.5 yrs WES (ERDC)	Principal Author
David Reece	Fish and Wildlife Ecology	9 yrs, Chief, Environmental Branch, Memphis District COE; 5 yrs Policy Division, HQ,USACE; 12 yrs Environmental Branch, New Orleans District, COE; 4 yrs Florida Game and Fish Comm.	Waterfowl analysis Environmental review; supervisory RSEIS 2 coordination, project planning
James Reeder, P.E.	Engineer/Program Manager	31 years USACE	Reviewer
Erwin Roemer	Archeologist	10+ years USACE	Archeologist
Larry Sharpe	Project Manager	33 yrs practicing engineer, 28 yrs of those with USACE	Senior Project Manager
Daniel Ward	Fish and Wildlife Biologist	5 years, Environmental Branch, Memphis District USACE; 1 Year, Tennessee Department of Environment and Conservation	RSEIS 2 Coordinator Principal Author
Jerry Welch, C.C.C.	Cost Engineer	33 years USACE, 6 years Army Combat Engineer	Senior Cost Engineering

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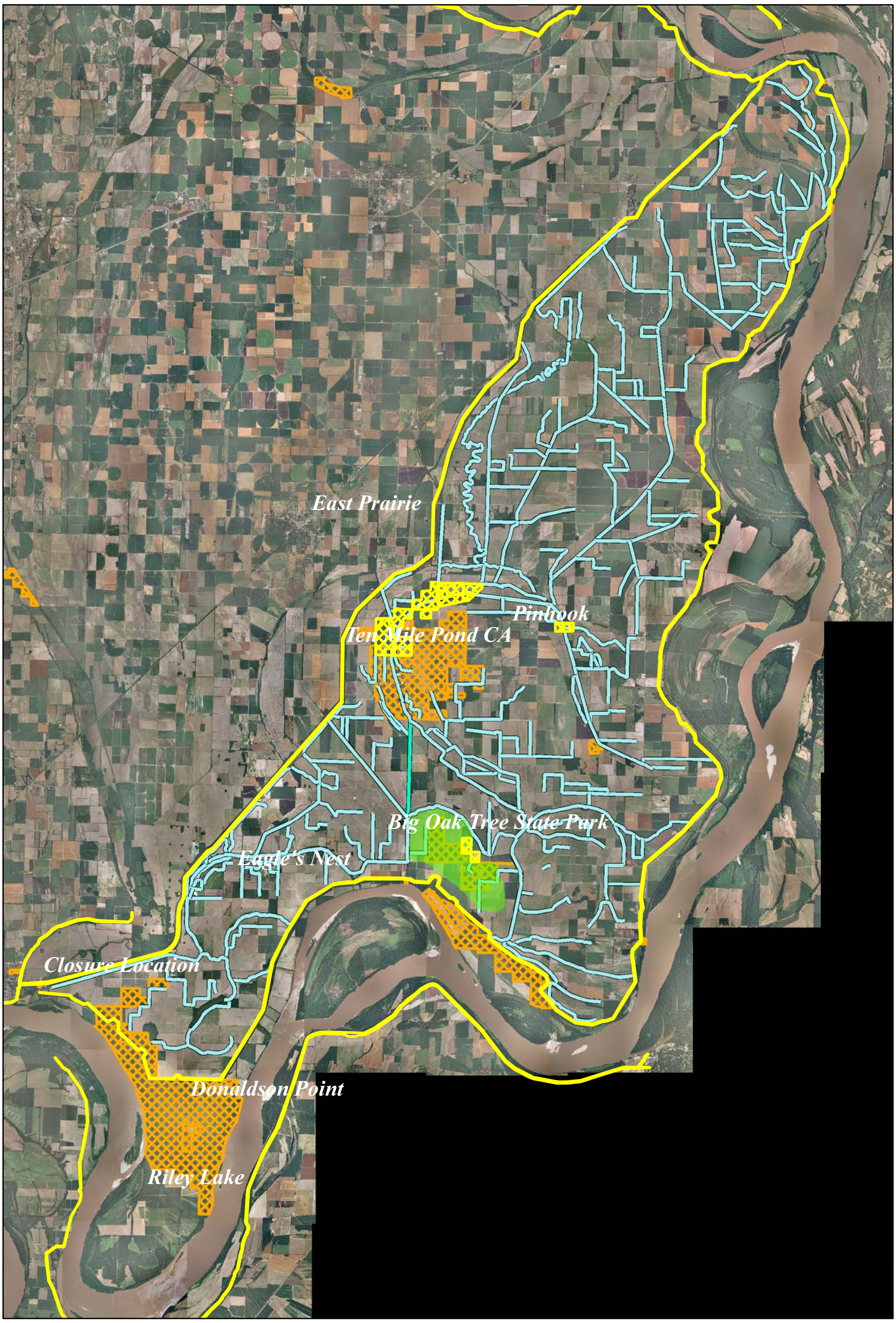
FIGURES USED



Potential Wildlife Corridor
Potential Riparian Buffer
Potential BOTSP Expansion
Purchased Mitigation Tracts
Levee
Existing State Land

0 0.5 1 2 3 4 5 Miles
0 0.5 1 2 3 4 5 6 7 8 Kilometers

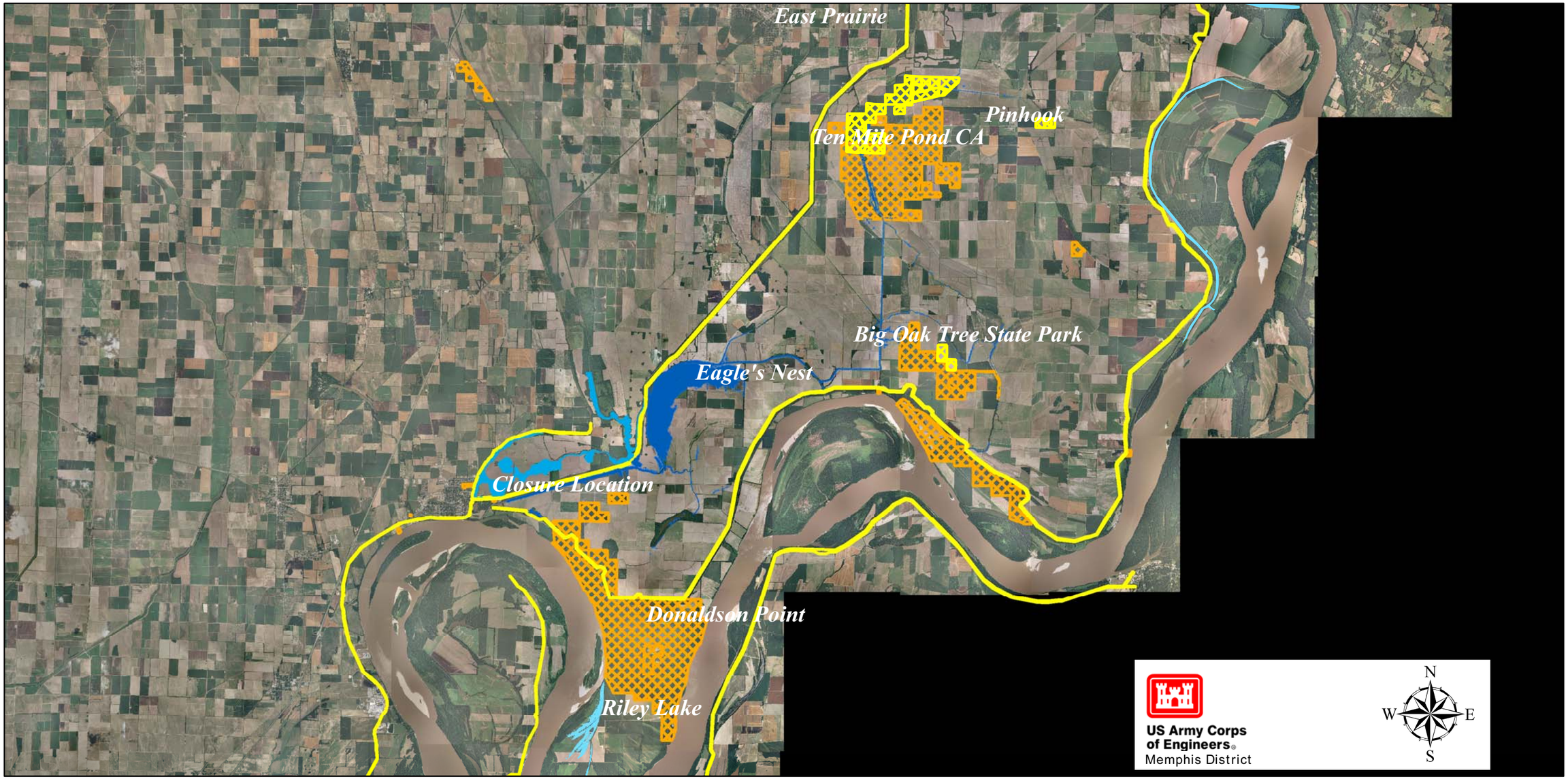
This map produced by the U. S. Army Corps of Engineers-Memphis District (USACE) Planning, Programs, and Project Management Division, Environmental Branch (PM-E) on 13 February 2006.
USACE-PM-E makes no warrenties, expressed or implied, as to the accuracy, completeness, currentness, reliability, or suitability for any particular purpose, of the data contained on this map.
Background Imagery: Missouri 2005 National Agricultural Imagery Program.

Note: Reforestation Locations To Be Determined in both Basins
Borrow Pit Locations To Be Determined

Figure 1. St. Johns Bayou Basin - New Madrid Floodway Project, MO Partial Basic Mitigation Techniques

US Army Corps of Engineers
Memphis District

N W E S



Potential Fishery Ponding
Potential Fishery Ponding
Floodplain Lake
Purchased Mitigation Tracts
Existing State Land
Levee

0 1 2 4 6 8 10 Miles

0 1.25 2.5 5 7.5 10 12.5 15 Kilometers

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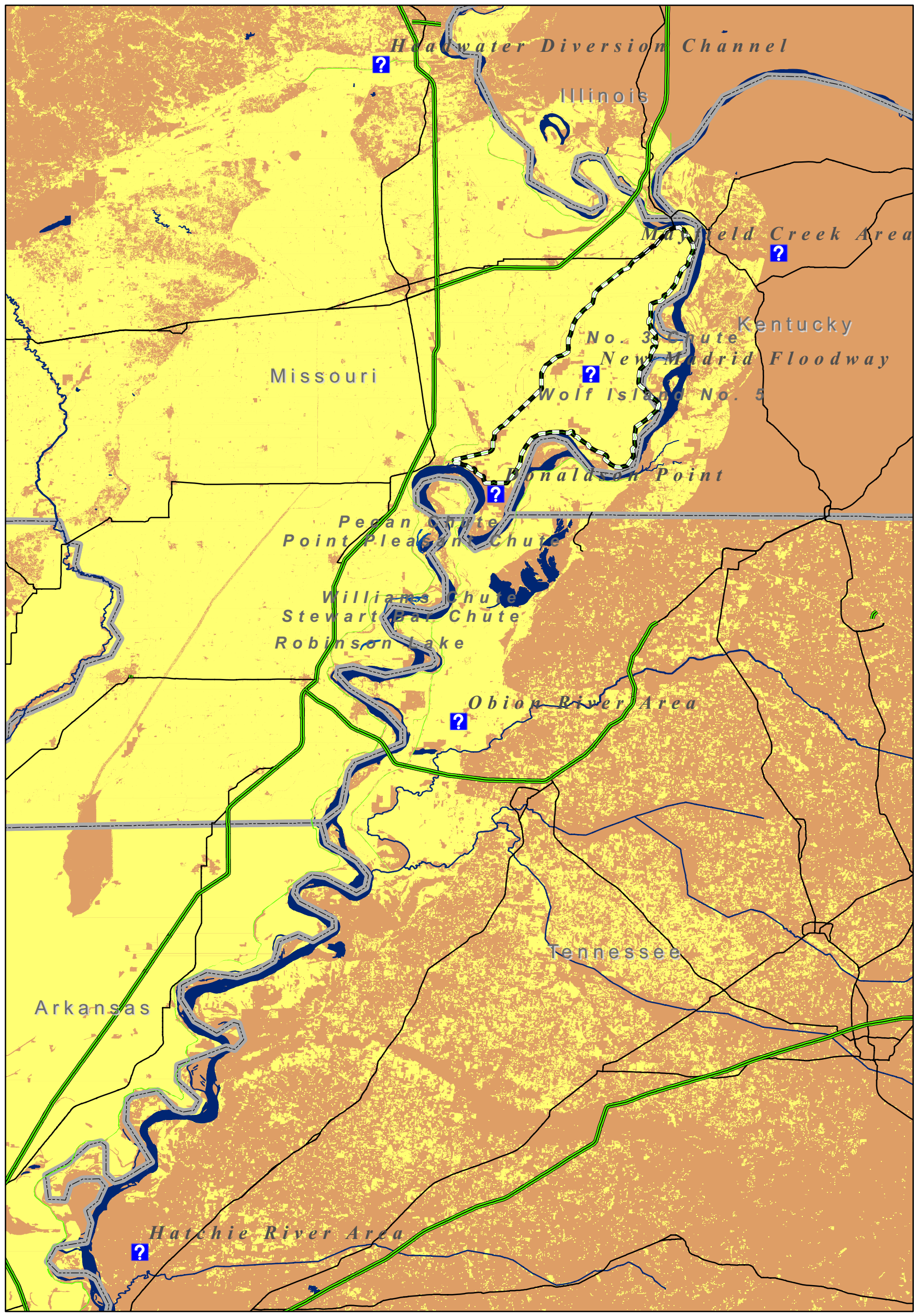
Figure 2. St. Johns Bayou Basin - New Madrid Floodway Project, MO Additional Mitigation Techniques



Floodplain Lakes
Potential Mitigation Areas
Row Crops
New Madrid Floodway
Levee

0 4.5 9 18 27 36 Miles

0 5 10 20 30 40 Kilometers

US Army Corps of Engineers
Memphis District

N W E S

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Figure 3. St. Johns Bayou Basin - New Madrid Floodway Project, MO Potential Mitigation Areas

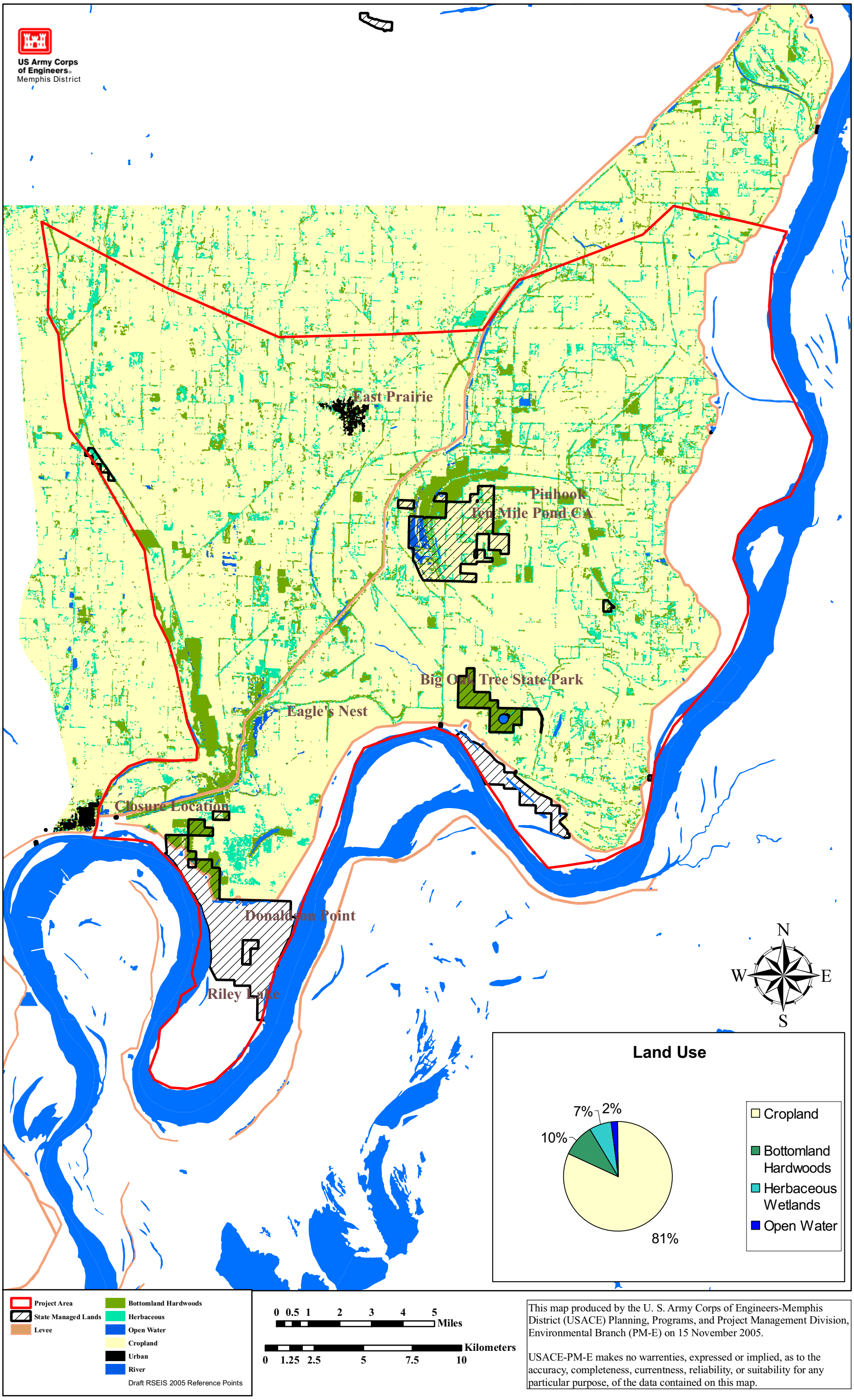
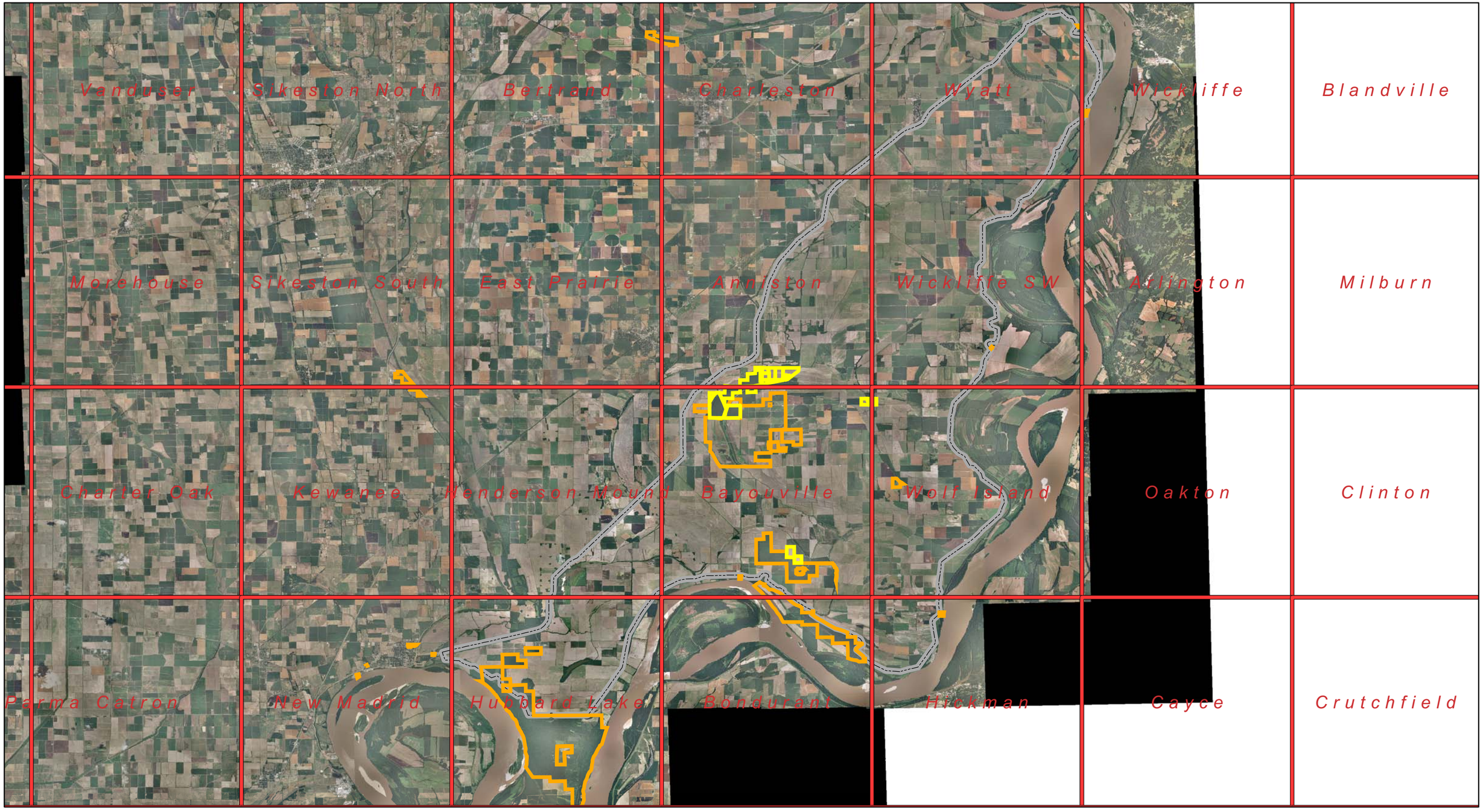


Figure 4. Land Use within the St. Johns Bayou Basin - New Madrid Floodway Project MO



Ownership

- **Purchased**
- **State Lands**
- **New Madrid Floodway**
- **USGS 1:24,000 Quad**

Figure 5. Index of New Madrid Floodway, MO Map Series

US Army Corps of Engineers
Memphis District

N W E S

0 2 4 8 12 16 **Miles**

0 2.5 5 10 15 20 **Kilometers**

This map produced by the U. S. Army Corps of Engineers-Memphis District (USACE) Planning, Programs, and Project Management Division, Environmental Branch (PM-E) on 23 February 2006.
USACE-PM-E makes no warranties, expressed or implied, as to the accuracy, completeness, currentness, reliability, or suitability for any particular purpose, of the data contained on this map.
Background Imagery: Missouri 2005 National Agricultural Imagery Program.

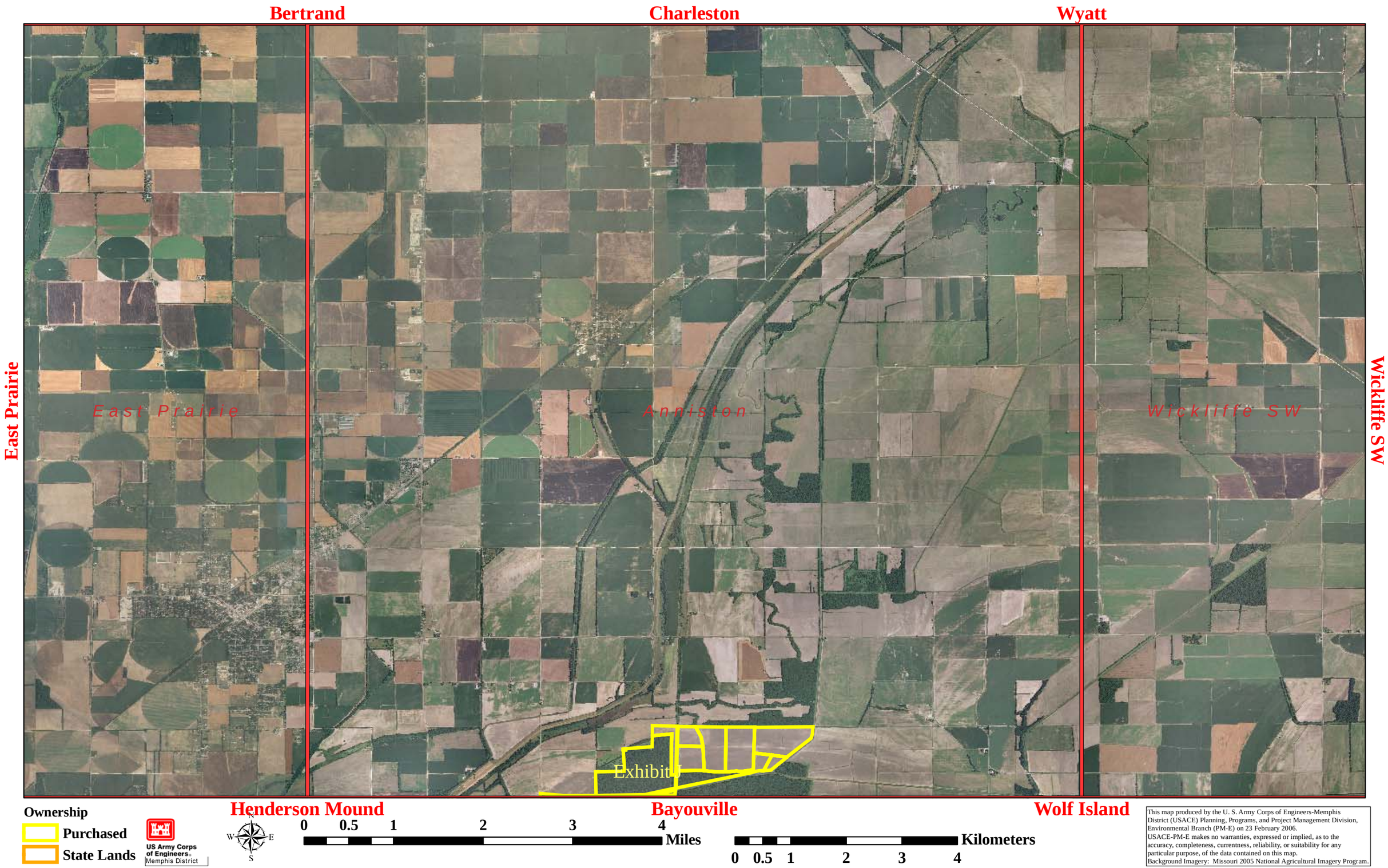


Figure 6. New Madrid Floodway, MO Anniston USGS 1:24,000 Quad

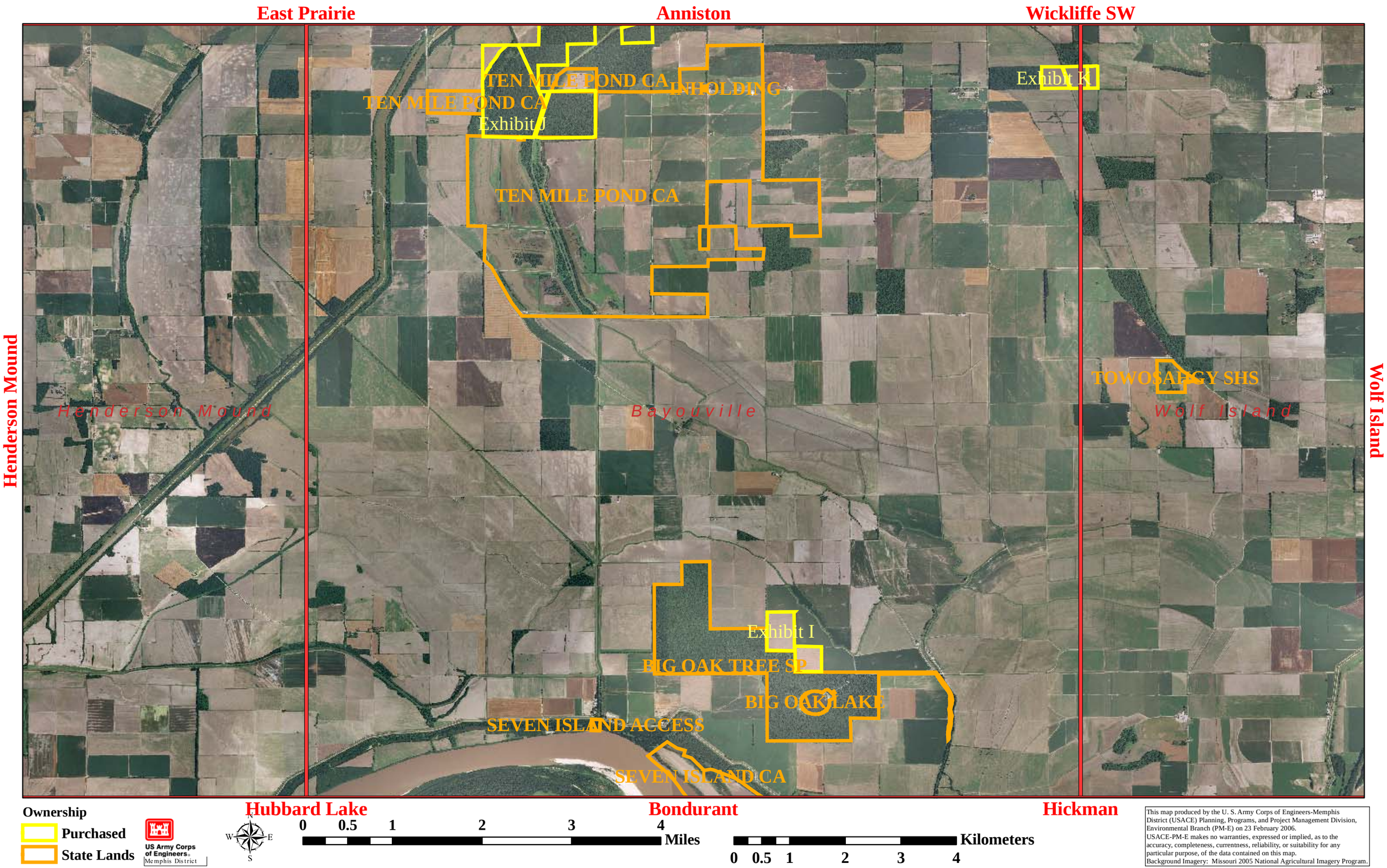


Figure 7. New Madrid Floodway, MO Bayouville USGS 1:24,000 Quad

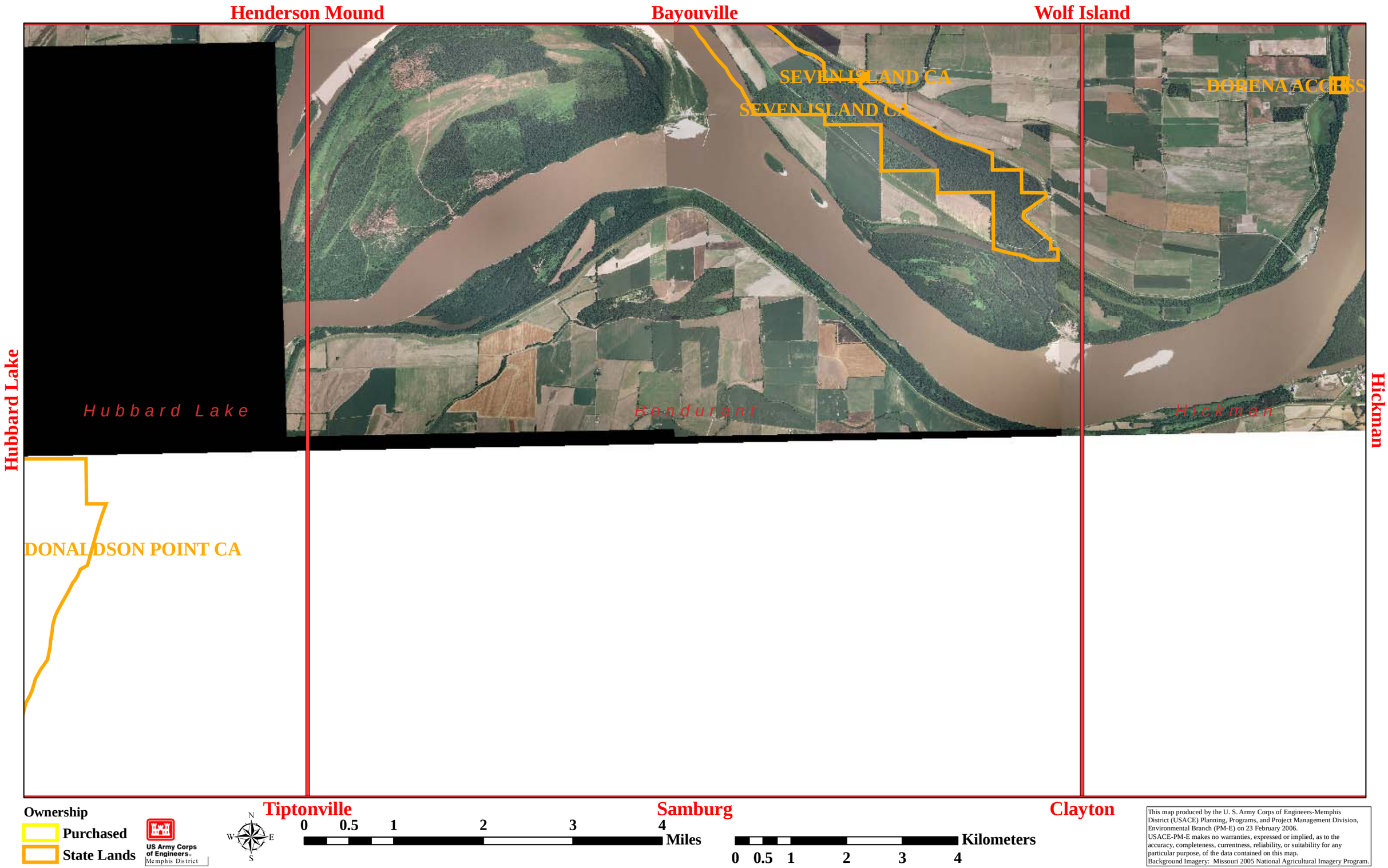


Figure 8. New Madrid Floodway, MO Bondurant USGS 1:24,000 Quad

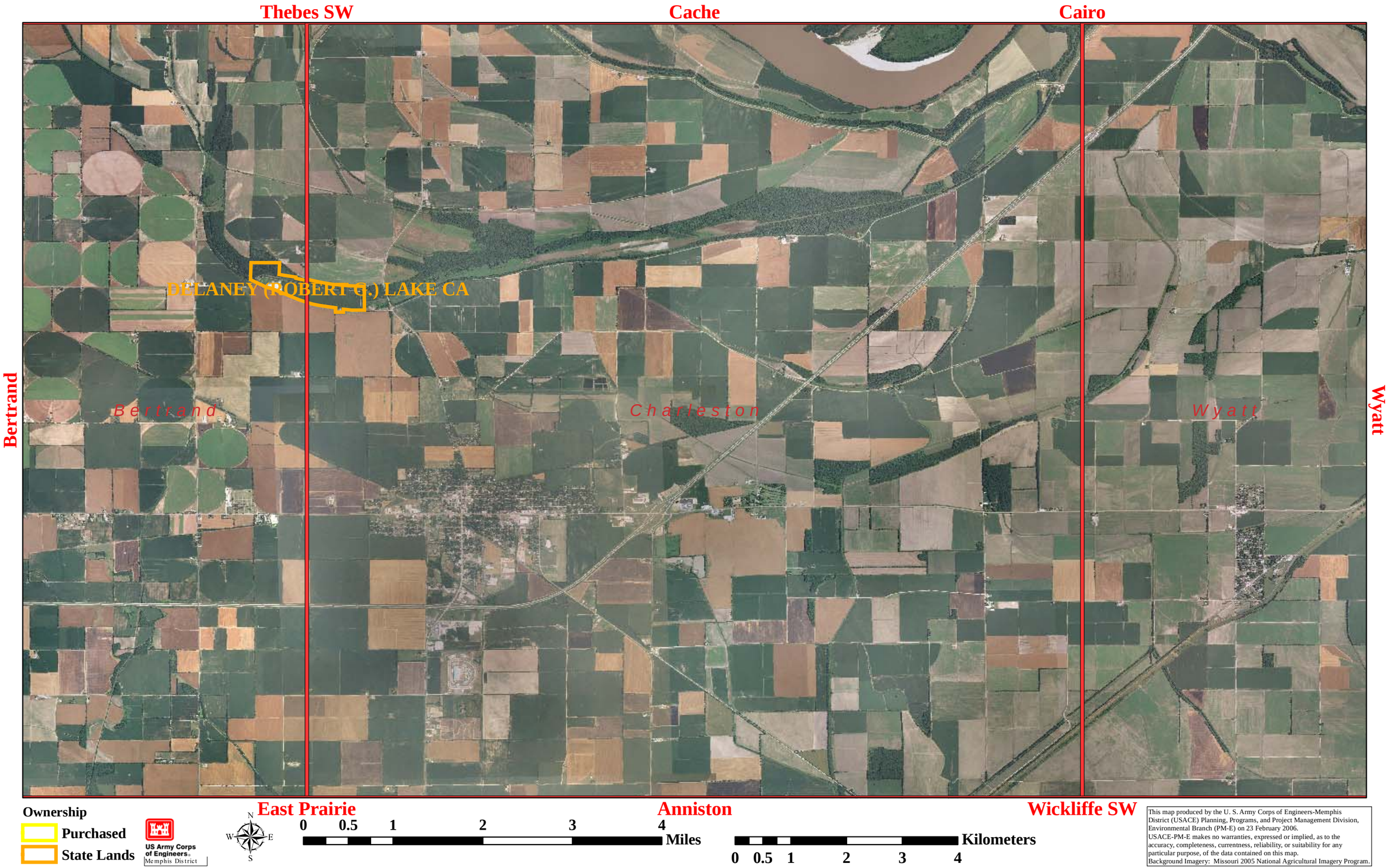


Figure 9. New Madrid Floodway, MO Charleston USGS 1:24,000 Quad

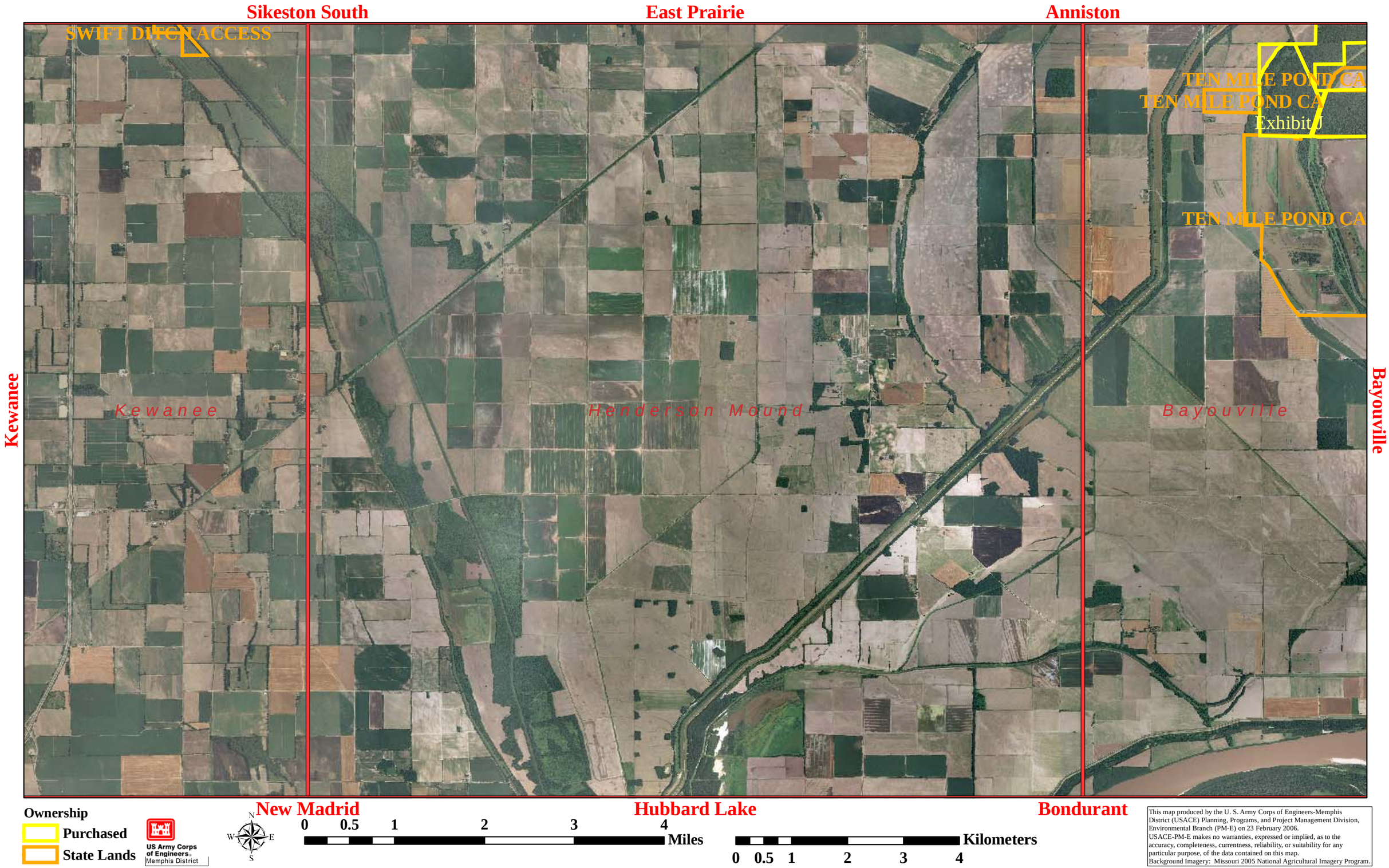


Figure 10. New Madrid Floodway, MO Henderson Mound USGS 1:24,000 Quad

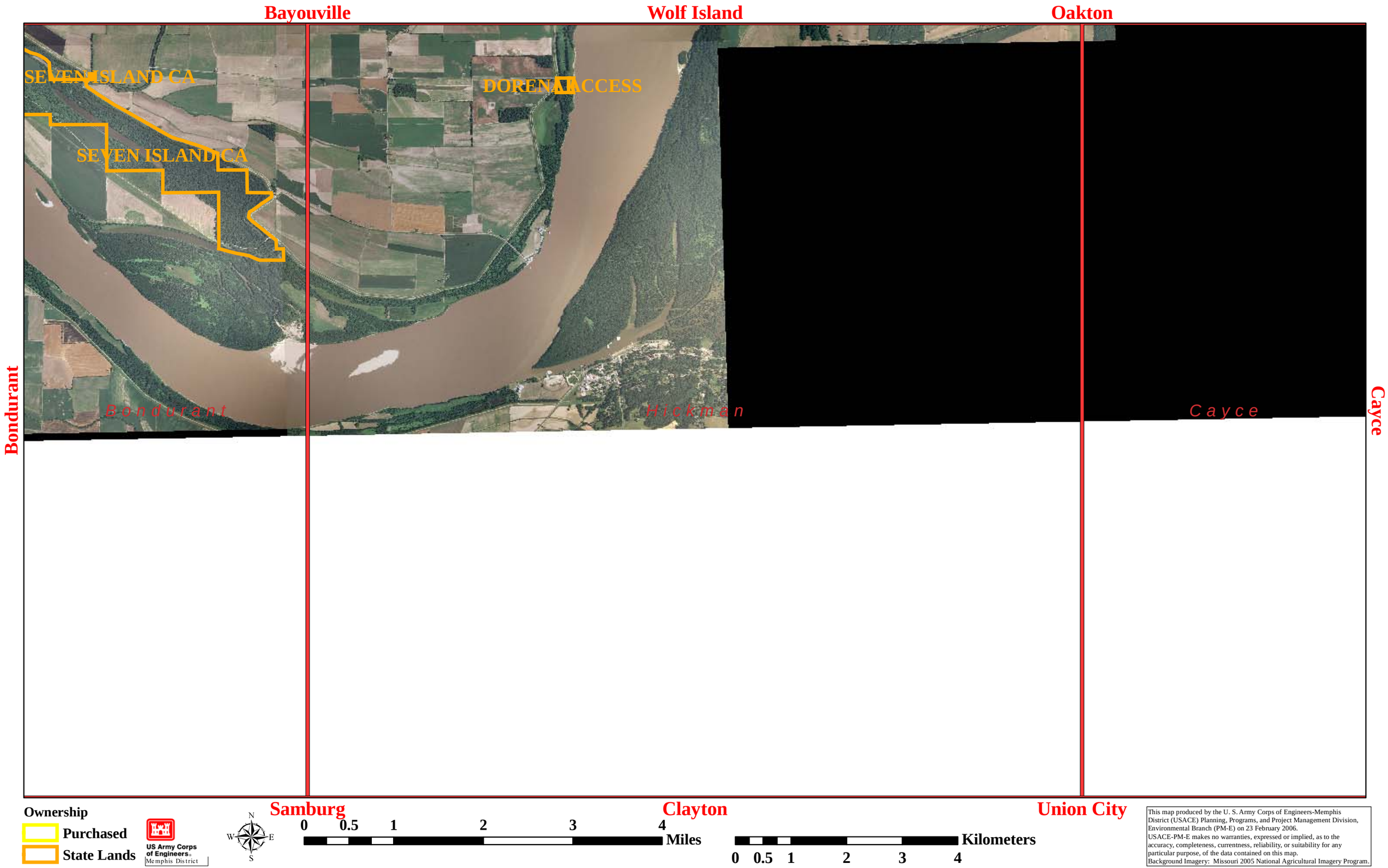


Figure 11. New Madrid Floodway, MO Hickman USGS 1:24,000 Quad

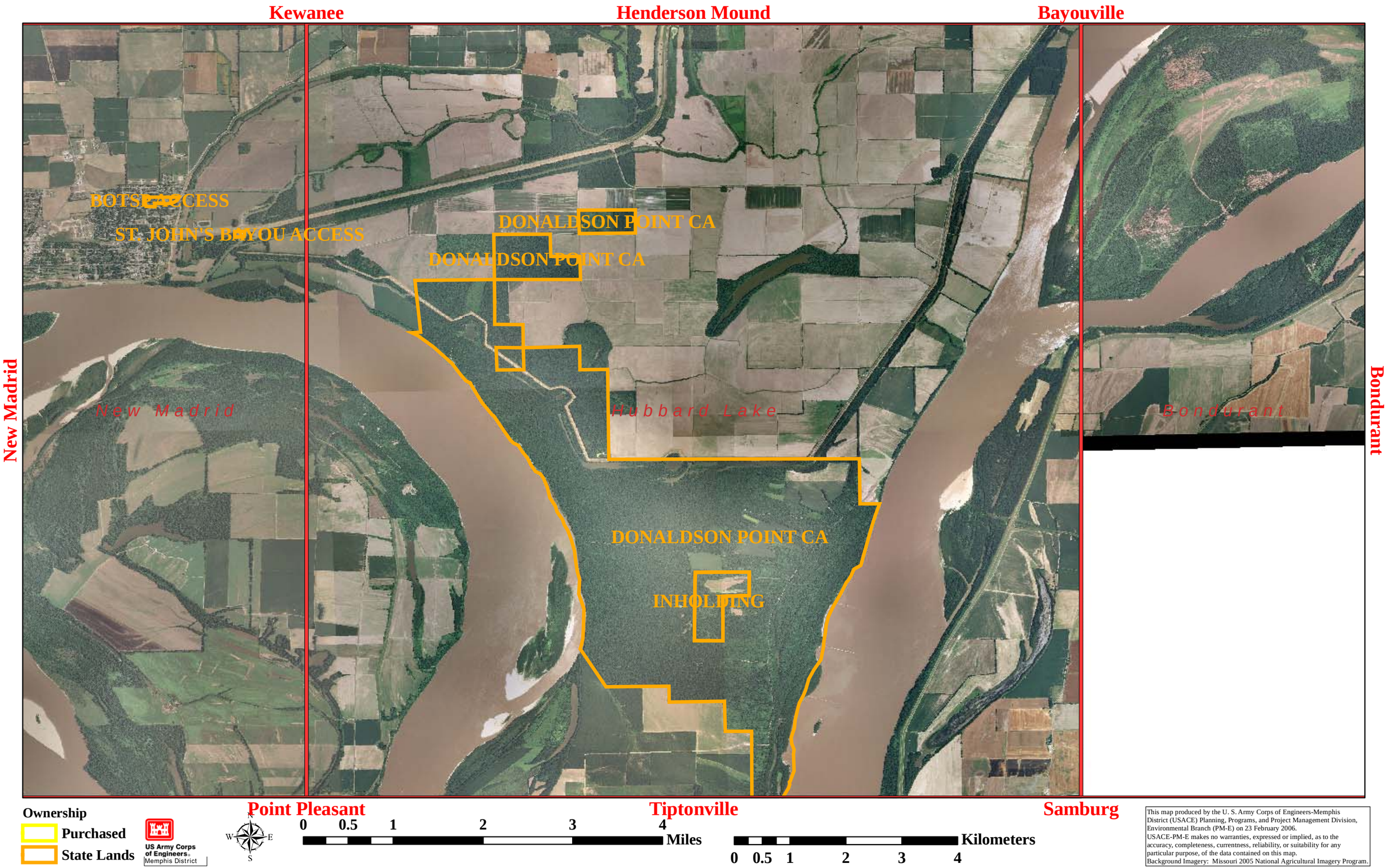


Figure 12. New Madrid Floodway, MO Hubbard Lake USGS 1:24,000 Quad

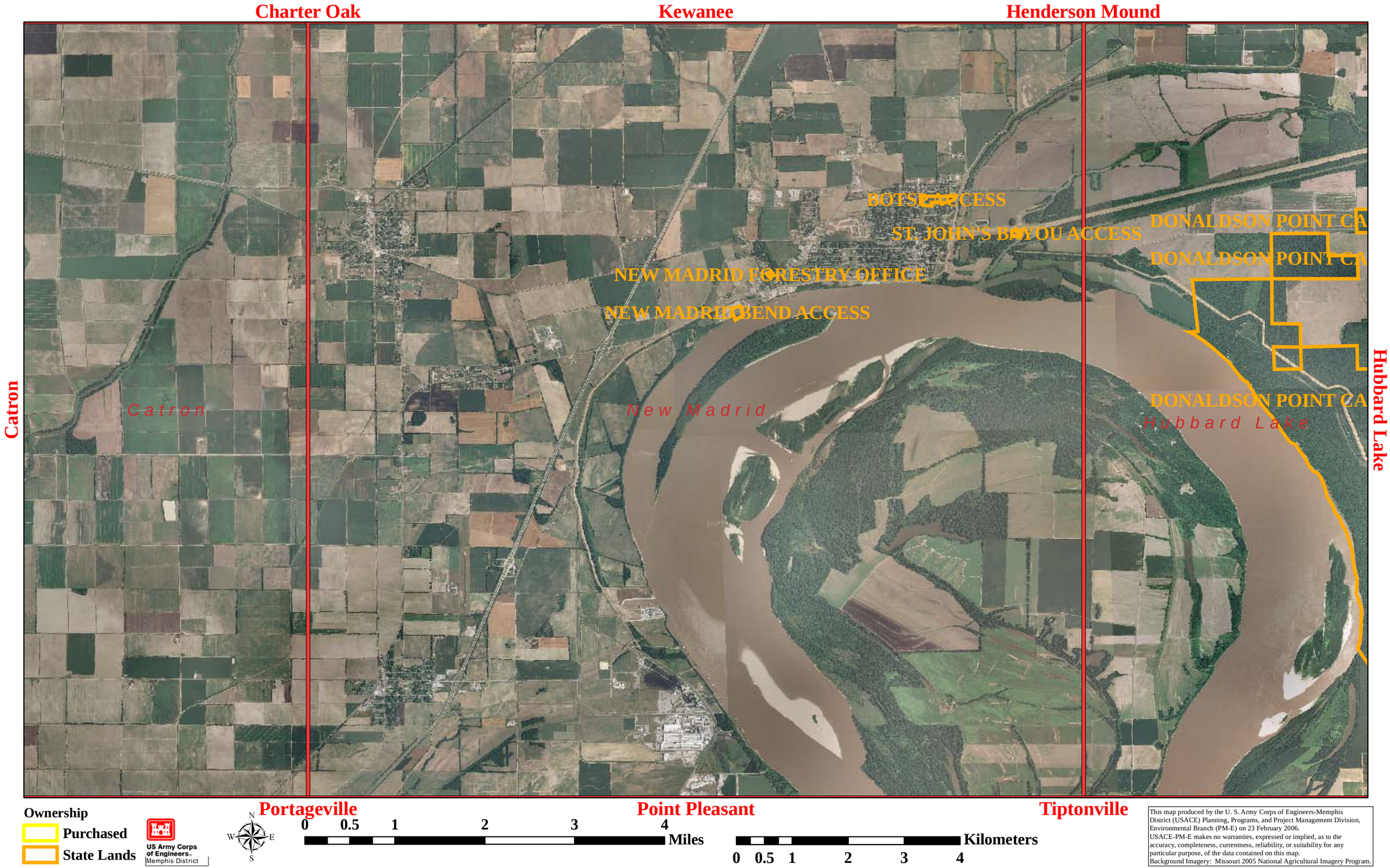


Figure 13. New Madrid Floodway, MO New Madrid USGS 1:24,000 Quad

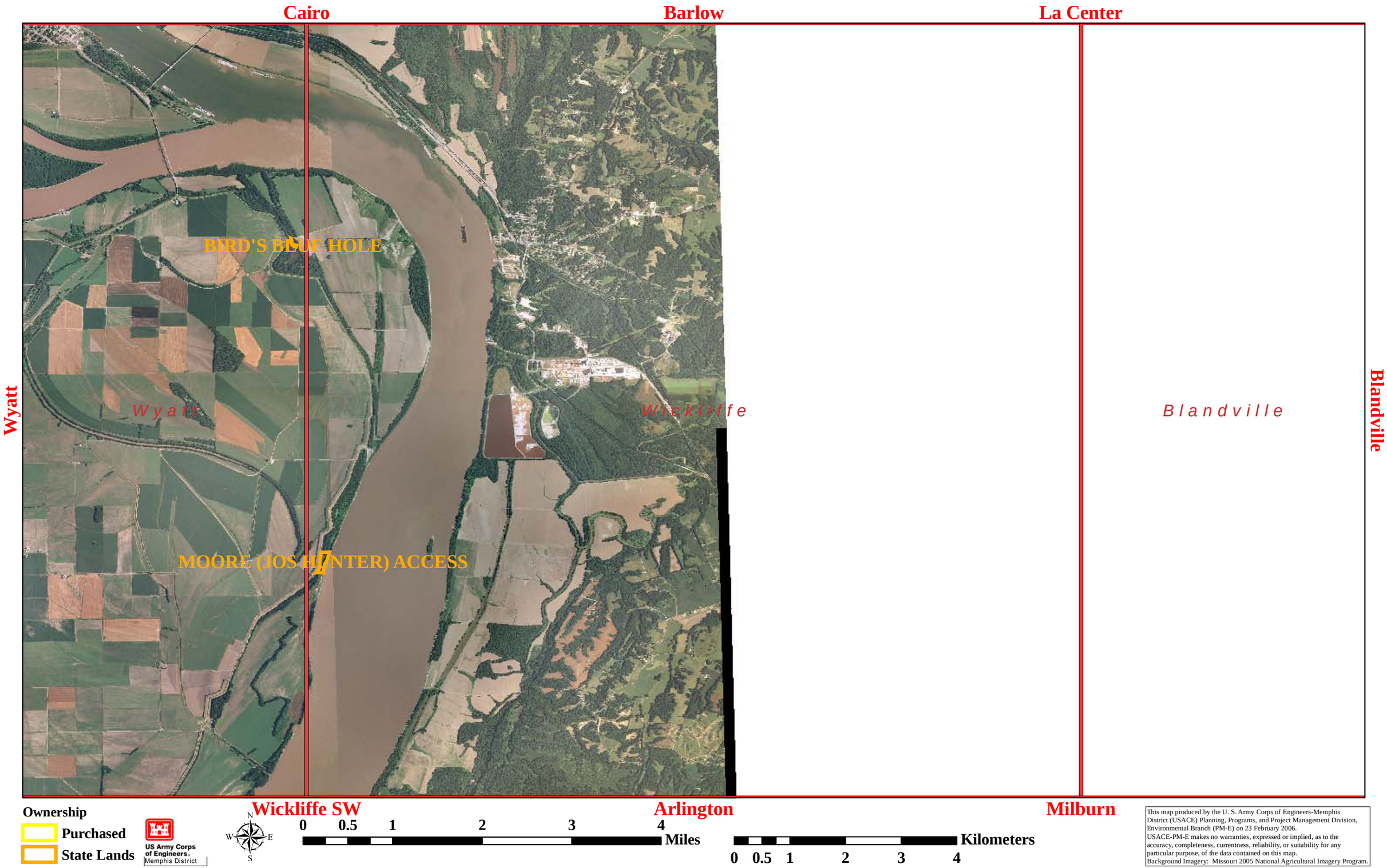


Figure 14. New Madrid Floodway, MO Wickliffe USGS 1:24,000 Quad

Figure 15. New Madrid Floodway, MO Wickliffe SW USGS 1:24,000 Quad

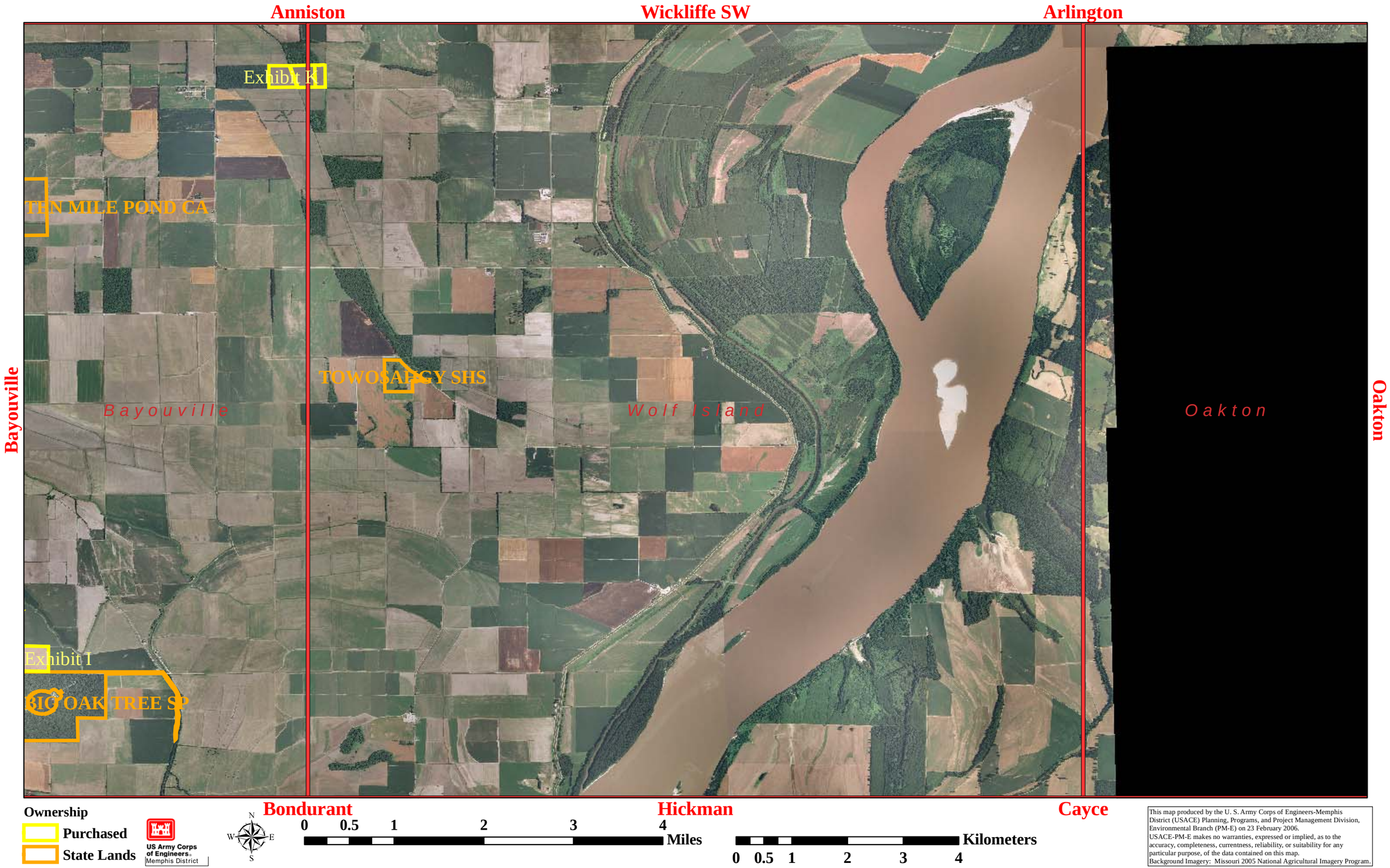


Figure 16. New Madrid Floodway, MO Wolf Island USGS 1:24,000 Quad

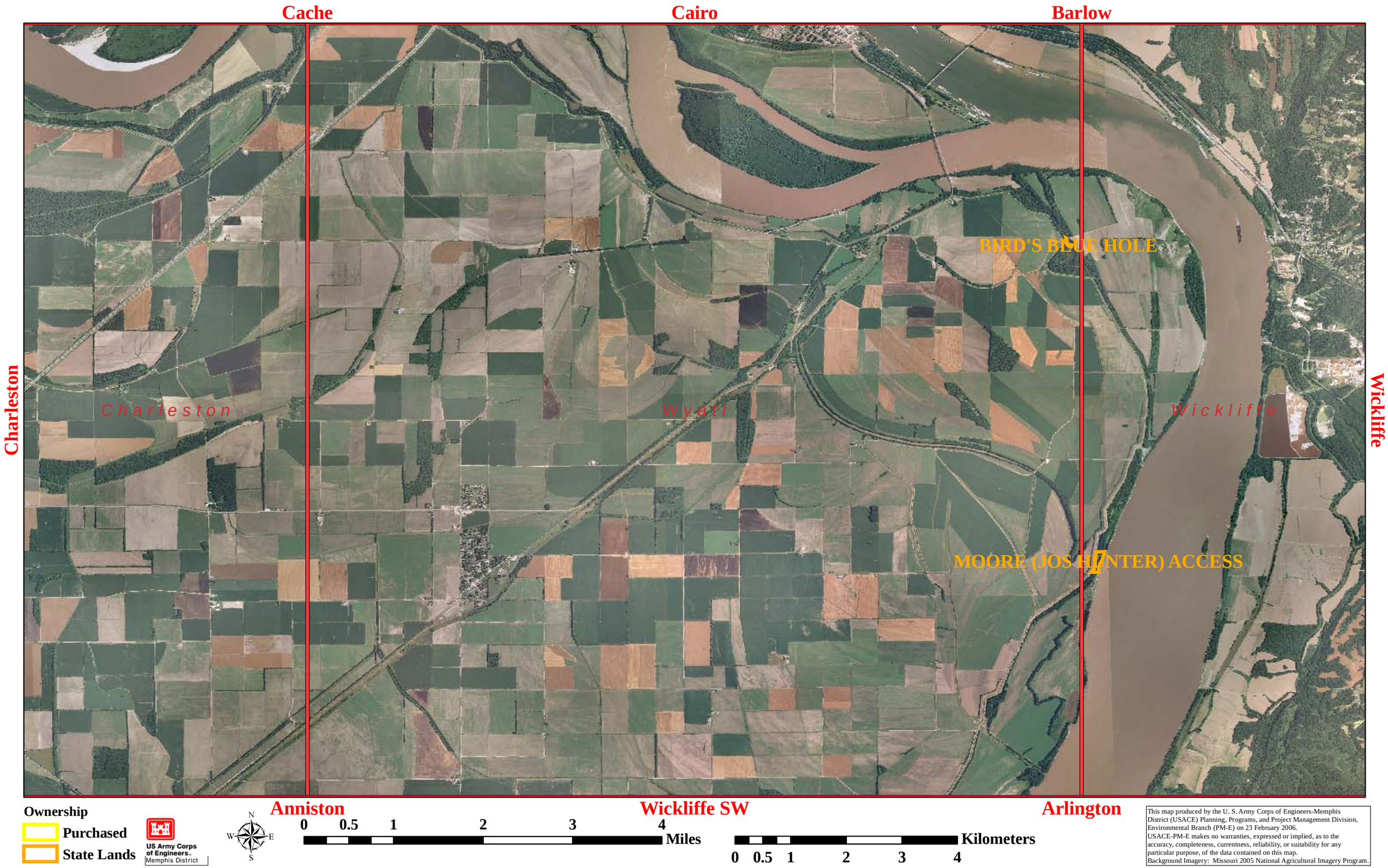


Figure 17. New Madrid Floodway, MO Wyatt USGS 1:24,000 Quad

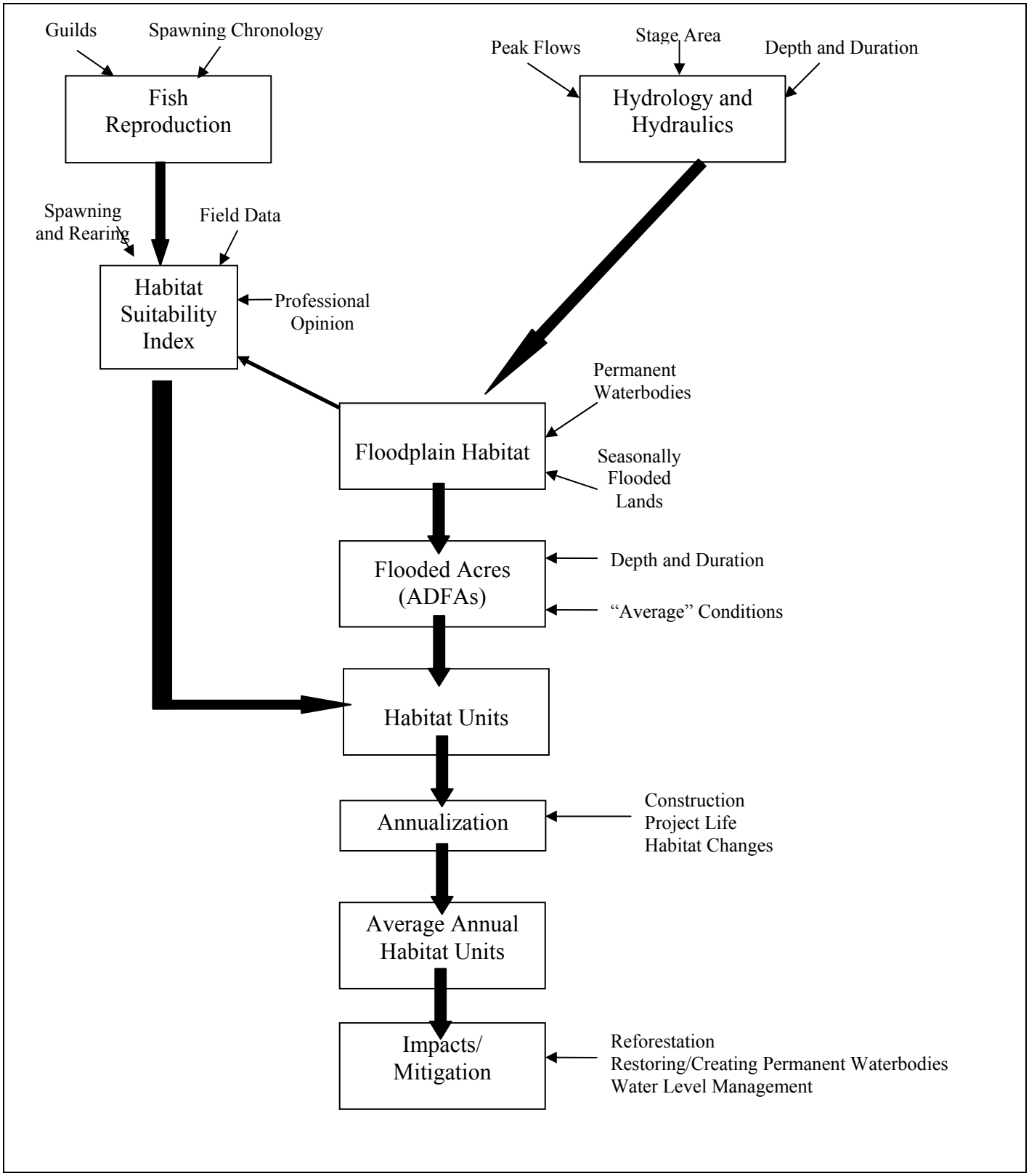
APPENDIX A

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:

<u>Federal</u>

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 63130 • 314-727-2402 Fax: 314-727-1665 • mcenviron@moenvirec.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 = <u>1.31 AAHUs per acre</u>

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 = <u>1.21 AAHUs per acre</u>

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 = <u>0.30 AAHUs per acre</u>

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 = <u>0.27 AAHUs per acre</u>

Specific Calculations

<u>Calculation 1: Reforesting 100 acres of cropland, Section 2.6.2.2</u>

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)

Charles V. Klimas
U.S. Army Corps of Engineers
Engineer Research and Development Center
Vicksburg Mississippi

October 17, 2005

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.

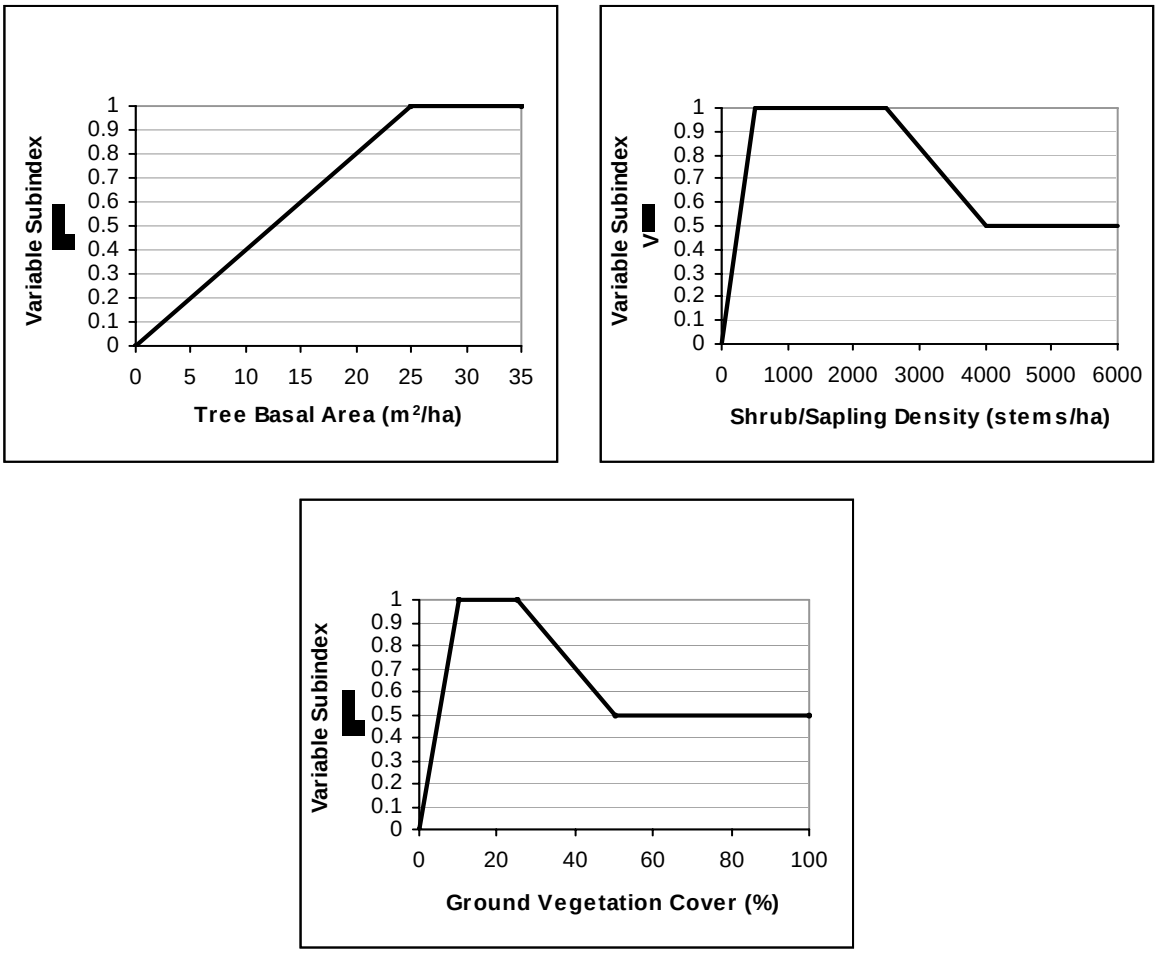

Figure 1. Subindex curves for 3 field indicators used as variables in the Organic Carbon Export functional assessment model.

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.

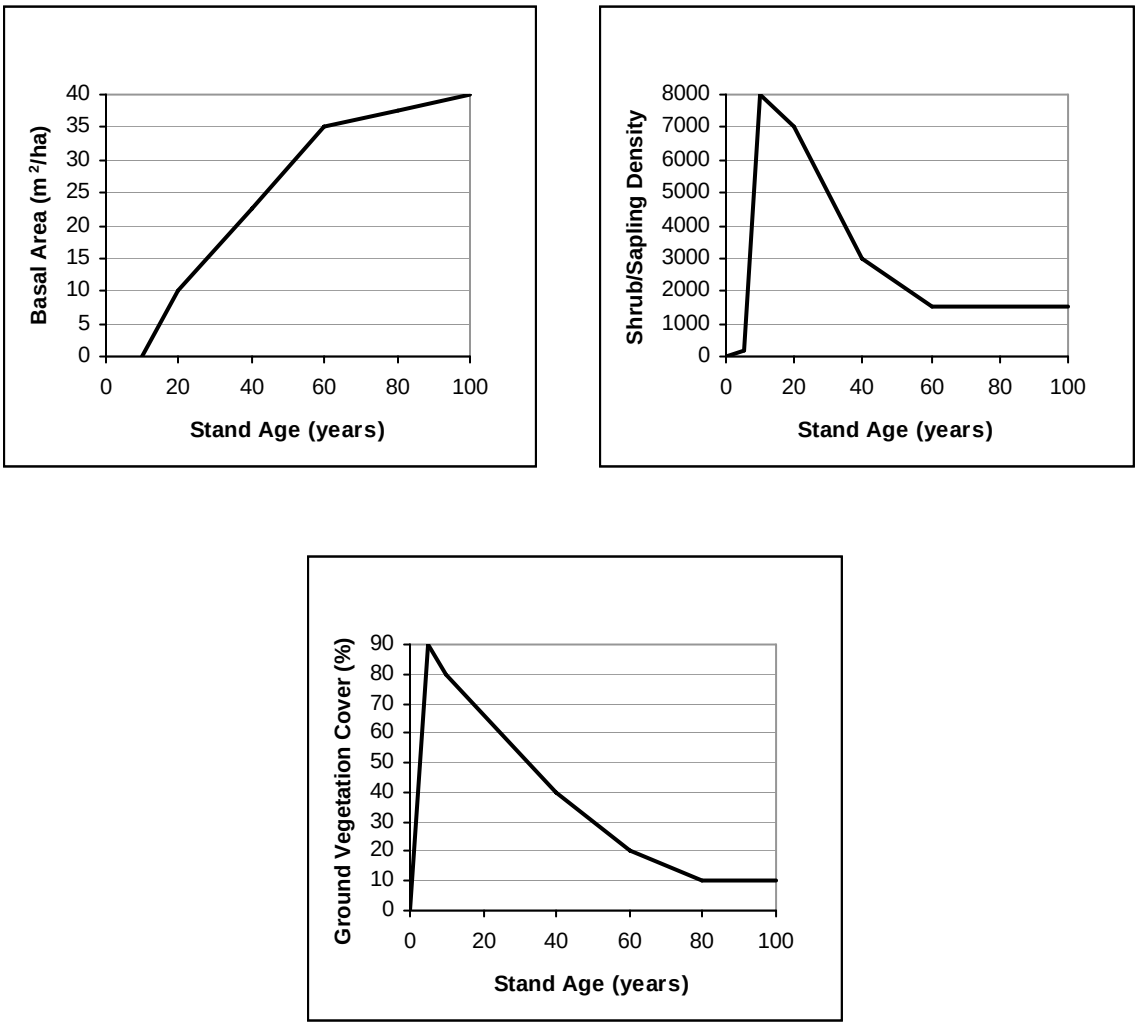

Figure 2. Recovery trajectories for 3 field indicators used as variables in the Organic Carbon Export functional assessment model.

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

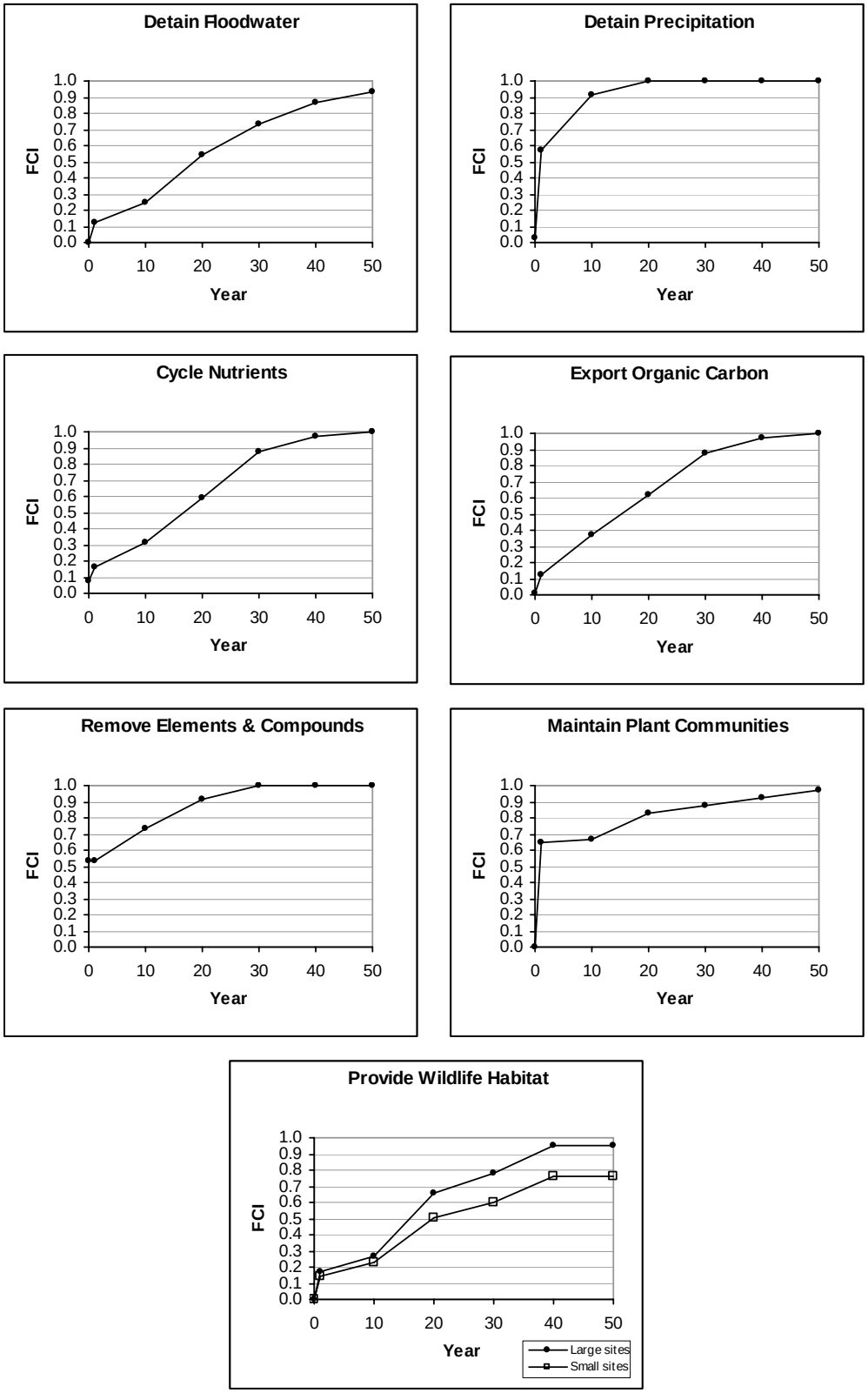

Figure 3. Changes in FCI on mitigation sites for each assessed function over the 50-year life of the project.

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)

LITERATURE CITED

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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

Federal and State Agency And Public Comments

United States Department of Interior, Office of the Secretary, Office of Environmental Policy and Compliance

DOI Comment 1:

United States Department of the Interior

TAKE PRIDE IN AMERICA

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Denver Federal Center, Building 56, Room 1003
Post Office Box 25007 (D-108)
Denver, Colorado 80225-0007

January 20, 2006

ER 05/1057

Colonel Charles O. Smithers III
Commander, Memphis District
U.S. Army Corps of Engineers
ATTN: CEMVM-PM-E
167 North Main Street, B-202
Memphis, Tennessee 38103-1894

Dear Colonel Smithers:

The U.S. Department of the Interior (Department) has reviewed the December 2005 Draft Revised Supplemental Environmental Impact Statement 2 (DRSEIS 2) for the Mississippi River and Tributaries, St. Johns Bayou and New Madrid Floodway Project; Mississippi, New Madrid, and Scott Counties, Missouri, and offers the following comments.

The Department has provided extensive comments on previous iterations of the EIS for this project, emphasizing the need to explore options for providing flood protection while avoiding or minimizing environmental impacts. This need, as well as the need for the project plans to include adequate compensatory mitigation to offset unavoidable project impacts, remains a concern for the Department. The DSREIS 2 indicates that the primary issue examined in the document is the overall compensatory mitigation strategy that was recommended in the 2002 RSEIS and that the DSREIS 2 will not revisit the entire 2002 RSEIS.

DOI Response 1: The decision to construct the recommended flood damage reduction plan, as outlined in the 2002 RSEIS, was 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.

There are alternatives with fewer environmental impacts. However, those alternatives also produce fewer flood damage reduction benefits. The recommended plan produces maximum flood damage reduction benefits while still fully mitigating all unavoidable environmental impacts. This meets the Federal Objective for water and related land resources project planning.

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

DOI Comment 2:

Our U.S. Fish and Wildlife Service (USFWS), Missouri Ecological Services Field Office, has been actively involved throughout the planning process. The USFWS has provided a number of planning aid letters and reports to the U.S. Army Corps of Engineers in accordance with the USFWS's responsibilities under the Fish and Wildlife Coordination Act (FWCA) and its agency expertise on fish and wildlife issues as identified in the CEQ NEPA Regulations, as well as in its role as a cooperating agency for the EIS.

The USFWS's most recent planning aid letter, dated August 11, 2005, is included in Appendix B of the DRSEIS 2. The Corps' responses to the USFWS's position on key aspects of the project, as expressed in the planning aid letter, are provided on pages 140 to 146 of the DRSEIS 2.

Colonel Charles O. Smithers III 2

These responses, as well as other information provided in the DRSEIS 2, indicate that the Corps will work with the interagency mitigation team during the development of site-specific detailed mitigation plans. Aspects of these plans include the development of fish-passage best management practices, fish access to specific tracts of land in the project area, and monitoring of fish passage and usage of mitigated areas. The USFWS, as a member of the interagency mitigation team (which also includes the Missouri Department of Natural Resources and the Missouri Department of Conservation) and in its obligations under the FWCA and as a cooperating agency, will continue to coordinate with the team and the Corps to address mitigation needs for this project.

DOI Response 2: Comment noted. Of particular interest, the Corps would like to coordinate the planning, design, and construction of the proposed culverts that would be required through the Mississippi Mainline Levee to restore hydrology to Big Oak Tree State Park with personnel from the USFWS' National Fish Passage Program. The National Fish Passage Program routinely modifies existing culverts to benefit fish passage. There is a unique partnering opportunity to restore the hydrology to Big Oak Tree State Park, provide significant benefits to fish habitat, and maintain the integrity of the Mississippi Mainline Levee System that protects thousands of acres from flooding.

DOI Comment 3:

Please continue to coordinate with the USFWS with respect to mitigation needs and other aspects of the project related to fish and wildlife resources. The primary contact for coordination continues to be Mr. Charles Scott, Field Supervisor, U.S. Fish and Wildlife Service, Ecological Services Field Office, 101 Park DeVille Drive, Suite A, Columbia, Missouri 65203-0057, phone: (573) 234-2132.

Sincerely,

Robert F. Stewart
Regional Environmental Officer

DOI Response 3: Comment noted. Continued coordination with the USFWS will be maintained throughout all aspects of compensatory mitigation and ecological monitoring.

United States Environmental Protection Agency, Region VII
EPA Comment 1:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

2 8 JAN 2008

Commander
U.S. Army Engineer District, Memphis
ATTN: CEMVM-PM-E
167 North Main Street, B-202
Memphis, TN 38103-1894

Dear Colonel Smithers:

The Environmental Protection Agency (EPA) has reviewed the St. Johns Bayou and New Madrid Floodway Project Draft Revised Supplemental Environmental Impact Statement 2 (RSEIS 2). Our review is provided under the National Environmental Policy Act (NEPA), Council on Environmental Quality regulations (40 CFR Parts 1500-1508), Section 309 of the Clean Air Act, and Section 404 of the Clean Water Act (CWA). As noted in the draft RSEIS 2, this document supplements the June 2002 Final Revised Supplemental Environmental Impact Statement, and is focused on clarifying how the Corps intends to compensate for impacts to fish and wildlife resources from the construction of the St. Johns Bayou-New Madrid Floodway Project.

Given this proposed project's large geographic scale, EPA understands the importance of careful assessment of potential mitigation efforts for their suitability in offsetting project impacts. We agree that mitigation measures will need to be evaluated on the extent to which habitat functions are replaced, and not solely on the number of acres enhanced or restored. To assist in clarifying how mitigation provisions under the U.S. Army Corps of Engineers' regulations are to be met, EPA recommends that the Final RSEIS 2 should:

1. Provide additional information to address uncertainties regarding proposed mitigation measures (e.g., location and acreage to be acquired), and expected benefits of mitigation measures in Table 2-2, and;

2. Provide additional information regarding contingencies for fisheries impacts should the proposed fish passage measures not perform as anticipated.

EPA Response 1: The Corps concurs with the statement that mitigation measures will need to be evaluated on the extent to which habitat functions are replaced, and not solely on the number of acres enhanced or restored.

1. Precise mitigation locations are not known at this time for the majority of mitigation measures.

   The overall acreage of compensatory mitigation is also not known at this time because mitigation is based on replaced habitat functions. Conservative estimates regarding gains in habitat functions have been

made throughout this RSEIS 2. Table 2.8 of the RSEIS 2 provides real estate requirements for four conceptual mitigation scenarios. RSEIS 2 Figure 3 illustrates the potential locations for some of the additional mitigation measures.

Additional information has been added to Table 2.2 in the RSEIS 2 to clarify the uncertainties over the proposed mitigation measures. The term "to be determined" (TBD) has been replaced with a range of values. The ranges of values represent potential gains from implementing compensatory mitigation measures. These ranges reflect the uncertainties of various mitigation measures. It is important to note that the minimum value has been used to calculate overall mitigation benefits for the purpose of this RSEIS 2. This is an extremely conservative approach. Habitat gains would be calculated during the development of site-specific mitigation plans. Additionally, sites will be modified to ensure that mitigation is successful and that gains in habitat were accurately calculated. Modifications will be made to overall mitigation accordingly. It is highly likely that site-specific tracts will yield greater gains in habitat than the conservative values that have been used in this RSEIS 2 to demonstrate that, even with increased compensatory mitigation, the overall project is still economically justified.

(a) Moist Soil Units

There are several uncertainties from construction of modified moist soil units. The first is the gain in wetland functions by the construction of moist soil units. The following paragraph has been inserted to Section 5.2.2.2 and changes have been incorporated in Table 2.2 and Table 2.7:

> 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. These modifications would likely provide additional gains to wetland functional capacity. The Arkansas Regional Guidebook (Klimas et *al*., 2004) limits wetland functional gains to reforestation techniques and does 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 likely more. However, HGM cannot quantify the additional gains due to limitations of the

model. The FCU gains in Table 5.2 represent those of a farmed wetland.

An additional uncertainty over modified moist soil units is the expected benefits to mid-season fish rearing habitat. The potential benefits to mid-season fish rearing habitat are discussed in Section 5.4.2.2. Table 2.2 and Table 2.7 have been changed to reflect the uncertainty.

(b) Big Oak Tree State Park Hydrologic Restoration

There will likely be a significant gain in several wetland functions by restoring the hydrology to Big Oak Tree State Park. However, quantification of these gains would require additional study to designate the historic conditions as the baseline, existing conditions as the degraded environment, and future conditions as the restored environment. This cannot be conducted at this time because the specific design of the water delivery system has not been finalized. Therefore, TBD will remain.

Section 5.4.2.5 provides a discussion of the potential benefits to mid-season fish rearing habitat from the restoration of hydrology to Big Oak Tree State Park. Providing Mississippi River surface water to the park has the potential to result in a gain of 442 mid-season fish rearing AAHUs. Changes have been made to Table 2.2 and Table 2.7.

(c) Big Oak Tree State Park Perimeter Land Acquisition

Section 5.4.2.6 provides a discussion of the potential benefit to mid-season fish rearing habitat by acquiring and reforesting 1,800 acres of cropland surrounding the park. If fish have access to the park, the surrounding 1,800 acres of land could provide 504 mid-season fish rearing AAHUs. Changes have been made to Table 2.2 and Table 2.7.

2. Section 2.9 titled Mitigation Contingencies has been added to the Final RSEIS 2. The Corps reiterates that it is highly likely that fish will pass through the New Madrid Floodway box culverts, as designed. No modifications are recommended. Additionally, conservative estimates (little or no habitat value for mid-season fish rearing benefits were taken) have been made throughout this RSEIS 2 concerning benefits to fish usage (*i.e.,* Big Oak Tree State Park Hydrologic Restoration, Big Oak Tree State Park perimeter land acquisition, modified moist soil units). However, the Corps will monitor fish passage and usage of

mitigation sites. Please refer to Section 2.9 on a discussion of mitigation contingencies.

EPA Comment 2:

EPA would like to offer assistance in mitigation planning efforts as part of the proposed interagency mitigation team to address the issues identified above and subsequent development of site specific mitigation plans. Please contact Mr. Thomas Taylor, (913) 551-7226, to discuss EPA's representation.

Thank you for the opportunity to review this RDRIS 2. In accordance with our national rating system, a description of which is attached, we have rated this draft RSEIS 2 as "EC-2; environmental concerns – insufficient information". If you have any questions, please contact Mr. Joe Cothern, NEPA Team Leader, at (913) 551-7148.

Sincerely,

U. Gale Hutton
Director
Environmental Services Division

Enclosure

cc: Dru Buntin, MDNR

EPA Response 2: Comment noted. The Corps acknowledges and appreciates EPA's offer of assistance in mitigation planning. All aspects of compensatory mitigation, including planning, constructing, and monitoring, will be coordinated with EPA Region VII.

Missouri Department of Natural Resources

MDNR Comment 1:

Matt Blunt, Governor • Doyle Childers, Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

www.dnr.mo.gov

January 24, 2006

Mr. Daniel Ward
U.S. Army Corps of Engineers, Memphis District
Attn: Environmental Branch
167 N. Main Street, B-202
Memphis, TN 38103-1894

Dear Mr. Ward:

I am writing to offer the Missouri Department of Natural Resources' (department) comments on the Revised Supplemental Environmental Impact Statement 2 (RSEIS 2) for the St. Johns Bayou/New Madrid Floodway project.

The St. Johns Bayou/New Madrid Floodway is a flood control project along the Mississippi River near East Prairie in New Madrid County. The overall purpose of the project is to protect the region from backwater flooding from the Mississippi River and to reduce headwater flooding in the vicinity of East Prairie. On June 9, 2003 the department issued a Section 401 water quality certification (401 certification) for the project. The 401 certification agreed to by the Memphis District of the Corps of Engineers called for the purchase of 8,375 acres of mitigation lands, with 1,800 of those acres to be purchased around Big Oak Tree State Park. The Corps also agreed to design and construct a project to protect the hydrology of the mesic bottomland forest and swamp within the park.

The Missouri Coalition for the Environment and the national group, Environmental Defense, subsequently appealed the department's decision to issue the 401 certification to the Missouri Clean Water Commission. The Clean Water Commission then assigned the appeal to the Administrative Hearing Commission (AHC). On July 13, 2005, the Coalition for the Environment, Environmental Defense, the State of Missouri and the Corps filed a joint motion for dismissal of the appeal of the department's 401 certification. The environmental groups also filed suit in federal court challenging the project. That suit is currently pending. As a result of the suit in federal court, the Department of Justice encouraged the Corps to rescind the Record of Decision on the project and prepare this RSEIS 2 on which the comments that follow are based.

MDNR Response 1: Comment noted.

MDNR Comment 2:

Daniel Ward
January 24, 2006
Page 2

We are pleased that the Corps has now conducted a Hydrogeomorphic (HGM) analysis to quantify direct impacts to jurisdictional wetlands and indirect impacts to farmed wetlands. The HGM analysis provides a clearer description of the wetland impacts and gives the department a greater degree of confidence that the Corps' proposed mitigation will fully offset these impacts. In our review of the RSEIS 2, our primary focus was to insure that the proposed mitigation scenarios would comply with the previously issued 401 certification and the associated settlement agreement. Upon completing our review, it appears that all of the mitigation scenarios comply with spirit of the 401 certification and settlement agreement. We will, however, need to meet with the Corps in order to consider whether or not some of the references in the 401 certification need to be updated so that they reflect the latest National Environmental Policy Act document.

MDNR Response 2: Comment noted.

MDNR Comment 3:

We look forward to working with the Corps of Engineers in the creation of the monitoring plans required by the 401 certification and settlement agreement in coordination with the other resource agencies as quickly as possible. The early creation of those plans will allow proper documentation of impacts and reduce the possibility of conflict later in the project development.

MDNR Response 3: The Corps concurs. Monitoring plans will be developed as quickly as possible in coordination with the interagency mitigation team.

MDNR Comment 4:

We believe that this project will improve the hydrology of Big Oak Tree State Park and will financially benefit the citizens of this region. Attached for your consideration are the department's detailed comments on the RSEIS 2. We appreciate the Memphis District providing the Department of Natural Resources the opportunity to comment on this document. Please contact Dru Buntin in my office at (573) 751-3195 to arrange a meeting with representatives of the department and the Missouri Attorney General's Office to discuss whether or not we need to update the 401 certification.

Thank you.

Sincerely,

DEPARTMENT OF NATURAL RESOURCES

Doyle Childers
Director

DC:db

Attachment

MDNR Response 4: The Corps concurs.

<u>MDNR General Comments</u>

MDNR General Comment 1: We are pleased that the Corps has now conducted a Hydrogeomorphic (HGM) analysis to quantify direct impacts to jurisdictional wetlands and indirect impacts to farmed wetlands. The HGM analysis provides a clearer description of the wetland impacts and gives the department a greater degree of confidence that the Corps' proposed mitigation will fully offset these impacts. In our review of the RSEIS 2, our primary focus was to insure that the proposed mitigation scenarios would comply with the previously issued 401 certification and the associated settlement agreement. Upon completing our review, it appears that all of the mitigation scenarios comply with spirit of the 401 certification and settlement agreement. We will, however, need to meet with the Corps in order to update some of the references in the 401 certification so that they reflect the latest National Environmental Policy Act document.

MDNR General Response 1: Comment noted.

MDNR General Comment 2: We look forward to working with the Corps of Engineers in the creation of the monitoring plans required by the 401 certification and settlement agreement in coordination with the other resource agencies as quickly as possible. The early creation of those plans will allow proper documentation of impacts and reduce the possibility of conflict later in the project development.

MDNR General Response 2: Comment noted. The Memphis District will consult with the interagency mitigation team in the development of the monitoring plans.

MDNR General Comment 3: Big Oak Tree State Park

In the 401 certification and the settlement agreement, the department and the Corps of Engineers agreed that acquisition of mitigation lands immediately surrounding Big Oak Tree State Park would be a priority focus. While we understand that the Corps is currently prohibited from acquiring additional mitigation lands, the department requests that the Corps aggressively pursue acquisition from willing sellers of the 1,800 acres of land immediately surrounding the state park as soon as the Record of Decision is signed for the project.

MDNR General Response 3: Two tracts of farmland totaling 105 acres have been acquired on the northeast boundary of the park. These areas will currently remain in agricultural production in order to control undesirable vegetation. The Corps will begin negotiating for additional land surrounding the park once the ROD has been signed. The Corps will work closely with the Big Oak Tree State Park staff, as well as the interagency team, in the development of the site-specific monitoring plans surrounding the park.

MDNR General Comment 4: Page 16 fourth paragraph
We are pleased that the Corps has now conducted a Hydrogeomorphic (HGM) analysis of the wetland impacts. The use of a standardized tool to assess the wetland impacts adds credibility to the analysis and provides greater confidence in the mitigation determination. By subjecting their own project to an analysis similar to that conducts on other projects, the Corps also addresses equity issues on wetland mitigation.

MDNR General Response 4: Comment noted.

MDNR General Comment 5: Page 17 first paragraph
We encourage the Corps to begin discussions promptly on the monitoring plan for those forested wetlands that are part of their mitigation strategy upon the signing of the Record of Decision. By defining the monitoring plan in advance of mitigation, the Corps can help ensure that all parties are in full agreement on the expectation of the mitigation and avoid later conflicts.

MDNR General Response 5: Concur. The Corps will coordinate the development of the monitoring plan with the interagency team. As part of the WQ certification, the monitoring plan will be reviewed by the interagency mitigation team and submitted to your office prior to construction.

MDNR General Comment 6: Page 21 first paragraph
Again, we encourage the Corps to work with us, and the other resource agencies as appropriate, to develop the monitoring plan required by the 401 certification and settlement agreement as soon as possible. An early agreement on the monitoring protocols will promote easier implementation.

MDNR General Response 6: Concur.

MDNR General Comment 7: Page 35 fifth paragraph
In this section, the Corps discusses coordinating with the department on the design process for the proposed water delivery system at Big Oak Tree State Park. The water delivery system is only one component of the entire hydrologic restoration project at the park. We suggest that the Corps incorporate language into the RSEIS2 that expounds upon the department's coordination role in the entire project, rather than just the design process for the water deliver system.

MDNR General Response: All references to Big Oak Tree State Park water supply feature have been changed to. The Corps will coordinate all aspects of the Big Oak Tree State Park Hydrologic Restoration with your department, as well as the entire interagency mitigation team. The following paragraph has been inserted in the abstract section of the RSEIS 2:

> 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 will be made up of members from the U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (USFWS), Missouri Department of Natural Resources (MDNR), the Missouri Department of Conservation (MDC), the Corps of Engineers, 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 plan, design, and construction of the Big Oak Tree State Park hydrologic restoration; and the development and implementation of project monitoring plans.

MDNR General Comment 8: Page 39 third paragraph

If a flood duration of 5% yields 1.33 AAHU's, shouldn't a 31% flood duration yield 8.25 AAHU's?

MDNR General Response 8: No, the hypothetical mitigation tract that is used in the example in Section 2.6.2.2 would yield 17.89 AAHUs. A linear relationship cannot be used to determine compensatory mitigation because mitigation is calculated by habitat value (habitat suitability) and duration of flooding. Like habitat suitability, duration needs to be annualized over the project life (50 years). Flood duration needs to be considered without mitigation (area remains farmland) and with mitigation. Compensatory mitigation credit is calculated by subtracting the existing conditions (utilizing post-project conditions) from the mitigated conditions. Compensatory mitigation efforts that increase habitat and increase durations yield higher AAHUs.

MDNR General Comment 9: Pages 46 and 47

We encourage the Corps to retain flexibility in implementing the various scenarios to meet its obligations. This flexibility can provide the Corps with the ability to avoid properties where land owners do not wish to cooperate while providing a wider range of options for meeting the mitigation goals should monitoring show that additional needs exist.

MDNR General Response 9: Concur. Any mitigation plan adopted by a future Record of Decision must allow for flexibility. Flexibility needs to be retained throughout the mitigation process to ensure that compensatory mitigation measures are successful. Flexibility also allows for contingencies and adaptive management in the event that some mitigation measures are not producing the desired outputs.

MDNR General Comment 10: Page 64 paragraph 2

We agree on the importance of monitoring jurisdictional wetlands and encourage the Corps to begin this monitoring before project construction in order to assure that these lands are properly documented before any action that may threaten their status.

MDNR General Response 10: Concur. The monitoring plan will include pre-construction conditions.

MDNR General Comment 11: Page 74 paragraph 4

The Corps should conduct early and multi-seasonal monitoring of dissolved oxygen in the borrow pits created during the project construction. Past land use poses the risk of high primary productivity in these pits and the risk of hypoxia or anoxia. Such low oxygen conditions would significantly reduce the value of these water bodies as fisheries. The Corps should prepare options for fisheries mitigation in the event that low oxygen does restrict the use of these water bodies by fish.

MDNR General Response 11: Concur. Water quality parameters will be monitored monthly in the borrow pits. The following sentence has been added to Section 6.5:

> 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).

Additionally, Table 6.1 has been edited to reflect the change. Fish usage will also be monitored. Detailed monitoring will be addressed in the formulation of each site-specific detailed mitigation plan.

As presented in Section 5.4.2.7, borrow pits will be constructed to maximize floodplain fish usage. It is highly likely that borrow pits will provide significant floodplain fish habitat. Overall mitigation needs may be adjusted in the event that borrow pits are not producing desired outputs. Section 2.9 has been added to the RSEIS 2 that describes mitigation contingencies to meet mitigation goals.

MDNR General Comment 12: Page 131 paragraph 5

The last sentence in paragraph 5 is awkward and its meaning may be misconstrued. The department suggests a change in wording to, "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."

MDNR General Response 12: Concur. The change has been made. The Corps wants to reiterate that it intends to construct the project concurrently with acquiring and implementing compensatory mitigation.

Missouri Department of Natural Resources State Historic Preservation Office

SHPO Comment 1:

STATE OF MISSOURI

Matt Blunt, Governor • Doyle Childers, Director

DEPARTMENT OF NATURAL RESOURCES

www.dnr.mo.gov

December 29, 2005

Commander
Memphis District Corps of Engineers
ATTN: CEMVM-PM-E
167 North Main, B-202
Memphis, Tennessee 38103-1894

Re: DRSEIS 2, Flood Control, Mississippi River & Tributaries, St. Johns Bayou & New Madrid Floodway (COE) New Madrid County, Missouri

Dear Sir or Madam:

Thank you for submitting information on the above referenced project for our review pursuant to Section 106 of the National Historic Preservation Act (P.L. 89-665, as amended) and the Advisory Council on Historic Preservation's regulation 36 CFR Part 800, which requires identification and evaluation of cultural resources.

We have reviewed the December 2005 report entitled *Revised Supplemental Environmental Impact Statement 2, St. Johns Bayou and New Madrid Floodway Project, Missouri.* Based on this review we have no additional comments at this time, as cultural resources surveys are to be conducted as project activities are scheduled.

SHPO Response 1: Comment noted. As project elements move through final design, construction, and operation, the Memphis District will complete compliance with the National Historic Preservation Act and related laws as project elements are fully designed, constructed, and operated. This will include continuing coordination with your office, Federally recognized tribes, and other parties; and inventory of historic properties, consideration of effects, and protection or other mitigative treatments of pertinent historic properties.

SHPO Comment 2:

Please be advised that, should project plans change, information documenting the revisions should be submitted to this office for further review. In the event that cultural materials are encountered during project activities, all construction should be halted, and this office notified as soon as possible in order to determine the appropriate course of action.

If you have any questions, please write Judith Deel at State Historic Preservation Office, P.O. Box 176, Jefferson City, Missouri 65102 or call 573/751-7862. Please be sure to include the SHPO Log Number (028-NM-05) on all future correspondence or inquiries relating to this project.

Sincerely,

STATE HISTORIC PRESERVATION OFFICE

Mark A. Miles
Director and Deputy State
Historic Preservation Officer

MAM:jd

c Jim McNeil, COE/M

SHPO Response 2: Comment noted.

Environmental Defense Comment 1

COMMENTS OF ENVIRONMENTAL DEFENSE,
THE NATIONAL WILDLIFE FEDERATION,
THE MISSOURI COALITION FOR THE ENVIRONMENT
REGARDING THE DECEMBER 9, 2005 DRAFT REVISED SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEEMENT FOR THE ST. JOHNS
BAYOU/NEW MADRID FLOODWAY PROJECT

January 30, 2006

The December 9, 2005 draft Revised Supplemental Environmental Impact Statement for the St. Johns Bayou/New Madrid Floodway project for the first time acknowledges that the value of reforested acres for mid-season fish rearing habitat, according to the model used for this project, depends on how often it is flooded. Acres the U.S. Army Corps of Engineers has identified as potential reforestation mitigation sites flood only a modest portion of the mid-season. As a result, the Corps previous commitment to reforest with 8,375 average daily flooded acres during the mid-season would require that the Corps purchase and reforest 124,000 comparably flooded acres, which would more than triple the costs of the project. What the Corps has previously characterized as a "minor" error involving the "transposition of units" therefore turns out to be a dramatic error.

Environmental Defense Response 1: See Bohlen Response 2. Conservative estimates have been made for flood durations of the mitigation sites. Actual flood durations of mitigation lands are anticipated to be somewhat higher than what was estimated for planning purposes in this RSEIS 2. As stated throughout the RSEIS 2, the Corps intends to mitigate for significant unavoidable impacts to habitat. The final number of mitigation acres will be determined through the application of techniques specified in the RSEIS 2 (Sections 2 and 5). Additionally, mitigation will include a variety of techniques, in addition to reforestation. Some of these techniques are more cost effective at producing habitat than reforestation. Therefore, it is incorrect to state that the Corps would be required to purchase and reforest 124,000 acres and the project costs would triple. Cost estimates of the additional techniques are provided in RSEIS 2 Appendix D. Your comment concerning the transposition of units is noted. However, the 2002 RSEIS calculated impacts based upon Habitat Units (HUs). This RSEIS 2 clarifies the transposition of units issue and calculates benefits from compensatory mitigation features using HUs, the same methodology by which impacts were quantified (RSEIS 2 Section 4.3.1.4).

Environmental Defense Comment 2:

In analyzing whether to proceed with a project, the Corps of Engineers is not supposed to be an advocate but to serve as an honest broker. In other words, it is supposed to determine appropriate mitigation, and if the costs of that mitigation result in an uneconomical project, it is supposed to reject it. This is particularly true because the economic test for a Corps of Engineers project is so minor, requiring only one penny of net benefit for every dollar of taxpayer cost. In 2000, an investigation by the Inspector General of the Army resulting from disclosures of wrongdoing on the Upper Mississippi

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River found that the Corps had improperly confused its mission and failed that obligation to serve as an honest broker and not an advocate. The analysis in the RSEIS2 indicates that the Corps is continuing to confuse this mission.

Environmental Defense Response 2: The Corps has determined the appropriate mitigation for unavoidable impacts from this project with extensive involvement by state and other Federal resource agencies and considering public comments previously received. Recommendations of these agencies have played heavily in the choice of methodologies used and the identification of critical values that drove the assessment of mitigation needs. It is the Corps' responsibility to consider not only the economic, social, and environmental needs of the project area, but also the most efficient and cost-effective means of meeting those needs. See Bohlen Responses 4. The Corps has recognized the environmental significance of the project area. This recognition is demonstrated by the Corps' commitment in previous NEPA documents, as well as this RSEIS 2 to mitigate for significant unavoidable impacts from project implementation. The Corps has diligently examined mitigation techniques, provided scenarios of different combinations of these techniques, and finds that the project is economically justified (RSEIS 2 Table 2.9).

Civil Works projects endure rigorous economic investigations and analyses that are governed by numerous regulations and guidelines (*e.g.*, Water Resources Development Acts, Engineering Regulation 1105-2-100, Budget Engineering Circulars). They are also subject to many phases of internal and public reviews and comments. The processes used by the Corps result in recommendation of projects that are sound economic investments and beneficial to the Nation's economy. These investments are required to return much more than "one penny" of benefit as stated in the comment. A project with a unity (1.0) benefit-to-cost ratio, by definition has an internal rate of return equal to the interest rate used in the analysis. The economic study analyzed all alternatives using the current interest rate of 5.125% (RSEIS 2 Tables 5.13-5.16). A unity benefit-to-cost ratio yields a return of 5.125% to the public. Since all alternatives had a benefit-to-cost ratio greater than unity, their returns were greater than 5.125%.

Environmental Defense Comment 3:

The new RSEIS2 finds that reforestation will generate only 2% of the mid-season fish rearing habitat required in the New Madrid Floodway and 17% in the St. Johns Bayou basin. But under the benefit cost analyses, these costs alone are almost sufficient to render the project not economic, even under favorable discount rate assumptions. The Corps has therefore endeavored to find alternative mitigation that is extraordinarily cheap.

Environmental Defense Response 3: As seen in RSEIS 2 Table 2.7, using reforestation as the only mitigation technique does not compensate for all of the impacts to mid-season fish rearing habitat. It is important to reiterate that precise gains in habitat from mitigation measures will be developed during the development of site-specific detailed mitigation plans. Table 2.7 provides several conceptual options that demonstrate that impacts to all significant resource categories are compensated. RSEIS 2 Table 2.9 demonstrates that these conceptual scenarios are economically feasible.

The RSEIS 2 analyzes techniques and methodologies to provide the required compensatory mitigation with approaches that in some cases are very efficient from a cost per mitigation value perspective (RSEIS 2 Table 5.12). In other cases, appropriate mitigation credit or the potential credit range has been added for project features. No mitigation credit had previously been taken for these features for example, in the case of borrow pits (See RSEIS 2 Section 2.6.1 and Table 2.2).

All alternatives presented are analyzed using the current interest rate of 5.125% (See RSEIS 2 Section 4.4.2 and Tables 5.13-5.16). Individual features of the alternatives were formulated or sized using their authorized interest rates. These rates are 2.5% for the Mississippi River Levee (MRL) portion and 7.375% for the remainder. When the individual pieces of the proposed alternatives were combined at the current interest rate, the benefit-to-cost ratio was above 1.0. There is nothing "favorable" or inappropriate about using the currently prescribed Federal interest rate. Regarding the comment about the mitigation alternatives being "extraordinarily cheap," the Corps always strives to find solutions that maximize benefits while minimizing costs, whether the need is for flood damage reduction or for compensatory mitigation. See Responses to Bohlen Comments 4 and 6.

Environmental Defense Comment 4:

The primary alternative mitigation it identifies involves artificial water level manipulation during the mid-season on existing wetlands – extending the average period of flooding in the sump areas for the New Madrid or St. Johns basins by 10% to 50% depending on the scenario. This approach is supposed to provide 98% of the New Madrid floodway mid-season fish rearing habitat for an extremely cheap price. This claim, however, is not scientifically supported. Indeed, the artificial manipulation of water levels on existing wetlands, which among other effects is expected to kill the existing trees in the area, is environmentally adverse in its own right.

Environmental Defense Response 4:

See Zedler Responses 5, 8, 10, and 14 and Sparks Responses 4 and 21. Creation of a spawning and rearing pool in the sump area of St. Johns Bayou or the New Madrid Floodway will provide significant mid-season fish rearing habitat. The statement "this claim is not scientifically supported" is unfounded. The Corps' approach is supported by sound science as detailed throughout the RSEIS 2 and in these and other comment responses.

A substantial portion of the increased value to the resource is derived from a change in the applicable habitat suitability index due to the mitigation technique employed. Under existing conditions the Mississippi River elevation drops leaving much of the Floodway dry during the mid-season fish spawning/rearing period. This drop in river elevation results in the desiccation of eggs and larvae that could result in year class failures. Mid-season fish will be allowed to enter the Floodway through the open box culverts located on Mud Ditch. The gates will be closed when the river reaches a certain elevation (*i.e.,* 284.4 foot NGVD) to decrease flood damages. The gates will be managed to create a spawning and rearing pool in the sump area. This spawning and rearing pool will provide adequate habitat throughout the entire mid-season rearing period (See Sparks Responses Comment 4-6).

Manipulating water levels has been recognized for years as an effective technique to increase fish reproductive success in reservoirs (Ploskey, *et al.*, 1984; Miranda, *et al.,* 1984), and this concept has been successfully applied to wetlands as well (Hoover and Killgore, 1998; Hoover, *et al.*, 2000). Benefits to mid-season fish rearing as shown in RSEIS 2 Tables 5.5, 5.6, and 5.7 were generated in the exact same manner as impacts were quantified. Additionally, gains in habitat were generated by subtracting post project conditions from mitigated conditions (the acres of habitat provided by nature were not credited towards mitigation).

As seen in RSEIS 2 Table 3.3, there are a total of 1,727 acres of land within the 284.0-foot NGVD contour. This area is 59% cropland (1,018 acres), 19% bottomland hardwoods (328 acres), and 6% fallow (98 acres). The remaining 16% consists of large

and small permanent waterbodies. There are approximately 800 acres of Wetlands Reserve Program (WRP) lands within the 284.0-foot NGVD contour. Flooding this entire area for 45 days during the mid-season is not likely to impact the existing vegetation. The bottomland hardwoods consist primarily of black willow. Black willow is an extremely flood tolerant species that is capable of withstanding the increased inundation (See Response to Sparks Comment 22).

Additionally, the NRCS stated that they did not plant the WRP sites in bottomland hardwoods. They allowed natural re-generation. A site visit conducted on February 2, 2006 revealed that areas that had re-vegetated naturally were predominantly black willows. A site visit report is included as Attachment 1 to Appendix F of the RSEIS 2 (See Response to Sparks Comment 22). In addition to the black willows, the majority of the WRP land appeared to have been seeded with grains. As stated in RSEIS 2 Section 5.2.3.5 compensatory mitigation will include acquiring the land and planting appropriate vegetation that can tolerate the expected flooding regime. In fact, removing agricultural products, creating microtopography, and planting appropriate vegetation to these areas will result in improvements to wetland habitat, resulting in an increase in the habitat value provided (See Responses to Zedler Comments 4, 5, 7, 8, and 11 and Dugger Comment 2).

Environmental Defense Comment 5:

The draft RSEIS2 supplements but does not replace the 2002 RSEIS and focuses on an alternative mitigation plan. It therefore continues to rely on the underlying environmental analysis set forth in the 2002 documents and earlier drafts and on the economic methodology set forth and used in the draft, updated to reflect changes in prices and the different mitigation options set forth in the RSEIS2.

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Environmental Defense Comment 5 (continued):

Environmental Defense, National Wildlife Federation and the Missouri Coalition for the Environment ("Conservation Organizations") now submit these comments. Conservation organizations have previously submitted extensive materials to the Corps challenging many of the key aspects of the analyses incorporated into the 2002 RSEIS and except as explicitly noted in these comments or incorporated additional expert reports, reaffirm those comments. These comments therefore incorporate, except as explicitly noted, the views expressed in comments submitted by the organizations for the 1999 DSEIS, the 2000 FSEIS, the 2001 draft RSEIS, and the 2002 RSEIS, associated expert reports and materials, the briefs submitted and the testimony of expert witnesses provided in the Missouri Clean Water Commission proceedings for the water quality certification related to this project along with associated exhibits (transcripts of whose testimony is in the possession of the Corps),[1] as well as the briefs and supplementary materials submitted to the U.S. District Court for the District of Columbia.[2] While the RSEIS2 in some places re-summarizes Corps positions regarding issues previously in dispute, these issues are addressed by our earlier comments and arguments, and nothing new changes our positions, which we reaffirm. Conservation organizations' new comments are therefore focused on the different mitigation proposals presented in the RSEIS2. The new comments include and

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[1] This testimony, setting forth the environmental and economic inadequacies of the project is fully applicable to the questions regarding the compliance of this project with the Section 404(b)(1) guidelines and the accuracy of the NEPA documentation.

[2] We also incorporate comments submitted by Environmental Defense and Missouri Coalition for the Environment on the scope of the proposed RSEIS2, which urged a reanalysis of project alternatives, which is necessary, among other reasons, because of changes in USDA conservation programs previously raised and because of the changes to the Corps' understanding of its mitigation calculations and other changes to its economic analysis.

3

Environmental Defense Comment 5 (continued):

incorporate the views expressed in the expert reports attached to these comments by Dr. Joy Zedler, Dr. Christopher Woltemade, Dr. Richard Sparks, Dr. Curtis Bohlen, Dr. Bruce Dugger, and SCI Engineering. These comments assume that the earlier documents described above are also incorporated into the record and are in the possession of the Corps but counsel for Environmental Defense Tim Searchinger would be happy to provide copies of any such documents.

Environmental Defense Response 5: Comment noted. See Responses to specific commenters. Unless clarified by this RSEIS 2, nothing changes the Corps' previous responses and testimony to your previous comments and testimony. This RSEIS 2 incorporates all previous comments and responses by reference. The Corps has responded to the attached comments provided.

The Corps does not consider SCI Engineering, Inc.'s comments to be expert testimony. In fact SCI, Engineering states, "[o]ur findings are based on our general overview of available materials, and are not intended to serve as formal or professionally certified opinion." Therefore, it is incorrect to classify this report as an expert report (See Response to SCI Comment 9).

Concerning the second footnote, the 2002 RSEIS analyzed several different alternatives to determine the alternative that maximized net economic benefits and compensated for significant unavoidable environmental impacts to the extent justified (see DOI Response 1). Concerning the USDA conservation programs refer to RSEIS 2 Sections 4.4.3.1 and 4.4.3.2. The RSEIS 2 demonstrates that the concerns raised in this footnote can be and have been addressed without a reanalysis of alternatives.

Environmental Defense Comment 6:

The most basic reason the new, proposed mitigation is inadequate is there is now a scientific consensus about the critical importance of natural hydrologic variability to the functions of wetlands and floodplain habitats. Artificial hydrologic manipulation of existing wetlands so that they flood according to an unnaturally extended and invariable pattern is adverse in its own right and accordingly cannot provide mitigation, let alone the massive levels of mitigation claimed by the draft RSEIS2. These failings of the new proposal are discussed in depth in the report of Dr. Joy Zedler. Dr. Zedler is one of the nation's leading authorities on aquatic ecosystems, wetlands, and their mitigation. She is an accomplished practitioner of wetland mitigation, a leading author, and chaired the panel of the National Research Council of the National Academy of Sciences, which authored the report Compensating for Wetland Losses Under the Clean Water Act, which was commissioned by the U.S. Environmental Protection Agency and the Corps of Engineers. Its recommendations have been broadly embraced by both agencies.

Environmental Defense Response 6: See Zedler Responses 4 – 7. Hydrologic variability is of critical importance to the function of wetlands. However, natural hydrologic variability is not critical to compensate for mid-season fish rearing habitat. In fact, natural hydrologic variability can result in rendering potential spawning and rearing habitat useless. Habitat may not be available during prolonged dry periods or habitat may only be available during the wrong time of the year for fish to be able to use it. Modifying hydrologic variability provides stable spawning and rearing habitat, stable food availability for larval fishes, and higher growth rates and survivability for fishes (See Sparks Response 5).

The claim that "artificial manipulation of existing wetlands so that they flood according to an unnaturally extended and invariable pattern is adverse it its own right" is unfounded. The existing conditions in the sump area of both basins are a far cry from natural hydrology. The existing hydrology can be described as an area of intense farming practices in which hydrology consists of channelized streams, levees, water control devices, and extensive drainage structures. It is true that portions of the New Madrid floodway are subject to backwater flooding. However, this backwater flooding is attributed to an artificial condition as well. If it were not for the Mississippi River

Frontline Levee, the area would most likely be subject to headwater flooding from the Mississippi River, as occurs in the present-day batture area. Because of the frontline levee, it does not experience that Mississippi River headwater flooding. The landscape in the area is mostly soybean fields (See RSEIS 2 Table 3.1 and Figures 5 - 17), not a pristine, natural wetland or floodplain. With the exception of Big Oak Tree State Park, portions of the Ten Mile Pond Conservation Area, and the Bogle Woods tract that has been acquired, most of the New Madrid Floodway is an engineered system. Referring to the New Madrid Floodway as a natural system is simply incorrect. As can be seen by Table 2.2 and Table 2.7 in the RSEIS 2, the additional engineering proposed by the project, including compensatory mitigation, results in significant gains to most of the existing resource categories that are found in the Floodway today (See Zedler Responses 2, 4, 5, 8, 9, and 14, Sparks Response 5, and Bohlen Comment 27).

The declaration of Dr. Joy Zedler appears to be discussing wetlands mitigation through restoration, not mid-season fish rearing mitigation. Efforts will be made in restoring hydrologic variability for wetland mitigation. In fact, this project provides for restoration of the historic hydrologic cycles to Big Oak Tree State Park and restoring 1,800 acres of bottomland hardwoods surrounding the park that are currently farmland. These areas currently experience little if any hydrologic variability. Restoration of hydrology to the park and providing an additional 1,800 acres of bottomland hardwoods surrounding the park will significantly improve wetland habitat. Moreover, there is also an opportunity to provide significant spawning and rearing habitat for fish (See Zedler Responses 1, 2, 4 - 7, 10, and 14, Dugger Response 4, and Bohlen Responses 27, 54, and 63).

Additionally, reforestation in order to compensate for wetland losses will include restoration of hydrologic functions to the extent feasible by creating microtopography and planting appropriate vegetation suitable to site-specific conditions (See RSEIS 2 Section 5.2.2.1). Dr. Zedler points out "[r]estore or develop naturally variable hydrological conditions. Promote naturally variable hydrology, with emphasis on enabling fluctuations in water flow and level, and duration, and frequency of change, representative of other comparable wetlands in the same landscape setting. NRC. Compensating for Wetland Losses Under the Clean Water Act p. 125 (2001)." The Corps' proposed wetland mitigation will do exactly what the NRC report recommends (See Zedler Response 4).

Modifying the operation of the gates in the St. Johns Basin or the New Madrid Floodway to create a spawning and rearing pool will provide significant gains to fish spawning and rearing habitat, take farmland out of production, restore vegetation, and not impact the existing black willows in the area. Therefore, claiming that this would be "adverse" is unfounded (See Zedler Responses 5, 8, 10, 14 and Sparks Responses 5 and 22.

Environmental Defense Comment 7:

As Dr. Zedler explains, scientists now refer to hydrology as the "master variable" in driving the ecology of aquatic ecosystems, including floodplains, and its key components include not just average flooding conditions but variability in the magnitude

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of water, frequency, duration, timing and rate of change. The disruption of natural flow patterns is considered to be at the root cause of the great ecological distress facing the Everglades and coastal Louisiana, and scientific papers have demonstrated broad unintended adverse effects more generally of altering the hydrology of wetlands and riparian areas, including floodplains. Accordingly, the NRC report she chaired set forth the restoration or development of "naturally variable hydrologic conditions" as a core guideline for wetland mitigation. And the Corps of Engineers has embraced this recommendation, referring to such seasonal and yearly variation as a basic requirement of wetland mitigation.

Environmental Defense Response 7: See Zedler Responses 4 - 6, 8, 9, and 11. It is inappropriate to compare the Everglades and coastal Louisiana to the New Madrid Floodway. The only similarity is that natural hydrology has already been disrupted, although the manner of the disruption is dissimilar. It is accurate to say that the ecosystem and landscape of the Floodway is significantly impacted by human activity. The project will do much to restore the entire ecosystem in the project area, not just preserve remnants of the hydrologic regime called backwater flooding. As a result, most ecological functions will be much improved from the ecological functions that soybean fields provide under existing conditions.

Environmental Defense Comment 8:

This variability in hydrology is closely related to landscape position. Broad, contiguous, topographically diverse areas flooded according to a naturally variable pattern are not comparable, and are far more valuable for a broad range of functions, to small areas flooded artificially. The NRC Report notes that "landscapes have natural patterns that maximize the value and function of individual habitats," and that "slight differences in topography" result in significant changes. As a result, large, contiguously flooded areas with "heterogeneous topography" – such as the project area with countless subtle variations in elevation – cannot be replaced by small, highly managed areas. Again, the Corps of Engineers has embraced this recommendation as a critical wetland mitigation guideline.

Environmental Defense Response 8: See Zedler Responses 4, 7, and 8 and Bohlen Response 26. As seen in RSEIS 2 Table 3.1, over 85% of each basin is classified as cropland. A large portion of this cropland has been leveled and extensively drained to promote agricultural production resulting in homogenous topography. The only contiguous habitat within the Floodway is farmland (See RSEIS 2 Figures 5 – 17).

The Corps is not proposing to replace "large, contiguously flooded areas with heterogenous topography with small, highly managed areas. The Corps is proposing to replace lost ecological functions on a large, contiguous tract of homogenous farmland with a variety of diverse techniques that include restoration of thousands of acres of bottomland hardwoods, restoration of hydrology to Big Oak Tree State Park, 64 miles of vegetated buffer strips, a wildlife corridor, moist soil units, modified borrow pits that benefit multiple species of fish, and additional techniques that may include restoration of degraded floodplain lakes or the creation of a spawning and rearing pool in areas that are mostly farmland.

Not only has the Corps embraced the recommendation of heterogeneous topography as cited in the NRC report, this project will implement its recommendations to the extent feasible. This project will provide more heterogeneous topography than exist under current conditions.

Environmental Defense Comment 9:

In this case, the core of the proposed new mitigation is based precisely on the principle that a small, artificially ponded area can replace a large, variably flooded area 5
with heterogeneous topography. This approach fundamentally contradicts known science embraced by the Corps itself.

Environmental Defense Response 9: See RSEIS 2 Section 4.3.2.4, and Zedler Responses 5, 7, 8, 10 and 14, Sparks Comments 5 and 21, and Bohlen Comments 63. The proposed mitigation is not based on the principle that small artificially ponded areas can replace large, variably flooded areas. Proposed mitigation is based on outputs of the environmental models that were agreed to during the development of the project. Mitigation will ultimately be accomplished when impacted habitat is replaced, not when certain quantities of acres are procured.

As seen in Section S.3 of the RSEIS 2, rather than small, artificially ponded areas, the proposed mitigation includes the following:

- Supply 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 has been used to delineate the project area because it is the upper limit of backwater inundation, which is greater than the 30-year flood event) in the St. Johns Bayou Basin. Reforesting 1,293 acres of cropland in areas below 300 feet NGVD would increase forested wetlands in this area by 59%.
- 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 in the New Madrid Floodway. Reforesting 4,126 acres of cropland would increase forested wetlands by 107% in these areas. Additionally, reforesting 1,800 acres of cropland surrounding Big Oak Tree State Park would nearly 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 practice 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 remaining 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.

Creation of a spawning and rearing pool can significantly increase mid-season fish rearing habitat. Refer to Environmental Defense Response 4 and Zedler Responses 5, 8, 10, 14, and Sparks Comments 5 and 21.

Restoration of floodplain lakes provides significant habitat for fish and is widely accepted as a habitat gain by the LMRCC. A similar restoration project has recently been completed on Tunica Lake Cutoff, Tunica County, Mississippi. Preliminary data

suggests that construction of a weir at the outlet of this lake has increased fish productivity (Keith Meals, Mississippi Department of Fisheries, Wildlife, and Parks, personal communication).

Environmental Defense Comment 10:

> Apart from the inadequacies of the new approach for fishery habitat, the new approach also remains inadequate for other separately analyzed functions previously addressed by conservation organizations including wetlands, shorebirds, and waterfowl. This is evident from the fact that apart from the artificially extended flooding on existing wetlands during the fish mid-season, the number of acres of mitigation have been reduced. Accordingly, all earlier comments on the adequacy of mitigation for these categories of species continue to apply.

Environmental Defense Response 10: For information about waterfowl and shorebirds, see Responses to Dugger. For wetlands, see Zedler Responses 1 and 7, and Bohlen Responses 30 – 37 and 43 - 47). The basic mitigation feature fully compensates for shorebird losses by the construction and management of 765 acres of moist soil units. The basic feature alone over-compensates impacts to waterfowl by 1,744,936 DUDs (See RSEIS 2 Table 2.2. and Dugger Response 2). These resources are further benefited by implementing the additional mitigation techniques that compensate for mid-season fish rearing losses.

The statement concerning the reduction in mitigation acreage is misleading. Mitigation is based on compensating for lost habitat not a certain quantity of acreage. The August 25, 2003, Record of Decision recommended the acquisition in fee or easement of a total of 9,140 acres of land for mitigation (See RSEIS 2 Section 2.2.). This RSEIS 2 analyzes several mitigation scenarios that entail the acquisition of real estate in fee or easement on a range of 9,877 acres to 10,412 acres (See RSEIS 2 Table 2.8). Mitigation acreages have not been reduced as the comment suggests. Mitigation acres have increased.

Environmental Defense Comment 11:

One of the major changes of the new analysis is the approach to Swampbuster. Instead of following its "don't ask, don't tell policy," the NRCS, according to the RSEIS2, has performed a new sample of farmed wetlands in the project area. This new sample, according to the Corps' summary of NRCS's views, confirms the NRCS analysis of wetlands present from 1980's analysis overall, which would place a mere 520 acres of farmed wetlands in the project area. Then, based on an HGM analysis of wetland functions, the NRCS has accepted the mitigation proposed by the Corps as adequate for Swampbuster purposes to avert violations of Swampbuster.

One of the basic flaws with this approach is that the new NRCS wetland analysis is technically inadequate. The Corps continues to report, based on hydrologic modeling developed from direct Mississippi River stage data, that more than 9,000 acres in the project area have 15 days of inundation during the growing season from Mississippi River backwater flooding. This is exceptionally, almost uniquely, strong data regarding

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Environmental Defense Comment 11 (continued):

compliance with farmed wetland criteria and is far more reliable than any result based on the indirect analysis from aerial photographs drawn by NRCS. Indeed, the entire economic and environmental analysis for the project, including the mitigation analysis, is based on the validity of this hydrologic analysis. Furthermore, the NRCS method, reflected in the applicable interagency mapping conventions, confirms the presence of wetland hydrology from impacts on crops through crop stress, delayed planting or unusual crop abundance in dry years. The whole premise behind the economics of the project is that the Mississippi River flooding has these impacts. Yet the NRCS acknowledged that its method did not pick up indicators of flood events on cropping. In a context in which flooding is known to occur, this statement amounts to an admission of the invalidity of its approach in this context. In fact, the approach by NRCS is not designed to pick up wetland impacts from Mississippi River backwater flooding and cannot be validly used in this context – let alone can it be viewed as sufficiently reliable to override the direct assessment of the hydrologic modeling.

Environmental Defense Response 11: Please refer to Section 4.4.3.1 of the RSEIS 2 for a discussion of the NRCS' involvement in the project.

The Corps has relied on the NRCS for a determination that project implementation will not cause area farmers to violate Swampbuster and lose their farm payments (See RSEIS 2 Section 4.5.1). The NRCS is responsible for this program. The Corps did not rely on NRCS to determine the amount of mitigation needed to compensate for unavoidable project impacts. The Corps, while it requested a statement of the adequacy of the proposed mitigation from NRCS and received such a statement, did not decrease the proposed wetland mitigation. The Corps stands by its hydrologic inundation analysis, regardless of NRCS' classification of those lands for its own program purposes. As the commenter points out, the Corps hydrologic analysis is "exceptionally, almost uniquely, strong data regarding compliance with farmed wetland criteria." It is precisely this analysis that is the basis for the proposed wetland mitigation. The Corps' mitigation plan for these lands that are either 'potential' farmed wetlands or prior converted croplands

fully meets Missouri guidelines for 1 to 1 mitigation for farmed wetlands (See Zedler Responses 1 and 7 and Bohlen Responses 43 – 47).

Environmental Defense Comment 12:

The NRCS judgment of acceptable wetland mitigation is therefore based on an incorrect analysis of wetland impacts. Dependent as it is on the HGM analysis, it is also invalid since it too was based on these wetland impacts and in other ways, it cannot be used appropriately in this context or to measure and offset all of the wetland functions lost. Indeed, an assumption behind the Corps's claims is that mitigation sites will all restore wetlands to non-wetlands. In fact, it appears that nearly all of the likely mitigation sites are already wetlands. In fact, much of the mitigation is likely to occur in areas that are dried as a result of the project and therefore may not have wetland

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hydrology at all, and if they do meet minimum hydrological criteria, they will not have full wetland hydrology comparable to impact sites. Indeed, even if the new NRCS analysis were accurate, Swampbuster still precludes reliance on mitigation funded by the federal government, which remains the proposal here. And there is no evidence that NRCS is insisting on the normal paperwork to assure that mitigation occurs and is compliance with Swampbuster.

Environmental Defense Response 12: See Environmental Defense Response 11. The Corps' mitigation plan requires that proper hydrology be provided to mitigation sites to obtain the appropriate habitat unit credit that is intended (See RSEIS 2 Section 2.6.1.1).

Swampbuster compliance is addressed in RSEIS 2 Sections 4.4.3.1, 4.4.3.2, and 4.5.1 and Bohlen Comments 30 - 37 and 40 - 47.

Environmental Defense Comment 13:

> There is a further suggestion for the first time that Corps approval provides Swampbuster compliance in accordance with NRCS acceptance of Corps mitigation judgments on the grounds that it is equivalent to a Section 404 permit. This novel view contradicts the plain language of the Swampbuster statute because the Corps is not issuing an actual Section 404 permit.

Environmental Defense Response 13: Under 16 USC §3822(f)(4), an action is exempted from Swampbuster where authorized by a section 404 Clean Water Act permit and where NRCS agrees that the converted wetland values, acres, and functions are adequately mitigated. The Corps does not process and issue permits for its own project, but it does follow all applicable legal requirements of the permitting for it projects. The Corps' own exemption from this requirement is set out in section 404(r). By letter dated October 5, 2005 (RSEIS 2 Appendix G), NRCS subsequently confirmed that the mitigation requirements would be sufficient under Swampbuster and this was further verified by the HGM assessment that is present in the RSEIS 2 indicating that farmed wetlands will be over-mitigated by the current project mitigation scenarios (See RSEIS 2 Sections 4.4.3.1, 4.4.3.2, and 4.5.1).

Environmental Defense Comment 14:

Another change is that the Corps claims for the first time, in an internally inconsistent explanation, that the grandfather provisions of the 1974 discount rate statute apply here because project sponsors had provided adequate assurances they would pay the local cost share requirement. This claim, contradicted by all earlier Corps assertions, is also contradicted by the fact that as of 1974, local sponsors had rejected the New Madrid levee closure, and that in any event, they could not have accepted the cost-share obligations that became applicable only as of the 1986 Water Resources Development Act. Indeed, local sponsors have still not committed to meet cost-share requirements, including mitigation requirements, either as required either by the 2986 WRDA or even prior to that Act. It logically follows that they could not have committed to the cost-share for the project now prior to 1974. The cost of those mitigation requirements,

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even as now estimated by the Corps, are in the many millions of dollars. The failure of the Corps to require local payment for land, easements and rights of way for mitigation is also a violation of cost-sharing requirements applicable under the 1986 WRDA as well as under prior applicable law.

Environmental Defense Response 14: See RSEIS 2 Section 4.4.1. Section 80(b) of WRDA '74 provides that the Corps may rely on the grandfather provisions if the non-Federal interests have prior to December 31, 1969 given satisfactory assurance to pay the required non-Federal share of the project costs. On January 30, 1959, the Corps accepted provisions of assurances of the St. Johns Levee and Drainage District to acquire flowage easements for the project in accordance with the FCA '54. See Administrative Record Volume 3, page 36.

Additionally, the levee closure portion of the project is not subject to cost-sharing as it is part of the Mississippi River Levee feature of the Mississippi Rivers and Tributaries Project originally authorized in the Flood Control Act of 1928. See 33 U.S.C. §702a. The authority for the gap closure at the lower end of the floodway was granted under the Flood Control Act of 1954. Since this project is not a separable element under the 1986

Water Resources Development Act, no cost sharing for this portion of the project is required. See 33 U.S.C. §2213(a)(1); (e)(1). The levee closure is not physically separable from the rest of the MRL feature as it is a part of a single structure – the levee that runs from Cairo, Illinois to the Gulf of Mexico and provides flood control for the Mississippi Alluvial Valley. Additionally, communications between the Corps and Congress indicate that Congressional understanding was that the New Madrid closure of the MR&T project would not be affected by the cost-sharing provisions of WRDA '86. This was based on two factors: (1) that separable elements of the MR&T project were defined as parts of the project that was located along tributaries to the mainstem Mississippi River and (2) that the New Madrid closure was a scheduled balance. Since the New Madrid closure is along the mainstem Mississippi and was a scheduled balance, the Assistant Secretary of the Army (Civil Works) wrote to the Chairman of the House Committee on Appropriations that the project would be exempt from cost-sharing requirements. See Administrative Record Volume 37, pages 161-65

Environmental Defense Comment 15:

The Corps should also learn from the recent experience of Hurricane Katrina regarding the critical public policy significance of prioritizing limited water resources dollars. In Louisiana, Corps and outside experts had long identified New Orleans levees as vulnerable to very large hurricanes that would cause catastrophic damage. Yet, dollars for analysis and improvements to the levee system were shortchanged even though Louisiana has long received the most dollars for Corps water projects of any state in the nation. Dollars were instead devoted to marginal navigation and flood control projects at best. Two articles in the Washington Post describe the Katrina situation and are included along with this submission.[5] There is already a backlog of more than $50 billion for authorized Corps projects. As a matter of public policy, it is only logical that the Corps consider the relative significance for the nation of approving of another project to compete for limited available funds whose benefits do not address remotely the kinds of property, human disruption and risk of lost life as many other critical flood control priorities.

Environmental Defense Response 15: The Corps does not have independent authority to implement its Civil Works Program as suggested in Comment 15. This would include

the Corps setting its own priorities for Katrina relief. The Corps carries out the Civil Works Program of the Department of the Army pursuant to Congressional (legislative branch) direction, which includes both authorization and funding. See U.S. Constitution, Article I, Section 1 (Legislative Powers reside in Congress) and Article II, Section 1, (the Executive Powers are vested in the President). The Corps, in carrying out the Department of the Army Civil Works Program, does so only at the direction of, and pursuant to, the authorities provided to the Corps, part of the Executive Branch, by the Legislative Branch.

Environmental Defense Comment 16:

It is also interesting that for the first time, the RSEIS2 mentions the Town of Pinhook and quotes with approval comments from the Pinhook Chamber of Commerce

[3] "The Slow Drowning of New Lreans," The Washington Post p. A1(Oct. 9, 2005); "Money Flowed to Questionable Projects: State Leads in Army Corps Spending, but Millions Had Nothing to Do with Floods," The Washington Post p. A1 (September 8, 2005).

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Environmental Defense Comment 16 (continued):

for the project. Pinhook is a community of roughly 30 structures that does not experience flooding directly from Mississippi River backwater. Instead, the main disruption to Pinhook from backwater flooding occurs through flooding of the most direct road connecting Pinhook to East Prairie. The costs of this disruption and damage to the road remain uncalculated. To the extent the Corps truly were focused on the needs of Pinhook, the obvious alternative would be to raise the road or otherwise improve passage during flood events, an alternative conservation organizations have repeatedly urged the Corps to analyze. Suggestions that Pinhook is economically dependent on agriculture and therefore would benefit enormously from the project are not only too vague to be meaningful but not substantiated. Obviously, there could be some benefit for Pinhook residents, but it would be extremely modest. The Corps does not expect the project to increase land in agricultural production, so labor and inputs to agricultural production will not significantly change and resulting increased demand for work that could be provided by residents of Pinhook is limited at best. Pinhook does not in any event include companies that provide agricultural inputs. According to established economic principles, the benefits of the project will flow to the owners of the agricultural land and any benefit to renters will be passed on to owners in the form of higher rents. Land plat maps indicate that most of the land in the New Madrid floodway is owned by a very small number of large landowners. How much land is owned by residents of Pinhook is unknown, but certainly small, and has been estimated in previous newspaper articles at around 600 acres.

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Environmental Defense Response 16: The comment indicates that this RSEIS 2 is the first mention of Pinhook. Many comments in support of the project were received from the late Mr. Jim Robinson (former Mayor of the town), many Pinhook residents, and the NAACP (both Charleston, MO and Missouri Chapters). These comment letters can be found in Appendix L of the 2002 RSEIS.

The comment is in error regarding the flooding situation at Pinhook. Although not quantified for the purpose of economic evaluation, Pinhook does experience backwater flooding directly from the Mississippi River. An approximate 50-year backwater flood begins to enter the resident's homes. Floods of much lesser magnitude surround Pinhook and isolate it causing many additional costs and increased dangers for the residents. Merely raising the roads as suggested by the comment, does nothing to keep the floodwaters out of the resident's houses or reduce the danger to a motorist who could accidentally leave the road and drive into the floodwaters.

Pinhook residents will also receive benefits due to the project's agricultural effects. The landowner directly involved in the farming operation will receive the direct benefit. But the local economy will also receive a portion of the indirect or secondary benefit as the landowner spends his or hers increased income. The farmer who rents benefited lands will receive a substantial portion of the economic benefit with the remainder going to the non-farming landowner.

How much goes to each will be a negotiating or bargaining process greatly influenced by the economic risk each assumes. Many of the benefits of the project require greater investments or changes in established practices. For instance, the farmer may plant earlier, use more inputs, or change to more valuable crops. Each time the farmer increases his or hers investment, he or she exposes themselves to the potential of an increased loss due to residual flooding, drought, hail, wind, frost, etc. These risks will require the farmer to keep a significant portion of the potential increased returns. The project area is dependent upon a farm economy. The increased benefits received by these farmers and landowners that are spent in the local economy will benefit the area's employers and employees, potentially increasing employment, personal income, taxes, etc.

Environmental Defense Comment 17:

Finally, criticism of the alternative that would use a modest levee to protect East Prairie from flooding from the St. James ditch is ridiculous on its face. The quoted statement suggests that this levee would increase Pinhook's isolation. East Prairie and Pinhook are now separated by the very large New Madrid setback levee, and any new levee would be far more modest. More important, even the setback levee has no real "isolating" effect on Pinhook but simply requires a barely perceptible rise and fall in the road separating it from East Prairie. As the concept applies to Pinhook, separation refers to the flooding of the road during very large floods not any levees that the road must pass over.

Environmental Defense Response 17: Prior studies analyzed the economic effects of a ring levee to protect East Prairie. All East Prairie ring levees had benefit-to-cost ratios of less than 0.5 to 1. The commenter has already recognized the importance of a positive benefit-cost ratio at comment 2, above (See 2002 RSEIS Section 2.4.1).

Environmental Defense Comment 18:

These comments of conservation organizations, including expert reports and associated documents, were provided based on the limited time available to analyze not only the RSEIS2 but critical documents necessary to analyze the RSEIS2 that were received by Environmental Defense in response to a Freedom of Information Act request. Critical documents received only on January 13th in the offices of Environmental Defense. There was also no advance indication that documents would be forthcoming on that day, a Friday, and counsel for Environmental Defense was out of town that day, so the organizations were not able to begin to review these documents and provide relevant documents to experts until January 16th. While the organizations and experts have worked hard to assimilate and evaluate this material in this limited time, they have not yet had time to review fully all parts of the analyses. Some review continues, and should we identify significant additional issues, further comments will be provided.

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Environmental Defense Response 18: This project has undergone three separate NEPA analyses since the mid-1990's. Many of the comments made, with the exception of comments specific to the details of this RSEIS 2 with respect to mitigation planning, have been made in some fashion before. Technical information requested under the Freedom of Information Act (FOIA) has been in Environmental Defense's possession for at least this comment period and in most cases since 2003 or earlier.

The public comment period was published in the Federal Register on December 9, 2005 and the commenter had the RSEIS 2 on that date. On December 14, 2005, the commenter gave notice to the Department of Justice that they would be making a FOIA request but said FOIA request was not received by the Corps until December 20, 2005. Aside from the FOIA attorney, the Corps employees who were needed to assemble documents responding to commenter's FOIA request were on vacation at that point and did not return until the first (and in some circumstances) the second week in January. The Corps provided most of the requested documents to the commenter on January 11, 2006, and the remaining documents on January 13, 2006. Additionally, the Corps did

extend the comment period an additional week to allow the commenter additional time to review and make comments on the project. The Corps considers all reasonable comments made by the public under NEPA, however, there is no requirement that the public comment period accommodate one group's personal schedule.

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ASSESSMENT OF WATERFOWL EFFECTS AND DISCUSSION
IN THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE ST. JOHNS BAYOU/NEW MADRID FLOODWAY PROJECT

Bruce Dugger
1-27-06

I have previously provided extensive comments and testimony regarding the St. Johns Bayou/New Madrid Floodway project and its impacts on waterfowl and shorebirds in particular. I have reviewed the December 2005 Revised Supplemental EIS2. In my view, nothing in the December 9, REIS2 draft alters the validity of these comments, except that there is now some proposal for managed impoundments, which I discuss below.

Dr. Bruce Dugger Comment 1:

For the first time, this draft suggests that some impoundments will be constructed to manage habitats to benefit waterfowl and shorebirds. In doing so, the draft for the first time proposes to create some small, managed areas in lieu of the current natural back water flooding that occurs. My understanding is that alternatives that did not rely on natural flood regimes were rejected by the Fish & Wildlife Service, among other reasons, because doing so would be inconsistent with the critical need to provide a large distribution of habitats over tens of thousands of acres to reflect the full range of waterfowl uses of the project area, including thousands of acres of shallow, temporarily flooded wetlands in a variety of cover types as flood waters recede (2002 RSEIS at E-151). As I understand it, the Fish & Wildlife Service maintains that mitigating for calorie loss, as calculated by the WAM, is a necessary but by no means sufficient criterion for mitigation, and I agree.

Dugger Response 1: This draft clearly restates the commitment from earlier reports to construct and manage impoundments to benefit waterfowl and shorebirds. Regarding the statement that USFWS rejected mitigation alternatives that do not rely on natural flood events, that is counter to USFWS formulation of alternatives that rely on man-made compensation measures such as the creation of moist soil areas (RSEIS 2 Section 4.3.4). We concur that large scale natural flooding regimes contribute to large distribution of habitats as stated in the referenced 1998 WAM report. Following project construction, flooded areas will be more concentrated. However, post-project there will still be flooding of agricultural lands from headwater events and ephemeral ponds will still be present throughout the project area. Diversity of waterfowl habitat will be provided by the thousands of acres of newly reforested areas, from shorebird moist soil areas, and the avoid and minimize measures such as riparian and wildlife corridors. Additionally, the operation of the spawning and rearing pool in retaining water to 284.4 each year will result in deeper water areas that will provide feeding habitat for diving ducks. Finally, up

to 6,400 acres of primarily agricultural lands will be flooded during the winter waterfowl season. See 2002 RSEIS Section 5.5.

We concur that mitigation based on calorie loss alone is not sufficient for waterfowl mitigation. However, the final recommended waterfowl mitigation plan far exceeds, both in type and acres of habitat, that recommended by USFWS as being necessary to compensate for unavoidable losses. See RSEIS 2 Section 4.3.4 for a complete discussion of the caloric effect of reforesting agricultural fields. See 2002 RSEIS Appendix E for the calculation of the effects of impacts and mitigation on waterfowl.

Dugger Comment 2:

Apart from the other concerns outlined in my testimony, the micro topographic variation important to shorebirds that occurs over 70,000 flooded acres, which is critical to the area's value to the variety of shorebirds it supports, is difficult to replicate or maintain on smaller areas, even when managed. Nothing in the new draft EIS indicates how this micro topographic variation would be achieved. For waterfowl, there are also additional problems using a managed habitat approach even for calorie replacement. Creating managed units that are flooded for long periods of time during winter may have reduced value in February and March because seeds produced in the fall have been depleted. The WAM indicated that acorns in bottomland hardwoods would decline each day of flooding and be depleted after 11-28 days (depending on the % of red oaks; Table 2, page B-9, Appendix B, 1998 WAM analysis). Thus, flooding a specific number of managed acres for one month would not provide the same foraging conditions provided by natural flooding where rising water levels continue to flood new habitat. That is, while some number of acres is flooded less than two feet deep on the current floodplain

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each day, the location of those acres will change as river level changes and thus provide fresh new food supplies, so the likelihood of depletion is reduced in a naturally flooded floodplain. To mimic this pattern with managed habitats, you would need a much larger total acre value. Thus – again in addition to other problems raised in my testimony – the model's reported mitigation acreage requirements can not be applied to managed habitat without adjustments that would increase the number of acres required.

Dugger Response 2: The comment is very misleading in that it speaks to the value of micro topographic variation occurring in over 70,000 flooded acres. First of all, if this amount of area was flooded, only a small percentage would be shallow enough to be of value to shorebirds. Secondly, a flood that would impact this many acres would be a rare (over a 25-year) event. A more realistic assessment would be to evaluate impacts on about 17,000 acres that occur within the two-year flood frequency in the New Madrid Floodway. This flooding currently occurs primarily on agricultural lands (11,843 acres) rather than bottomland hardwood wetlands (3,354 acres) as the comment suggests (See RSEIS 2 Table 3.3). Even so, only a small portion of these acres (about 1,300 cumulative

acres less than 24"deep) is available for waterfowl and shorebirds on average at any given time during the November 1 to March 31 waterfowl season. See 2002 RSEIS Section 5.5.1. Little to no microtopographic variation exists in the project area because the majority of the area has been extensively leveled for agricultural production. See Zedler Response 8. However, the limited amount of microtopographic variation that still exists in the project area would still provide valuable habitat for shorebirds and waterfowl post-project due to headwater flooding and rainfall. Further, microtopography is readily implementable in mitigation site development and will be created to mimic dimensions present in nearby reference sites (See RSEIS 2 Section 5.2.2.1).

Regarding the contention that managed areas may have reduced food values during February and March, the intent of managing moist-soil and bottomland hardwoods for winter and spring habitat is to maximize food availability for winter and spring migrants. Also, experience and data from the University of Missouri Gaylord Memorial Laboratory show that much spring food use is of invertebrates which mature over winter and only become available by spring (because of detrital decomposition processes) regardless of whether the moist-soil or bottomland hardwoods area was flooded all winter or not (Dr. Mickey Heitmeyer, personal communication). In fact, longer flooding promotes some spring foods such as invertebrates (See 2002 RSEIS Appendix E, E-149).

The commenter is incorrect that more acres are required for mitigation. USFWS through its CAR indicated that more bottomland hardwood and moist soil habitat is being proposed than is shown to be necessary by the model. See RSEIS 2 Table 2.2 (showing overmitigation of 1.7 million DUDs for waterfowl). See 2002 RSEIS 2 Appendix E, U.S. Fish and Wildlife Service CAR.

Dugger Comment 3:

> **While some hydrologic restoration is now included in the current plan; I question the proposed value of several mitigation features. Specifically, from maps, it appears that proposed reforested buffer strips and wildlife corridors would be above the areas still allowed to flood as a result of the project, and thus would not be in a position to produce significant flooded habitat for waterfowl, and isolated, linear corridors of trees would have limited value to waterfowl even if flooded.**

Dugger Response 3: Buffer strips and wildlife corridors were proposed throughout the New Madrid Floodway. However, benefits these areas provide were not quantified in the 2002 RSEIS. This RSEIS 2 quantifies benefits these areas provide (See RSEIS 2 Section 2.6 and Tables 2.2 and 5.11). Some of these areas would still be exposed to interior flood events and those in the lower project area would be exposed to springtime modified gate operation. Minimal value was calculated for waterfowl in these areas. Detailed mitigation plans will be submitted pursuant to the requirements of the State Water Quality Certification setting forth the benefits to waterfowl that will be provided by each mitigation site. See Water Quality Certification at 3(b) (RSEIS 2 Appendix G).

Dugger Comment 4:

> I also question the increased benefits assigned to Big Oak Tree State Park for waterfowl. It may be true that the site is drier than it used to be; however, the area already floods, so those acres currently provide waterfowl benefits when flooding occurs. While there may be some enhancement of natural flooding, the area contributes to mitigation only to the extent of this enhancement, and according to the Waterfowl Assessment Model, only when flooded less than two feet. There is no estimate of how much of a habitat increase that would be. This concern applies to all proposed mitigation sites. Additionally, simply preserving existing habitat should not count as mitigation. Finally, the water quality certification requires that Big Oak Tree not be subject to artificial flooding but instead to be allowed to flood according to the rise and fall of the river. Given this stipulation, it is not clear you could establish and maintain red oaks or that habitats would be flooded in March.

Dugger Response 4: The Corps did not assign a waterfowl benefit for Big Oak Tree State Park (see RSEIS 2 Table 2.2). However, based on development of a water management plan that mimics natural, historic flooding conditions which would increase springtime flooding over existing conditions, it would have been appropriate to do so.

Also, there is an incorrect assumption regarding the existing flood frequency of Big Oak Tree State Park in this comment (See RSEIS 2 Section 2.6.1.5). The enhancement provided by the hydrologic restoration system will return the park to a more natural flood frequency pattern. Currently MDNR is concerned that the park is drying from drainage caused by the surrounding cropland (2002 RSEIS Section 4.9). In its present state, the park is changing from wet-mesic bottomland hardwoods to drier forest types. Therefore, the Big Oak Tree hydrology project is not merely preserving the present vegetation at Big Oak Tree State Park but restoring the historic hydrological conditions of the park and the habitat those conditions produce. It is appropriate to take mitigation credit for this restoration.

Dugger Comment 5:

> The new draft suggests the sump area may provide additional benefits to ducks because the duration of the flooding in the sump area will be increased in April and May. Those months are outside the primary migration season for waterfowl. As I have previously stated, the value of a relatively stable sump area is not comparable to that provided by the dynamic flooding events that currently characterize the project area. Finally, the new report indicates that this modified sump operation will provide feeding habitat for diving ducks between 2 and 4 feet deep. My previous testimony concurred that habitats greater than 2 ft deep have value to waterfowl (both feeding divers and resting dabblers). However, these water depths were not considered in the WAM analysis and no mitigation was assigned for them. If the Corps would like to claim value for sump habitats created between 2-4 feet, they then should include those depth categories in their estimate of waterfowl habitat eliminated by the project (currently they only include habitats < 2 feet deep). There is no quantitative reason to believe that the

Dugger Comment 5 (continued):

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modest number of acres in the sump area can replace the loss of all acres flooded 2-4 feet deep under current flooding conditions.

Dugger Response 5: The RSEIS 2 did not calculate impacts to diving ducks. The interagency teamed determined that diving ducks are not significant users of the floodway and that the proposed project therefore would not significantly impact them (RSEIS 2 Section 4.3.4). Since impacts have not been calculated, mitigation credit is not being claimed either. In the interest of full disclosure, the RSEIS 2 does point out that the spawning and rearing pool may provide potential benefits to waterfowl species as a whole. The benefit of this 2,000 acre spawning and rearing pool is that it creates habitat for thousands of duck use days resulting in a net plus in waterfowl habitat even without other mitigation.

Dugger Comment 6:

There are also additional arguments in the new draft emphasizing that flooded hardwood forests are overall better for mallards and other forest using ducks than flooded crop fields in spring. I agree and have always agreed. Among the reasons this is true, is that they provide a variety of enhanced functions, including certain kinds of food sources, not reflected in the WAM model. I also agree that mitigation goals should seek to restore some historic vegetation and wetland communities rather than to flood more cropland --- again, among other reasons, because historic communities provide functions not reflected by the WAM model. These comments overall support my view that application of the WAM model without regard to other functions, including those provided by large variably flooded natural areas, is improper.

I declare under penalty for perjury that the foregoing is true to the bet of my knowledge, information and belief.

Bruce Dugger
Assistant & Mace Professor

Dugger Response 6: In summary, the Corps plan fully mitigates the assumed waterfowl and shorebird habitat losses in all regards. The acreage proposals are generous and include a diversity of habitats including reforestation and management of bottomland hardwoods, construction and management of moist-soil impoundments, and allowances

of spring flooding up to 284.4 feet NGVD elevation in the New Madrid Floodway. The DUD increases, based on caloric analyses clearly exceed losses in all seasons. Further, the text is clear in stating that bottomland hardwoods management will seek to emulate natural seasonal and annual patterns of flooding dynamics and attempt to sustain the health of this valuable community. While not all bottomland hardwoods will be flooded each spring, the large acreage planned, coupled with more predictable resources in moist-soil impoundments (regardless of whether they are targeted to shorebirds or waterfowl), will provide more than adequate replacement foods for assumed losses that frequently flooded agricultural areas provide during the spring migration.

SCI Engineering, Inc. Comment 1:

SCI ENGINEERING, INC.

[illegible]

www.sciengineering.com

January 27, 2006

CONSULTANTS IN DEVELOPMENT, DESIGN, AND CONSTRUCTION
GEOTECHNICAL
ENVIRONMENTAL
CULTURAL RESOURCES
NATURAL RESOURCES
CONSTRUCTION SERVICES

Mr. Tim Searchinger
Environmental Defense
1875 Connecticut Avenue
Washington, D.C. 20009

RE: Proposed Riley Lake Expansion
St. John's Bayou / New Madrid Floodway Project
New Madrid County, Missouri
SCI No. 2006-2021.30

Dear Mr. Searchinger:

INTRODUCTION

As you requested, SCI Engineering, Inc. (SCI) has prepared the following letter summarizing our findings regarding the proposed expansion of Riley Lake. As we understand, the Riley Lake expansion project is proposed as a means of providing compensatory mitigation for the St. John's Bayou / New Madrid Floodway (SJB/NMF) Project. The proposed plans for the expansion of Riley Lake are generally described in the Revised Supplemental Environmental Impact Statement 2 (RSEIS), prepared by the U.S. Army Corps of Engineers (CE) and dated December 2005. According to the RSEIS, Riley Lake is proposed to be increased from approximately 36 permanently inundated acres to (up to) approximately 680 permanently inundated acres. This increase in permanently inundated acres would provide a portion of the compensatory mitigation required for the loss floodplain wetlands, seasonal waterbodies, and wildlife habitat that will result from the SJB/NMF Project. The proposed method for increasing the size of Riley Lake is through the construction of a weir or impoundment approximately 980 feet in length across the northern end of the lake and its adjacent area.

SCI has reviewed portions of the RSEIS and other documents prepared by the CE concerning the proposed expansion of Riley Lake. In addition, we have researched aerial photographs, soil survey information, and other limited resources. Based on our review of this information, we offer the following comments.

RESULTS

SCI reviewed the Scenario C & E – 288 Riley Lake Cost spreadsheet prepared by the CE (October 17, 2005). In addition, we reviewed undated volumetric calculations given for 10-foot intervals for the length of the proposed impoundment, as well as a conceptual cross-section and other data. Specific construction details or site-specific plans for the impoundment structure and footprint were not available. Based on the information available to us, it appears that the construction costs for the impoundment structure itself generally reflect industry standards. However, we believe that the overall impoundment design as proposed warrants further discussion regarding issues related to function or intended benefit. These issues may affect costs and subsequent benefit values beyond those shown on the October 17, 2005 Riley Lake Cost spreadsheet.

[illegible]

SCI Response 1: The Corps concurs that the Riley Lake restoration project required further conceptual consideration regarding function and benefits. Such consideration has occurred and is discussed in the responses to comments as follows.

SCI Comment 2:

Soils

The mitigation value of the proposed Riley Lake expansion is based upon the capability of the expanded lake to provide mid-season fish-rearing habitat. In order to provide this habitat, the lake must provide a suitably inundated aquatic habitat for the duration of the mid-season fish rearing period. The proposed pooling elevation of Riley Lake given in the various documents we reviewed ranged from 285 feet to 289 feet. For our review, we assumed a maximum pooling elevation of 288 feet. The RSEIS indicates that at a pooling elevation of 288 ft., 538 acres will be permanently inundated. This elevation was also used in the Scenario C & E cost evaluation and Mitigation Scenario C from Appendix E of the RSEIS. SCI used the 288-foot elevation to develop an approximate boundary for the expanded lake on the USGS 7.5-minute series topographic map (see enclosed SCI Figure 1). Our estimated boundary contained approximately 597 acres, which is slightly larger but similar to the 538 acres given in the RSEIS. This boundary was then used to determine the soil types contained within the approximate lake expansion area. Since a soil survey for New Madrid County was not readily available at the time of our research, the soil types within this boundary were researched using the Center for Agricultural, Resource and Environmental Systems (CARES) on-line interactive mapping system (www.cares.missouri.edu). The CARES data reveals that the site is composed predominantly of Commerce silty clay loam, Sharkey silty clay loam, Cooter silty clay, and Crevasse loam. These soils are described in the *Soil Survey of Pemiscot County, Missouri* (1971) and the *Soil Survey of Cape Girardeau, Mississippi, and Scott Counties, Missouri* (1981) prepared by the Natural Resource Conservation Service. The Crevasse soils are described as being excessively drained and sandy, with rapid permeability. While surface layers contain sandy loam, substratum layers contain predominantly sand. The permeability of Crevasse soils varies, but can be up to 10 inches of water per hour.

Approximately 151 acres within the 288-foot boundary are shown on the CARES soil map to contain Crevasse loam. We have illustrated the approximate extent of the Crevasse loam within the 288-ft. pooling area in the enclosed SCI Figure 3. This area represents an estimated 25percent of the 597-acre area below the 588-foot elevation (as determined by SCI) and 28 percent of the 538-acre area listed by the CE. For other proposed scenarios (ex. 286-foot maximum pool, 432 acres), the percentage of permeable soil becomes much higher. The Crevasse soils predominantly exist on the site at elevations ranging from 280 feet to 285 feet. Should the Mississippi River occur below this elevation for extended periods, it maybe likely that the Crevasse soil could serve as a seepage outlet through which the lake would drain. Assuming no significant recharge from precipitation and high permeability of subsoils, drainage would likely occur until water levels recede below the lowest elevation of the permeable soil (approximately 280 feet). If this were the case, the acres of permanent inundation would be limited to an estimated 100 acres or fewer. This has been shown on the enclosed Figure 2 prepared by SCI.

In order to achieve the permanent inundation (and hence the mitigation value) proposed by the RSEIS, it may be necessary to remediate the area containing the Crevasse soil to reduce its permeability. Methods for reducing soil permeability could include the installation of a mineral liner such as Bentonite enhanced clay, or the importation of less permeable soils from elsewhere on the site. These activities could significantly add to the project budget. A typical Bentonite application rate for sandy soils is 10 lbs/ft^2. Using an estimated cost of $84.00 per ton, the materials costs for remediating 151 acres of permeable soil could exceed 2.75 million dollars. The Scenario C & E – 288 Riley Lake Cost spreadsheet shows that the unit price for clearing and grubbing is projected to be $1,000.00 per acre. Remediation of highly permeable soils would require clearing and grubbing of existing forested area occurring on permeable soils (see enclosed Photograph 1). Using the CE cost estimate, this could potentially add an additional $151,000.00 to the project budget. Added to the overall costs would be the expense of equipment and labor necessary to actually move the material and install it over the permeable soil.

SCI Response 2: The Corps recognizes that detailed plans and design work would be necessary prior to installing a weir 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.

The Corps has extensive geotechnical experience with many batture waterbodies in the Lower Mississippi River. Historically, Mississippi River floodplain and batture waterbodies experience a substantial amount of sedimentation that includes relatively impermeable fines and organic material. This material facilitates water retention. The Corps' experience in working with these impermeable sediment layers enhances confidence that Riley Lake will also hold water at the level planned. This is confirmed by Corps contacts with local residents. See RSEIS 2 Section 2.6.2.3 and Sparks Response 10. In the late 1980's, local interests dug a ditch in the lake's outlet channel to drain the lake and allow farming around the lake. If there were a sand lens, as the comment supposes, then this additional drainage measure would not have been necessary. Local interests have informed the Corps that Riley Lake maintained a higher water level before the drainage ditch was dug.

SCI Comment 3:

Maintenance

The proposed method for impounding water within the Riley Lake basin is through the construction of a weir or dam with a height at the desired maximum pooling elevation. The impoundment is assumed to have an outlet or discharge in order to allow controlled flow back to the Mississippi or adjacent low-lying areas. Discharge would presumably occur when the lake exceeded its design capacity. The Scenario C & E – 288 Riley Lake Cost spreadsheet and Table 5.12 from the RSEIS make no mention of long-term maintenance costs for this structure. However, we believe that it is likely that the lake and its discharge would require significant annual or otherwise periodic maintenance in order to function as designed. For example, sections of the area proposed to be inundated contain large quantities of driftwood and accumulated cleared woody vegetation (see enclosed Photograph 1). This material presumably is deposited as drift during the recession of floodwaters, and may also be carried from the site during subsequent flooding events. The lake will likely fill with water from the Mississippi during flood events (water levels greater than 290 feet). As the water recedes below 290 feet and becomes slack water, the debris contained within will be trapped within the lake. As the lake drains toward the Mississippi through its discharge, significant amounts of debris could be carried to the discharge. This debris may be required to be removed from the discharge regularly in order for the lake to function as designed. Additional activity may be necessary for keeping the impoundment structure itself stable and in good repair considering the high-water flows that it would be subjected to. The top-of-bank elevation of the Mississippi River adjacent to the project area is shown on the USGS topographic map to be 290 feet. Should the impoundment be constructed to an elevation of 288 feet, the impoundment may be likely be subject to frequent overtopping and erosive current forces. It appears reasonable that some maintenance of rip-rap and vegetation may be necessary to keep the impoundment functioning as designed. .The RSEIS and other documents which we have reviewed do not appear to account for these or other long-term maintenance costs.

SCI Response 3: Certainly, as is currently the case, there will be instances when, as the river falls, debris will become trapped in Riley Lake and around the weir structure. The Corps intends to transfer mitigation lands and structures to the USFWS. The Service may turn the lands and structure over to a state agency such as MDC for operation and maintenance. The responsible resource agency may choose to perform routine maintenance, or may choose to let a more natural condition develop. If the debris accumulates near the outlet, it could provide substantial large woody debris habitat. The value of such habitat for fish and wildlife is widely recognized. If routine maintenance of the structure or outlet is required, it would be a normal part of the operation of the area and the responsibility of the operating agency.

SCI Comment 4:

General Remarks

The results of SCI's review raise questions from a broader perspective regarding the overall ability of the Riley Lake project to provide fish- rearing habitat as intended. Currently, Riley Lake exists at an elevation of approximately 276 feet (as shown on the USGS topographic map). At the lake's northern end, it is only approximately 400 feet from the right-descending bank of the Mississippi River. The USGS topographic map shows the elevation of the bank in this area to be approximately 280 feet. Furthermore, the northwestern end of the lake contains a nick-point in the surrounding swale that appears to serve as a high-water inlet/out connection with the Mississippi River. It is likely that fish readily enter and exit the lake at this point when the Mississippi reaches water elevations of approximately 280 feet or higher. This point occurs north of the proposed impoundment structure, and will be blocked off from the lake body by the impoundment. We assume that the proposed impoundment is intended to permanently maintain water at elevations up to 288 feet. While the impoundment may or may not be successful at accomplishing this, it seems certain that the frequency with which water and/or fish are exchanged between the Mississippi River and Riley Lake will be significantly reduced. This in turn may be counter-productive from the standpoint of creating fish-rearing habitat.

The proposed maximum water elevation of 288 feet is just below the adjacent top-of-bank elevation of 290 feet. Therefore, it seems likely that the lake will only exchange water with the Mississippi River during significant high-flow events. If these events do not occur with regular frequency, fish will be "trapped" within the lake following recession of the water. Provided the lake does not draw down and kill the fish or substantially reduce their numbers, it could potentially be some length of time before the fish are returned to the river. This lack of connectivity may reduce the fisheries value of the expanded lake.

SCI Response 4: Please refer to SCI Comment 3 above, which contains the statement "[s]hould the impoundment be constructed to an elevation of 288 feet, the impoundment may be likely be subject to frequent overtopping." Either there will be frequent connection to the river as indicated there, or the "lake will only exchange water with the Mississippi River during significant high-flow events" as stated in this comment.

Please see Bohlen Response 12 and Sparks Response 10. Fisheries access between the Mississippi River and the lake will occur more frequently than the 2-year event.

Fish will have frequent opportunities to enter the lake and disperse into the Mississippi River. Fish will not be "trapped" in the lake as the comment implies. A pulsed

hydrograph provides numerous opportunities during the winter and spring to access the river and adjacent floodplain habitat (RSEIS 2 Section 4.3.2.2).

SCI Comment 5:

SCI earlier references that the proposed expanded lake footprint includes highly permeable soil types. If the lake draws down significantly due to soil percolation, acres of fish-rearing habitat are lost and the mitigation value becomes substantially less. In addition, it seems likely that a significant draw-down of the lake following an exchange of fish with the Mississippi River or an in-lake spawn would concentrate fish populations into a progressively smaller area of water. This would likely increase predation and reduce resources available to fish retained in Riley Lake, further reducing its value as fish-rearing habitat.

SCI Response 5: See SCI Response 2 above regarding the sand lens and potential for a "significant" drawdown. The Corps agrees that water levels in a restored Riley Lake could decline due to low Mississippi River stages and evaporation. However, this will only occur to a limited degree. Riley Lake does not currently dry out, and there is no reason to expect that it will do so upon completion of the restoration project.

Any drawdown due to low stages or evaporation is likely to occur in the late summer or fall. Fish rearing habitat is appropriately calculated during the spring. Periods of connection and disconnection between batture lakes and the Mississippi River occur naturally. As explained in Sparks Response 10, each phase of connectivity has ecological importance and it would be inappropriate to uniformly state that a drawdown will reduce a lake's value as fish-rearing habitat. For example, periodic drawdowns create numerous foraging opportunities for fish as well as numerous species of birds including the Federally endangered least tern.

SCI Comment 6:

Table 2.4 in the RSEIS (pg. 41) indicates that area proposed for impoundment contains roughly equal amounts of bottomland hardwood and farmland. It is our understanding that the proposed project area contains some fallow farmground. However, we believe that significant amounts of the area assumed to be farmland actually exist as densely-planted cottonwood trees (see enclosed Photograph 2). It is unclear to SCI whether this has any bearing on the fisheries potential of the proposed lake expansion. However, it does not seem to be addressed by the CE, either. For example, the standing timber would likely be killed after prolonged inundation. In addition, the existing vegetation may trap other organic debris and hold it within the lake (much of the timber would be in 5 feet of water or less). Anaerobic decomposition of vegetation and organic matter is known to reduce the amount of available dissolved oxygen in water. Low dissolved oxygen is also known to be detrimental to fish and other aquatic life. It is our opinion that the questions surrounding the effects of the existing biomass on the habitat quality of the proposed lake should be addressed prior to implementation of the plan.

SCI Response 6: See Sparks Response 22. The comment states that a significant part of the area consists of densely planted cottonwood trees. The trees were planted circa 2001 for pulp production and will be harvested (Robert Riley, Jr., landowner, personal communication). A site visit to the area conducted on February 2, 2006 confirmed that a cottonwood plantation has been planted in the vicinity of the expanded Riley Lake footprint (See site visit report, RSEIS 2, Appendix F, Attachment 1). However, this plantation is located above the 290-foot contour. Therefore, it appears that the comment

provided incorrect information about the land cover of the proposed Riley Lake restoration and no further response to the comment is necessary.

SCI Comment 7:

SUMMARY

As requested, SCI has reviewed the projected costs associated with the construction of the Riley Lake impoundment structure. The cost projections prepared by the CE specific to the construction of the proposed impoundment structure did not generally appear to be inaccurate. However, having reviewed the overall project design, we do believe that there are questions regarding site suitability (based on soils) and project effectiveness.

SCI Response 7: See previous responses above regarding soils and project effectiveness. As stated in Section 2.6.2.3 of the RSEIS 2, Riley Lake is used only as an example. RSEIS 2, Table 2.3 identifies additional opportunities for restoration of Mississippi River floodplain lakes within southeastern Missouri.

SCI Comment 8:

SCI has assisted in the submittal and approval of numerous mitigation plans required by the CE. It has been our experience that Section 404 Permits are not authorized until all aspects of the proposed mitigation plan have been addressed in detail for projects that have more than minimal environmental effects. The CE requires clear illustration that the environmental benefits of a proposed mitigation plan provide adequate compensation for the proposed impacts. The plan is also required to include enough detail to provide reasonable evidence of the likelihood of success. It has also been our experience that questions regarding mitigation design must be resolved prior to the commencement of the activities for which mitigation is required. Therefore, if you have questions or concerns regarding the proposed Riley Lake expansion plan, we recommend that you contact the CE for additional information or clarification. We also recommend that the proposed plan be reviewed by a qualified, professional fisheries biologist to answer questions specific to the successful creation of fish habitat at Riley Lake.

SCI Response 8: The Corps has addressed comments regarding the differences between private 404 applicants and federal civil works projects elsewhere. See RSEIS 2 Sections 4.4.3.1 and 4.5.2. The Corps has also addressed comments that suggest a detailed mitigation plan is required. See Bohlen Responses 48, 49, and 51. The Corps' mitigation proposal, with its requirements for monitoring and adaptive management is set out in Section 6.0 of the RSEIS 2. Monitoring is also included as a requirement in the WQ certification. All aspects of the project, including impacts and mitigation, have been thoroughly reviewed by fisheries biologists who have been fully involved in the development of the plan and will continue to be involved in its implementation and monitoring.

SCI Comment 9:

LIMITATIONS

This report and the findings contained therein have been prepared for exclusive use by Environmental Defense. SCI is not responsible for independent conclusions or recommendations made by others. SCI is not responsible for surveys, calculations, or plans that were prepared by others. Our findings are based on our general overview of available materials, and are not intended to serve as a formal or professionally certified opinion.

SCI Response 9: No response required.

SCI Comment 10:

We appreciate the opportunity to work with you on this project. If you have any further questions about our findings, please do not hesitate to contact us.

Respectfully,

SCI ENGINEERING, INC.

Matthew S. Shively
Project Scientist

Scott D. Harding, CPSS/SC
Vice President

MSS/MRH/tlw/bv

Enclosures

Figure 1 – Estimated Lake Footprint – 288 Feet
Figure 2 – Estimated Lake Footpring – 280 Feet
Figure 3 – Crevasse Loam Within 288-Feet Lake Footprint
Photographic Summary

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(Maps and Figures Omitted)

SCI Response 10: Noted.

DECLARATION OF DR. JOY ZEDLER

Dr. Joy Zedler declares as follows.

1. I am Professor of Botany and Aldo Leopold Chair of Restoration Ecology at the University of Wisconsin-Madison. I am an expert in wetland ecology. I obtained my Ph.D. degree from the University of Wisconsin-Madison in Botany in 1968. I have published about 200 papers in the peer-reviewed literature (CV attached).

2. A major area of my research has concerned wetland mitigation and wetland restoration in other contexts. My expertise derives in part from direct field experience in evaluating the outcomes of wetland mitigation efforts and in designing, implementing, and evaluating wetland restoration efforts with a strong science base. I have also taught seminars on wetland mitigation and published two dozen articles on wetland mitigation. I organized and edited a forum on wetland mitigation that was published in *Ecological Applications* in 1996. I chaired the National Research Council committee that evaluated compensatory mitigation under the Clean Water Act.

3. I have been selected to serve on three panels established by the National Research Council of the National Academy of Sciences to examine important wetland policy issues of direct relevance to the Section 404 Clean Water Act program - panels that were established at the request of the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers. One panel explored and issued a report the definition of wetlands and the criteria for identifying and delineating wetlands. A second panel evaluated and made recommendation for restoration of aquatic ecosystems generally, which deals with essentially the same scientific issues as those involved in mitigating adverse effects on those ecosystems under Section 404 of the Clean Water Act.

4. From 1999 to 2001, I chaired a third panel formed by the National Academy of Sciences at the request of the Environmental protection Agency to evaluate wetland mitigation both scientifically and from a policy perspective. As part of this

panel, we heard extensive testimony and reviewed extensive documentation about actual mitigation policies and procedures utilized by the Corps of Engineers as part of its permit program under Section 404, including input from Corps officials. Our report was issued in 2001 and entitled *Compensating for Wetland Losses Under the Clean Water Act.*

5. The findings were embraced by the U.S. Army Corps of Engineers, which issued a report to the field in 2003 instructing it to follow the ten key recommendations, including those most relevant to the St. Johns Project discussed in my report.

6. I have reviewed the Draft Revised Supplemental Environmental Impact of the Corps of Engineers for the St. Johns Bayou/New Madrid Flood Control Project dated December 9, 2005 (Draft Supplemental EIS). I have also reviewed relevant portions of the Revised Supplemental Environmental Impact Statement for the project dated June, 2002, a Declaration of Dr. Richard Sparks regarding the project dated July 10, 2003, maps of the project showing flood elevations in the New Madrid Floodway both pre- and post- project.

7. The attached report contains my important conclusions regarding the analysis of the Draft Supplemental EIS and the adequacy of the proposed mitigation.

I declare subject to the penalty for perjury that the foregoing and the views of the attached report represent my true views to the best of my knowledge, information and belief.

Dr. Joy Zedler

January 24, 2006

Joy B. Zedler

Aldo Leopold Professor of Restoration Ecology
Botany Department and Arboretum
University of Wisconsin
Madison, WI 53706

PROFESSIONAL EXPERIENCE and EDUCATION

1998-	Professor of Botany, Univ. of Wisconsin, Madison
1980-98	Professor of Biology, San Diego State University (SDSU)
1986-	Director, Pacific Estuarine Research Laboratory, SDSU
1997	Associate Director, Environmental Science Program, SDSU
1991-3	Director, Coastal and Marine Institute, SDSU
1969-80	Asst. and Assoc. Professor, SDSU
1968-69	Instructor in Botany, Univ. of Missouri, Columbia
1968	Ph.D. in Botany (Plant Ecology), Univ. of Wisconsin, Madison
1966	M.S. in Botany, Univ. of Wisconsin, Madison
1964	B.S. in Biology, Augustana College, Sioux Falls, So. Dak.

RESEARCH INTERESTS

Wetland ecology: structure and functioning of wetlands; restoration ecology (especially adaptive restoration, which is the design and implementation of restoration as phased field experiments, learning while doing); interactions of native and exotic species, use of mesocosms in controlled experiments, effects of rare, extreme events on wetland ecosystems; use of scientific information in management of wetlands.

PROFESSIONAL SOCIETIES AND EDITORIAL BOARDS

Ecological Society of America
- ESA Vegetation Section Chair, 1996-7
- ESA Editorial Board, *Ecological Applications*, 1992-4; reappointed 1999-2005

Estuarine Research Federation
- ERF Vice President, 1987-89
- ERF Program Chair, 10th Biennial International Conference, October 1989
- ERF Editorial Board, *Estuaries*, 1985-89

Society for Ecological Restoration
- Editorial Board, *Restoration Ecology*, 2004-

Society of Wetland Scientists
American Ecological Engineering Society
- Editorial Board, *Ecological Engineering: The Journal of Ecotechnology*, 1991-2005

Non-society international journals:
- Editorial Board, *Wetlands Ecology and Management*, 1988-2005
- Editorial Board, *Ecosystems*, 1997-2000

HONORS

Career Achievement Award, Augustana College 2004
William A. Niering Outstanding Educator Award (first recipient): Estuarine Research Federation, International Biennial Conference, Tampa, Fla., November 2001
Southern California Wetlands Recovery Project: First Award for Achievements in Regional Wetland Conservation, October 2000
Environmental Defense (formerly EDF) Board of Trustees, 1998-
Wisconsin Chapter of The Nature Conservancy, Board of Trustees, 2004-
The Nature Conservancy Governing Board, 1995-2004
Invited to prepare the Society of Wetland Scientists' Position Paper on the Definition of Wetlands, 1993.
National Wetlands Award (Environmental Law Inst. & Environmental Protection Agency) for Science Research, demonstrating "an extraordinary commitment to the conservation and restoration of the nation's wetlands," May 1997
SDSU Biology Department Teacher-Scholar Award, May 1997
SDSU Alumni Association Award for Outstanding Faculty Contributions to the University, 1997
National Oceanic and Atmospheric Administration, Sanctuaries and Reserves Division, Special Award for outstanding contributions to the understanding of estuarine ecology and for contributions to the Tijuana River National Estuarine Research Reserve, March 1997
Society for Ecological Restoration, Theodore M. Sperry Award, 1998
National Research Council
- Committee on Wetland Characterization, 1993-4
- Water Science and Technology Board, 1991-4
- Committee on Restoration of Aquatic Ecosystems, 1990-92
- Planning Committee for the Second National Forum on Biodiversity, 1996-8
- Committee on Wetland Mitigation (chair), 1999-2001

Chancellor's Distinguished Lecturer, University of California, Irvine, April 1992
Phi Beta Kappa Lecturer, SDSU, Fall 1992
Roger Revelle Perpetual Award, Oceans Foundation, 1991
Fellow, San Diego Natural History Museum, 1989
SDSU Meritorious Performance and Professional Promise Awards, 1985, 1988

ADVISORY COMMITTEES

State of Washington Salmon Restoration Validation Monitoring Panel, 2000-
UW University Ridge Research Steering Committee, 1999-
Wisconsin Department of Natural Resources, Natural Area Preservation Council, 1998-
National Wetlands Awards Selection Committee, US EPA and Environmental Law Institute, 1997-98
National Wetlands Newsletter Advisory Board, 1997-
Pro Esteros, Board of Directors, 1990-91; Advisory Board 1993-
National Parks: Research Program Reviewer, Exotic Species Invasions in Everglades National Park, 1996-7
Wetland Advisory Board, City of San Diego, 1992-6
California Coastal Commission, Technical Review Committee for Developing State-Wide Standards for Mitigation Performance, 1994-5.
American Society of Civil Engineers Task Committee on Physical Processes in Tidal Wetland Restoration, 1996-8

National Wetlands Awards (Environmental Law Inst. & Environmental Protection Agency) Honorable Mention, 1994; Review panel member, 1995
U.S. Environmental Protection Agency Science Advisory Board Consultant, 1995-6
President Clinton's Forum on Science and Technology, Invitee, March 1994
Technical Panel, Environmental Protection Agency Global Change Program, 1993-95
National Water Research Institute, Research Advisory Board, 1992-3
Wetland Advisory Board, City of San Diego (Mayoral Appointee), 1992-6
California Sea Grant College, Coastal Resources Research Coordinator, 1992-6
Ecological Society of America ad hoc Committee on Wetlands Delineation, 1991
City of San Diego, Famosa Slough Guidance Committee, 1991
National Wetland Technical Council (13 members nationwide), charter member
Review Panel, US Dept. of Agriculture Competitive Grants Program for Water Quality, 1991
Scientific Advisory Committee, NOAA Estuarine Habitat Research Program, 1990-3
Tijuana River National Estuarine Research Reserve, Research and Education Committee Chair, 1982-93; Restoration Committee, 1993-8
Public Affairs Committee, Ecological Society of America (ESA), 1988-91
SDSU representative to the California Sea Grant Committee, 1980-1990
Los Peñasquitos Lagoon Foundation, Technical Advisory Committee, 1985-87
Congressman Jim Bates Environment Subcommittee, 1985-86

PUBLICATIONS (not including abstracts and project reports)

Zedler J. B. 1966. Buena Vista Marsh in historical perspective. M.S. Thesis, Univ. of Wisconsin, Madison. 75 pp.
Zedler, J. B. 1968. Vegetational response to microtopography on a central Wisconsin drained marsh. Ph.D. Thesis, Univ. of Wisconsin, Madison. 90 pp.
Zedler, J. B., and O. L. Loucks. 1969. Differential burning response of *Poa pratensis* fields and *Andropogon scoparius* prairies in central Wisconsin. *Amer. Midl. Nat.* 81:341-352.
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Zedler, J. B. 1980. Algal mat productivity: comparisons in a salt marsh. *Estuaries* 3:122-131.
Zedler, J. B., T. P. Winfield, and P. Williams. 1980. Salt marsh productivity with natural and altered tidal circulation. *Oecologia* (Berl.) 44:236-240.
Zedler, J. B. 1981. The San Diego River marsh before/after the 1980 flood. *Environment Southwest* 495:20-22.
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Zedler, J. B. 1982. Salt marsh algal mat composition: spatial and temporal comparisons. *Bull. Southern California Acad. Sci.* 81(1):41-50.
Zedler, J. B. 1982. *The ecology of southern California coastal salt marshes: a community profile.* U.S. Fish and Wildlife Service, Biological Services Program, Washington, D. C. FWS/OBS-81/54. 110 pp.
Zedler, J. B., M. Josselyn, and C. P. Onuf. 1982. Restoration techniques, research, and monitoring: vegetation. Pp. 63-72 in Proceedings of the Workshop on Wetland Restoration and Enhancement in California, Feb. 19-20, 1982, Calif. State Univ., Hayward. California Sea Grant College Program, La Jolla, Calif. Report No. T-CSGCP-007.
Metz, E., and J. B. Zedler. 1985. Who says science can't influence decision making? Proceedings, *Coastal Zone '85*, Vol. I:584-600. Am. Soc. Civil Engr., New York.
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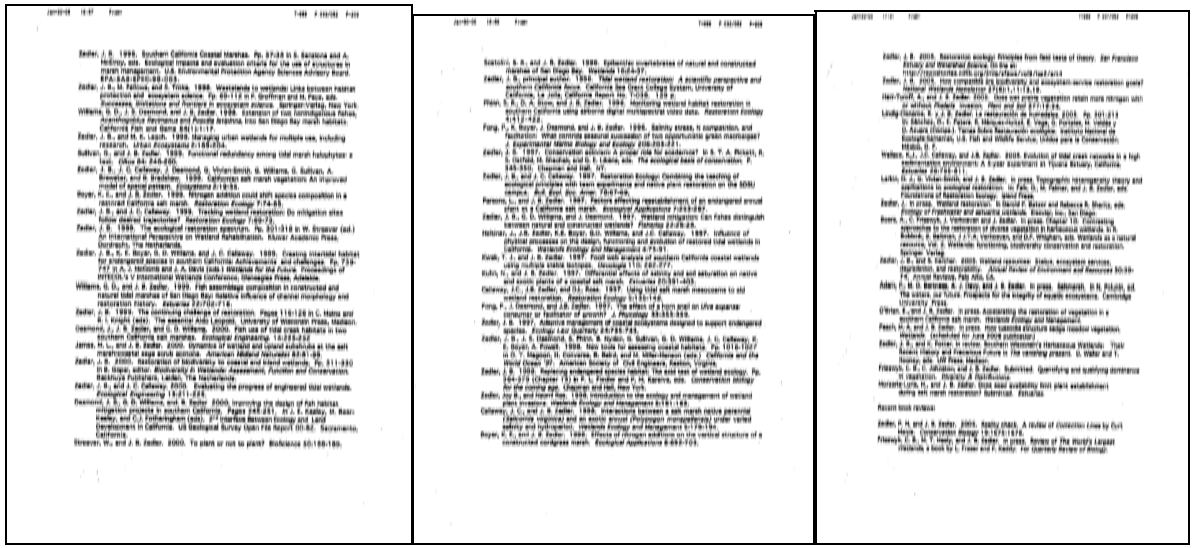

Zedler Response: Curriculum vitae is noted.

Dr. Joy Zedler Comment 1:

REPORT OF DR. JOY ZEDLER ON
THE MITIGATION PROPOSAL
FOR THE ST. JOHNS BAYOU/NEW MADRID FLOODWAY PROJECT

Dr. Joy Zedler (January 2006)

The U.S. Army Corps of Engineers has issued a Draft Supplemental Environmental Impact Statement for the St. Johns Bayou/New Madrid Floodway project dated December 9, 2005 (RSEIS2). This project would close a levee gap in the New Madrid Floodway on the lower Mississippi River that allows tens of thousands of acres to flood on a two- or three-year basis. It would also install pumps to drain water out of the floodplain, and install a pump on the closed St. Johns basin to drain water out of it. Today, according to analysis by Dr. Curtis Bohlen, more than 80,000 acres flood on a regular basis, with the precise amount depending on the flood frequency. Under various versions of environmental impact statements for the project, the Corps itself has estimated that roughly 18,000 acres of wetlands within the two-year flood elevation and more than 30,000 acres of wetlands when wetlands at higher elevations are included, would have their backwater flooding from the Mississippi River either eliminated or greatly reduced. My understanding is that under the proposed plan (exclusive of mitigation), only two small sump areas of roughly 2,500 acres combined would remain undrained and therefore still be allowed to flood by Mississippi River backwater.

Zedler Response 1: The Corps is unable to determine the source of the commenter's 80,000 "regularly flooded" acres. The Corps' analysis indicates that the 10-year event, which is not a "regular flood", inundates 87,674 acres (2002 RSEIS, Table S-1). The 2-year flood frequency, which is a "regular flood", inundates 27,372 acres.

See Responses to Bohlen Comment 30 - 32 for an explanation on the number of acres of wetlands and prior converted cropland that would experience a decrease in inundation from Mississippi River backwater.

There are not 18,000 acres of wetlands within the two-year flood elevation. Please see Table 4-1 and 4-2 of the 2002 RSEIS. The 2002 RSEIS stated that there are 6,461 acres of wetlands (3,514 acres of which are farmland) in the St. Johns Bayou Basin and 11,659 acres of wetlands (6,186 acres of which are farmland) in the New Madrid Floodway at or below an elevation of 300 feet NGVD. The elevation of 300-feet NGVD corresponds, not to the two-year floodplain, but to an approximate 30-year event in the New Madrid Floodway and 70-year event in the St. John's Basin. See Response to Bohlen Comment 42 for the significance of the 300 foot elevation. For a discussion of the Corps' wetland analysis see RSEIS 2 Section 4.2.1 and Bohlen Response 38.

NRCS determined that there is a total of 520 acres of farmed wetlands within the project area for the purpose of this RSEIS 2. Therefore, the 2002 RSEIS overestimated Swampbuster jurisdictional wetlands. Utilizing the NRCS' farmed wetland determination, there is a total of 8,940 acres of wetlands within the project area below an elevation of 300 feet NGVD.

It is also incorrect to state that only the sump areas would experience Mississippi River flooding. The recommended plan includes allowing the Mississippi River to flood 6,400 acres of land during winter to benefit waterfowl inclusive of the 2,000 acre sump area. Additionally, this project specifically recommends restoring hydrology to Big Oak Tree State Park and expanding the park's boundaries by a minimum of 1,800 acres. Therefore, depending on river stages, the Mississippi River would inundate up to 9,191 acres (6,400 acres for winter waterfowl, 991 acres of existing Big Oak Tree State Park, and 1,800 acres of expanded parkland) of floodplain habitat.

The project does not "drain" any wetlands. See Bohlen Responses 32.

Zedler Comment 2:

The RSEIS2 for the project offers four separate, but ultimately similar, mitigation scenarios and states that the final, actual mitigation plan will be left to further decision-making.

The RSEIS2 includes some acres of reforestation and manipulation of other tracts on 6,571 acres. RSEIS2 p. 217. However, many of these acres will generally be above the sump area and will therefore be in areas that are at least substantially drained by the project. Accordingly, the RSEIS2 in Appendix C and at page 104 indicates that many reforestation sites will flood only 5% of the time, and that reforestation sites within the New Madrid Floodway will flood only 6% of the time on average. To mitigate for fish impacts, all of the plans rely primarily on the unnatural extension of flooding on a relatively small number of acres of already existing wetlands.[1] The Corps would do this by artificially extending

[1] The 2002 EIS gave a flood elevation of roughly 290 feet for acres that would meet hydrologic wetland criteria, even for farmed wetlands. All of the sump acres are below 290 feet and therefore would qualify as wetlands according

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Zedler Comment 2 (continued):

flooding first on a range from slightly more than 1,000 to 2,800 acres in the sump area of either the New Madrid Floodway, the St. Johns Basin, or some of both. These are the areas behind either the existing levees or levees to be built by the project and that would not be drained by the pumps at least before May 15th each spring. The Corps would extend flooding in these areas by closing gates to trap water behind the levees and keep it from receding into the river from April 1st to May 15th. The Corps proposes to do something similar on 430 to 700 acres of land outside the levees (known as Riley Lake) by constructing a weir to block flow out of the "lake," which is described as an old oxbow lake, only a small portion of which is flooded year-round. Under three of the four scenarios analyzed for the New Madrid Floodway, artificial ponding would provide 98% or more of the mid-season habitat for fish, and under the fourth scenario, it would provide 93% of that habitat. Table 5.7, RSEIS 2 p. 117.[2]

In short, under the now proposed EIS, the project would drain more than 75,000 acres of frequently flooded floodplain and eliminate or greatly reduce backwater flooding on thousands of acres of wetlands, and would mitigateprimarily by artificially extending flooding (using levees) on something between 2,000 and 3,000 acres.[3] All or nearly all of these mitigation sites are already wetlands and flood now under variable conditions that are relatively natural in that they turn on the rise and fall of the Mississippi River. This mitigation result allegedly derives from a so-called Habitat Evaluation Procedure model for fish habitat (HEP model).

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to this analysis. Riley Lake is also below 288 feet and according to analysis in the 2005 EIS is part of Donaldson Point, floods even more frequently than the project area and therefore would also qualify as wetland.

[2] The Corps presents a range of additional mitigation measures that also involve artificially manipulating flooding on other sites to be reforested. For example, one option would reforest 100 acres of cropland and increase flood duration, presumably through levees and pumps, to 31% of the mid-season for fish, while another would create fallow habitat and flood it 95% of the time. RSEIS2 p. 197-98. These possible mitigation options are subject to the same problems with artificial flooding that are set forth in this report.

[3] The Corps also proposes some acres of reforestation, but most of these acres would rarely be flooded, RSEIS2 p. 104, so they too are not subject to natural hydrologic variability or any semblance thereof. The apparent exception is land around Big Oak Tree State Park, which now floods but which will be subject to some kind of hydrologic enhancement intended to flood according to relatively natural patterns. This effort affects 1,800 acres, but it is dependent on long-term active management, whose problems I discuss below.

Zedler Response 2: This project does not intend to "drain" any land. Closing the gap in the New Madrid Floodway will prevent backwater flooding. For Clean Water Act purposes, outside of direct impacts, forested jurisdictional wetlands will not lose their status because of closure of the levee as they will still receive headwater inundation (See RSEIS 2 Section 4.2.1.3 and 2002 RSEIS Appendix D, pages D-9 and D-10).

The project will not "drain more than 75,000 acres of frequently flooded floodplain". Although the Corps is uncertain of the source of this number, there are 75,000 acres in the New Madrid Floodway below the elevation of the 30-year event. The 30-year flood is not a "frequent" event. There are 17,315 acres below the elevation of the 2-year flood event in the Floodway. This is the Corps' definition of "frequently flooded" (See 2002 RSEIS Appendix L, Sections 6.1 and 10.2). See also Bohlen Response 29 for a description of why the Corps chose the 2-year event to evaluate fish impacts, how the Corps determined the appropriate elevation of that event, and the number of acres below that elevation. See RSEIS 2 Table 3.3 for a stage area curve that lists acres of land cover types by elevation. Project induced impacts to these acres are set out in Section 5 of the RSEIS 2.

The percentages of inundation that were cited in the comment and the RSEIS 2 (5% and 6%) indicate the duration of flooding on potential mitigation sites from April 1 to May 15. These flood percentages are very conservative (that is they may underestimate the duration of flooding on the potential mitigation tracts during the mid-season fish rearing period). Actual flood durations will be calculated during the development of site-specific mitigation plans and verified through monitoring. These areas will be inundated during other periods of the year, not just 5% or 6% during April 1 to May 15, due to various factors including backwater flooding, headwater flooding, high groundwater table, and precipitation.

The comment states, "… and would mitigate primarily by artificially extending flooding (using levees) on something between 2,000 and 3,000 acres." The issue of "artificial" vs. "natural" flooding is discussed in Sparks Response 4 and Zedler Response 8 below. Creation of spawning and rearing pools in either the New Madrid Floodway or the St. Johns Bayou Basin, or the restoration of a floodplain lake, such as Riley Lake, are only parts of a much greater compensatory mitigation plan. The "Habitat Evaluation Procedure for fish habitat" was not the only technique used to describe impacts and determine compensatory mitigation. The Corps, along with the interagency team made up of members of the Missouri Department of Natural Resources, Missouri Department of Conservation, Environmental Protection Agency, and the U.S. Fish and Wildlife Service, defined significant resource categories that would be unavoidably impacted by construction of the flood damage reduction project. These resource categories were wetlands, terrestrial wildlife, waterfowl, shorebirds, and fish spawning and rearing habitat. Appropriate models were developed and used to describe and quantify impacts. Compensatory mitigation is based on the results of these models and input from the interagency team, and public comments. As can be seen by Table S.1 of the RSEIS 2,

creation of a spawning and rearing pool is only one part of the overall compensatory mitigation plan. In addition to creation of a spawning and rearing pool, the plan also includes the following features:

- Placement of riprap at channel intersections and installation of channel improvement structures
- Restoration of 1,293 acres of bottomland hardwoods in the St. Johns Bayou Basin
- Restoration of 2,326 acres of bottomland hardwoods in the New Madrid Floodway
- Restoration of approximately 1,800 acres of bottomland hardwoods surrounding Big Oak Tree State Park
- Restoration of the hydrology to Big Oak Tree State Park
- Provision of 64 miles of vegetated buffer strips along New Madrid Floodway channels
- Creation of a wildlife corridor that connects Big Oak Tree State Park to Ten Mile Pond Conservation Area
- Construction of 387 acres of modified borrow pits in farmland
- Other techniques that include additional reforestation, increasing flood durations during April 1 to May 15, and restoration of small waterbodies

Zedler Comment 3:

For the reasons described below, the claim that this mitigation fully offsets project impacts on aquatic resources is completely inconsistent with scientific understanding of wetland functioning, wetland replacement, wetland restoration, and mitigation of other aquatic areas, as well as inconsistent with established practice under the Section 404 program.[4] The claim is so outside the range of reasonable scientific understanding that it cannot be seriously advanced as science-based. It therefore should be disregarded.

[4] I also note that the RSEIS2 attempts to minimize the description of impacts on wetlands. For vegetated wetlands, it only discusses as wetland impacts those that would be directly filled, disregarding the elimination or substantial reduction in flooding of thousands of acres of forested and other vegetated wetlands. For farmed wetlands, it claims that only a few hundred acres count even though the Corps' own hydrologic analysis indicates thousands of acres of cropped areas meet the 15-day inundation requirement. Under the 1987 wetland manual used by the Corps, this kind of direct hydrologic analysis establishes wetland hydrology.
[5] This report explicitly addresses wetland mitigation. However, it

Zedler Response 3: The proposed mitigation not only fully offsets impacts on aquatic resources but overcompensates for most resources. Please refer to Tables 2.2 and 2.7 in

the RSEIS 2. The numbers are based on sound scientific principles and professional opinion from an interagency team of scientists that are familiar with ecological resources in the project area.

The comment states that the proposed mitigation is inconsistent with established practice under the Section 404 program. The proposed mitigation over-mitigates in comparison to what is typically required under the Section 404 program. Section 404 does not regulate impacts to or require mitigation for impacts to prior converted cropland (See http://www.mvm.usace.army.mil/regulatory/regulations/clean_water.htm). The current mitigation proposal compensates for all significant unavoidable impacts to fish and wildlife including direct impacts from channel widening and deposition into waters of the United States and indirect impacts from reduced flooding, whether on jurisdictional wetlands or prior converted cropland. All compensatory mitigation for impacts to waters of the United States, including jurisdictional wetlands, is consistent with, and in most cases exceeds, the Section 404(b)(1) Guidelines.

The claim that mitigation "is so outside the range of reasonable scientific understanding that it cannot be seriously advanced as science-based" is unfounded. The habitat models were based on relevant science that was conducted within the study area and the Lower Mississippi River. Additionally, the habitat models were agreed to by the mitigation team and experts who have visited the study area and are familiar with the existing habitat (2002 RSEIS Section 5).

The fourth footnote incorrectly states that the RSEIS 2 attempts to minimize the description of impacts on wetlands. All direct and indirect impacts to wetlands were appropriately analyzed (See 2002 RSEIS Section 5). All direct and indirect impacts (*i.e.*, due to channel widening and fill and due to a reduction in backwater flooding) to jurisdictional vegetated wetlands, farmed wetlands, and prior converted cropland were analyzed by the fish spawning and rearing HEP. Additional impacts due to a reduction of flooding were analyzed by the U.S. Fish and Wildlife Service's Waterfowl Assessment Methodology. As the Corps has made clear, the Corps is not mitigating based on wetland jurisdictional status but on significant unavoidable impacts to fish and wildlife resources due to reduced inundation from the project operation.

Zedler Comment 4:

> My comments draw heavily on a 2001 report by the National Research Council of the National Academy of Sciences, *Compensating for Wetland Losses Under the Clean Water Act*, prepared by a panel that I chaired. [5] This report has been broadly embraced by the U.S. Army Corps of Engineers, which issued a memorandum to the field in 2003 highlighting key recommendations, reaffirming them, and calling the recommendations of this report either a "basic requirement for mitigation success" or a "guide for mitigation site selection." U.S. Army Corps of Engineers, Memorandum to the Field on Adaptation of NAS Guidelines (Oct. 29, 2003).

Zedler Comment 4 (continued):

[5] This report explicitly addresses wetland mitigation. However, the same scientific principles apply to any mitigation activity required to offset impacts on aquatic ecosystems, including floodplain habitat for fish whether or not they qualify as wetlands. The Clean Water Act Section 404(b)(1) guidelines require that impacts on fish habitat be offset in general, as well as impacts on wetlands.

Zedler Response 4: The report *Compensating for Wetland Losses Under the Clean Water Act* (2001) was extensively used as a guide during the formulation of compensatory mitigation.

The October 29, 2003 memorandum to the field is titled Model "Operational Guidelines for Creating or Restoring Wetlands that are Ecologically Self-Sustaining" for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbor Act. This guidance is intended to serve as a technical support for 404 permit applicants preparing compensatory mitigation plans to offset impacts to aquatic resources authorized under the Clean Water Act Section 404 and the Rivers and Harbors Act Section 10 programs. This Civil Works project has followed the Section 404(b)(1) Guidelines and implemented NAS' ten recommendations to the extent practical to achieve justifiable mitigation and not violate Federal law, specifically WRDA 1986, 906(b)(1). These recommendations are the following:

A.1. Wherever possible, choose wetland restoration over creation.

Restoration of bottomland hardwoods, including hydrology, comprises the vast majority of the proposed compensatory mitigation features. The project area was historically bottomland hardwood wetlands. However, the overall majority of the historical bottomland hardwoods have been cleared, and the wetlands drained and leveled to provide for agricultural production. Restoration will return these areas to pre-agricultural conditions where possible.

Additionally, even though restoration of floodplain lakes is not intended to compensate for wetland impacts, compensatory mitigation may include restoration of floodplain lakes, in particular Riley Lake, to historical conditions.

A.2. Avoid over-engineered structures in the wetland's design.

The wetland mitigation features will not rely on over-engineered structures. Because the goal of the Corps' proposal is to restore historic wetlands and not to create wetlands where they did not exist before, only simple engineering is required in most cases. However, the project area has been modified so extensively due to decades of intense

farming that some engineered structures are a necessity in some mitigation features to replace lost hydrology. See Zedler Response 6.

The Corps will take advantage of engineered structures that are a necessary part of the project including the borrow pits and the sumps behind the levee closures. A spawning and rearing pool for fish will be created behind the Floodway closure and borrow pits will be engineered to create shallows, deep areas, islands, and sinuous shorelines.

A.3. Restore or develop naturally variable hydrological conditions.

Compensatory mitigation features include the restoration of variable hydrological conditions. Restoration of hydrology to Big Oak Tree State Park encompasses a significant portion of the overall mitigation plan. Restoring the hydrology to Big Oak Tree State Park will significantly restore bottomland hardwood habitat to pre-frontline levee conditions (See RSEIS 2 Sections 2.6.1.5 and 5.2.2.4). Additionally, most mitigation features include the restoration of hydrology to the extent practical (See RSEIS 2 Section 5.2). Further discussion concerning this specific NAS recommendation is found in Zedler Responses 5-9.

A.4. Consider complications associated with creation or restoration in seriously degraded or disturbed sites.

The project area is a degraded environment due to decades of intense agricultural practices. Detailed coordination with the interagency mitigation team is being undertaken to develop, implement, and monitor mitigation. Coordination will include overall site selection, methods to control invasive species, methods to promote natural rates of redevelopment, and methods that achieve maximum benefits to fish and wildlife resources.

A.5. Conduct early monitoring as part of adaptive management.

Monitoring is a critical element of the overall mitigation strategy. Monitoring includes an assessment of baseline conditions (RSEIS 2 Section 6.5). All mitigation areas will be monitored to ensure that the sites are functioning as designed. Aspects of monitoring mitigation sites will be formulated during the development of the site-specific detailed mitigation plans that will be coordinated with the interagency mitigation team. This is a requirement of the water quality certification (RSEIS 2, Appendix G, Water Quality Certification, Paragraph 3).

Additionally, aquatic biological communities, freshwater mussels, jurisdictional wetlands, fish passage, and fish spawning and rearing habitat will be monitored throughout the project area to ensure that impacts to fish and wildlife resources were properly modeled and that compensatory mitigation techniques are effective. Overall mitigation will be adjusted through adaptive management as necessary (RSEIS 2 Section 7).

B.1. Consider the hydrogeomorphic and ecological landscape and climate.

The Corps intends to provide compensatory mitigation within the project area. The project area was historically bottomland hardwood wetlands. The proposed bottomland hardwood restoration is suited to the area's hydrology, soils, ecology, and climate. Therefore, bottomland hardwood restoration, including restoration of hydrology, makes up the majority of compensatory mitigation acreage. Hydrogeomorphic considerations will be addressed in the formulation of site-specific detailed mitigation plans. These considerations include reversing the practices of intense agricultural production. This will include the restoration of hydrology to the extent feasible by removal of farm drains, plugging drainage ditches, and restoring microtopography to a more heterogeneous condition.

B.2. Adopt a dynamic landscape perspective.

The October 29, 2003 memorandum to the field states the following:

> Consider both current and future watershed hydrology and wetland location. Take into account surrounding land use and future plans for the land. Select sites that are, and will continue to be, resistant to disturbance from the surrounding landscape, such as preserving large buffers and connectivity to other wetlands. Build on existing wetland and upland systems. If possible, locate the mitigation site to take advantage of refuges, buffers, green spaces, and other preserved elements of the landscape. Design a system that utilizes natural processes and energies, such as the potential energy of streams as natural subsidies to the system. Flooding rivers and tides transport great quantities of water, nutrients, and organic matter in relatively short time periods, subsidizing the wetlands open to these flows as well as the adjacent rivers, lakes, and estuaries.

A dynamic landscape perspective has been adhered to throughout mitigation planning. Compensatory mitigation includes the restoration of 64 miles of buffer strips on New Madrid Floodway channels and the creation of a wildlife corridor that will connect two of the most critical remaining habitats within the New Madrid Floodway (Big Oak Tree State Park and Ten Mile Pond Conservation Area). Additionally, compensatory mitigation includes restoring hydrology to Big Oak Tree State Park and acquiring 1,800 acres of cropland surrounding the park that will be restored to bottomland hardwood habitat.

B.3. Pay attention to subsurface conditions, including soil and sediment geochemistry and physics, groundwater quantity and quality and infaunal communities.

The Corps' mitigation strategy is to restore the mitigation sites to conditions that more nearly approximate historic conditions. Since the strategy restores formerly existing conditions rather than attempts to create new conditions, the project area should be receptive to the planned activities. Nevertheless, subsurface conditions will be analyzed once potential mitigation tracts are identified. Compensatory mitigation will include planting appropriate vegetation that can thrive in the existing soils and tolerate the expected flood frequency and duration of the site. Detailed mitigation plans will be closely coordinated with the interagency mitigation team and will rely on expert judgment from those with experience in mitigation/restoration efforts in the project area.

B.4. Pay particular attention to appropriate planting elevation, depth, soil type, and seasonal timing.

Section 5.2.2.1 of the RSEIS 2 provides mitigation measures that will be adhered to for restoration of bottomland hardwoods. Appropriate vegetation to be planted in mitigation sites will be coordinated with the interagency mitigation team and be based upon reference sites in the project area. Vegetation will be planted at the appropriate time of the year and undergo annual maintenance until it has become established.

B.5. Provide appropriately heterogeneous topography.

The project area can be considered a homogenous topographical landscape due to the clearing, leveling, and draining that has been conducted to provide for agricultural production. Compensatory mitigation includes measures to restore a more heterogeneous landscape. See Zedler Responses 7 and 8.

Additionally, the NRC (2001) lists five wetland functions that warrant attention. These functions have received a great deal of attention in the development of compensatory mitigation for the proposed St. Johns Bayou and New Madrid Floodway Project.

(1) Hydrologic Function – The basic mitigation feature includes bottomland hardwood restoration on a minimum of 6,356 acres (1,293 acres in the St. Johns Bayou Basin, 2,326 acres in the New Madrid Floodway, 671 acres of vegetated buffer strips, 266-acre wildlife corridor, and 1,800 acres surrounding Big Oak Tree State Park – see RSEIS 2 Table 2.2). There will likely be more acres of bottomland hardwood restoration with the inclusion of the additional mitigation techniques that restore mid-season fish rearing habitat (see RSEIS 2 Table 2.7). Bottomland hardwood restoration includes restoration of hydrologic conditions to the extent justified (*i.e.,* hydrologic restoration will include reasonable measures that are cost effective without inducing economic damages to adjacent landowners). This includes removal of farm drains, plugging drainage ditches, and constructing microtopography to mimic reference areas. These measures will ensure that jurisdictional wetland hydrology will meet the jurisdictional hydrology criterion as outlined in the 1987 Wetland Delineation Manual and reaffirmed by NRC (2001). Hydrology of most sites will be well above the

minimum threshold due to existing soil types, frequency of over-bank flooding, precipitation rates, high groundwater table, planned microtopographical features, and planted vegetation.

Additionally, a major component of the basic mitigation feature includes restoration of hydrology to Big Oak Tree State Park. This feature will restore the park's hydrology and preserve and restore historic vegetation and biological communities to natural conditions to the extent practical.

As the NRC (2001) report recommends, hydrologic functions will be a critical restoration component for all wetland mitigation.

(2) Water-Quality Improvements – NRC (2001) states that it is entirely possible for the restored or created site to have water-quality functions superior to those of the impacted site. Additionally, the report states, "If a mitigation site is restored riparian wetland located between a stream and a non-point pollution source (either urban or agricultural) the mitigation wetland will have a water-quality function superior to the impact site." The proposed mitigation entails 64 miles of riparian buffer strips along New Madrid Floodway streams. An additional riparian wildlife corridor will be established between Big Oak Tree State Park and Ten Mile Pond Conservation Area. These activities are precisely what the NRC (2001) report recommended and will provide the water quality improvements noted.

(3) Support of Vegetation – NRC (2001) states that wetlands fail to support plant biodiversity when the environment is extremely hostile or when one or a few species dominate the site. Invasive species control has been incorporated into the mitigation plan. Black willow, although a native species, can become established on mitigation sites and can out-compete more desirable planted vegetation. Potential mitigation sites will remain in agricultural production primarily to control black willow until the site can be properly prepared and planted to the desired plant community.

Species to be planted on mitigation sites will depend on site-specific hydrologic conditions. Species to be planted will be determined during the formulation of the site-specific mitigation plan with input from the interagency team. Sites will have to be prepared to promote vegetation. Areas may have to be deep-disked or a sub-soiler may have to be used to break up the hard pan that has resulted from decades of intense agricultural production. Routine maintenance will be conducted on reforested mitigation sites to control invasive species as necessary.

As stated in the NRC (2001) report, the support of vegetation will be accomplished on proposed mitigation sites.

(4) Habitat Supports for Fauna – The NRC (2001) report stated that none of the compensatory mitigation projects visited by the committee included design evaluation criteria for animals. However, all proposed mitigation for the St. Johns Bayou Basin and New Madrid Floodway Project has extensively modeled and designed mitigation based on a variety of animal habitats including terrestrial resources that represented guilds of all mammals, birds, amphibians, and reptiles that are found throughout the complete range of habitats in the project area (See RSEIS 2 Sections 4.3.3 and 5.5). Mitigation for waterfowl resources was based on dabbling ducks that make up a significant percentage of migration numbers in the project area which is a part of the Mississippi Flyway (See RSEIS 2 Sections 3.3.2, 4.3.4 and, 5.6; and 2002 RSEIS Appendix E). Shorebird habitat mitigation was based on likely changes to agricultural practices (See 2002 RSEIS Appendix E), and fish habitat mitigation focused on the mid-season rearing impacts (See RSEIS 2, Sections 4.3.1 and 5.4, and 2002 RSEIS Appendix G).

The NRC (2001) report also emphasized the importance of considering migratory pathways and upland buffers in the design of a compensatory mitigation plan. The proposed mitigation plan includes the establishment of a wildlife corridor that will connect Big Oak Tree State Park to the Ten Mile Pond Conservation Area (see RSEIS 2 Section 2.6.1.4). Due to the intense farming in the project area many species of wildlife are isolated to these two tracts of state owned and managed lands. It is likely that there is little movement of wildlife populations between the two areas. The wildlife corridor will allow for wildlife migrations/movement (*i.e.*, numerous species of reptiles and amphibians; large mammals such as white-tailed deer, fox, mink, etc.; and numerous avian species such as wild turkey, waterfowl, and neotropical migrants) as recommended in the NRC (2001) report.

(5) Soil Functions – Many of the recommendations in the NRC (2001) report concerning soils will not be a critical factor in the restoration of wetlands because much of the soil in the project area is hydric that is well suited for wetland restoration. However, as previously stated, the existing soils have been leveled and have had years of intense agricultural production. All mitigation sites will be prepared to reverse the effects of years of farming. Preparation includes deep disking/sub-soiling and the creation of microtopography.

Zedler Comment 5:

1. Inconsistency with Accepted Understanding of the Importance of Natural Hydrology

Aquatic and wetland ecologists agree that natural hydrologic patterns are critical to the ecological functions of rivers and wetlands. In a report on riparian areas that include floodplains, the National Research Council has called hydrology the "master variable" in driving the ecology of river riparian areas, whose key components include not just broad averages but magnitude of water, frequency, duration, timing and rate of change. National Research Council, Riparian Areas, Functions and Strategy for Management (2002).

Zedler Comment 5 (continued):

The focus on preserving and or restoring natural hydrologic patterns reflects humility about the limits of our understanding of the role played by each variable for different ecological functions and hard-taught lessons about how alterations of natural hydrology have often had strong effects that were not well understood. For example, disruption of natural flow patterns, and the timing and amount of wet and dry conditions, of Florida's Everglades are believed to be the root cause of the great declines of its fish and wildlife, and the restoration of these natural patterns of flow is the principal goal of a more than $8-billion restoration plan authorized by Congress. The disruption of natural hydrology caused by levees is believed to be the root cause of the disappearance of more than a million acres of wetlands in coastal Louisiana and a significant contributor to increased hurricane damages. The Corps has proposed an even more expensive plan to restore natural hydrology to reverse the losses of these wetlands. And while these are two of the most high-profile examples of unintended negative consequences of altering natural hydrological conditions, hundreds of papers on rivers and wetlands have demonstrated adverse ecological consequences from hydrologic alteration for countless other rivers and wetlands. Numerous other papers have demonstrated that efforts to restore wetland and river habitat without restoring natural hydrologic patterns nearly always fail to reproduce key aquatic functions.

For this reason, the report of the National Research Council of the National Academy of Sciences, prepared by the committee that I chaired, strongly emphasized the importance of naturally variable hydrological conditions. One of the major guidelines it set forth for wetland mitigation was as follows:

> "Restore or develop naturally variable hydrological conditions. Promote naturally variable hydrology, with emphasis on enabling fluctuations in water flow and level, and duration, and frequency of change, representative of other comparable wetlands in the same landscape setting." NRC, Compensating for Wetland Losses Under the Clean Water Act p. 125 (2001).

The report also stated, "Hydrology is most often cited as the primary driving force influencing wetland development, structure, functioning, and persistence. Proper placement within the landscape of compensatory wetlands to establish hydrological equivalence is necessary for wetland sustainability." Ibid p. 45. Elsewhere, the report stressed, "Hydrological variability should be incorporated into wetland mitigation design and evaluation. . . . Hydrological functionality should be based on comparisons to reference sites during the same time period." Ibid p. 45. The reference to "reference sites" is to provide a mechanism for imitating natural hydrology.

Zedler Comment 5 (continued):

The Corps has officially embraced this recommendation in its 2003 Mitigation Memo. This memo states: "Natural hydrology is the most important factor in the development of successful mitigation. Wetlands and other waters are very dynamic, and dependent on natural seasonal and yearly variations that are unlikely to be sustainable in a controlled hydrologic environment." This memo goes on to refer to our recommendation to establish natural hydrology as a "basic requirement."

The Corps' claim for this project that the loss of a vast area of seasonally flooded aquatic habitat could be replaced by unnaturally extended flooding on a small area of already existing wetlands would be an extreme example of what the NRC report recommended against.

Zedler Response 5: Please see the discussion of "artificial" vs. "natural" flooding in Zedler Response 8 below and Response to Sparks Comment 4. For a discussion of replacement of a "vast area of seasonally flooded aquatic habitat" with "a small area of already existing wetlands," see Zedler Response Comment 2 above and Bohlen Response 63. Creation of a spawning and rearing pool for fish is only a part of the overall mitigation plan. Creation of a spawning and rearing pool will extend flooding over the entire 45-day mid-season fish rearing period in most years. This action will result in significant gains to mid-season fish rearing habitat. It is not appropriate to take a narrow view and only look at one part of overall mitigation and make the claim that the overall mitigation strategy is an extreme example of what the NRC report recommended against.

As recommended in the NRC (2001) report, natural hydrology is being promoted to the extent justified (See Zedler Response 4, Paragraph (1) Hydrologic Function) in the potential mitigation sites (See Zedler Response 4, Paragraph A.3 above). The guidelines have been used extensively throughout mitigation formulation. Compensatory mitigation features also include the restoration of a minimum of 6,356 acres of bottomland hardwoods, creation of moist soil units, and the restoration of hydrology to Big Oak Tree State Park.

As stated in Section 5.2.2.1 of the RSEIS 2 forested wetland mitigation will include (1) the restoration of hydrologic functions to the extent practical. This may be accomplished by removing existing farm drains or plugging drainage ditches; (2) preparation of the area for vegetation through deep disking or the use of a sub-soiler; and, (3) creation of microtopography based on the geomorphic setting. Dimensions will be based on patterns that occur in nearby reference sites. These practices are consistent with the NRC's recommendations.

Mitigation in shorebird areas (See RSEIS 2 Section 5.2.2.2) will involve the use of groundwater pumps to provide the desired hydrology in the area. These areas are designed to be intensively managed to promote the desired output for shorebirds and waterfowl. However, the overall design of shorebird areas is modified to allow for natural hydrology. This modification includes degrading the perimeter levee to allow out of bank flood events (and fish) to enter the area. Shorebird areas will be managed in a similar fashion to existing moist soil units in the Ten Mile Pond Conservation Area.

The hydrologic restoration of Big Oak Tree State Park (See RSEIS 2 Section 5.2.2.4) will provide natural hydrology to the park and additional 1,800 acres of reforested cropland that will be acquired. This significant portion of compensatory mitigation will restore hydrological conditions in a fashion that the NRC (2001) report recommended.

Zedler Comment 6:

Related to the biological importance of natural hydrology is a strong recommendation against the reliance on engineering structures even to establish natural hydrology, let alone to distort it. Our report discussed problems with use of engineering structures to establish hydrology, and stated "natural hydrology should be allowed to become reestablished rather than finessed through active engineering devices to mimic a natural hydroperiod," i.e., naturally variable hydrology. The Corps has accepted this recommendation as well, and writes in its memo regarding adoption of NAS recommendations, "Artificial structures and mechanisms should be used only temporarily. Complex engineering and solely artificial mechanisms to maintain water flow normally will not be acceptable in a mitigation proposal."

Because the Corps' proposed mitigation relies on these kinds of artificial engineering structures, not just for fish but also for waterfowl and shorebirds, this proposed mitigation also violates these established principles.

Zedler Response 6: See Zedler Responses 4 and 5 above for a detailed discussion of how this recommendation was implemented in the RSEIS 2. The Corps acknowledges that engineering structures will be necessary to achieve the desired output in some cases. In fact, a "complex" engineering structure is critical to restore natural hydrology to Big Oak Tree State Park. The past impacts to the project area are so extensive that some engineering will be required at most mitigation sites. These past impacts are attributed to Corps projects (*e.g.*, construction of the Mississippi Mainline Levee System) and non-Corps projects (*e.g.,* wide scale channelization of natural waterways, clearing large tracts of bottomland hardwoods, leveling of virtually all topographical features for farming, excessive drainage, etc). However, as recommended by the NAS report, over-engineered structures have been avoided. Most engineered structures will be very simple, such as perimeter levees, drain plugs, stop-logs, and groundwater pumps (moist soil areas).

As an example, bottomland hardwood restoration will rely on natural hydrology to the extent practical. However, restoration measures will have to ensure that adjacent properties are not inadvertently flooded. Therefore, perimeter levees may have to be established around mitigation sites and existing drainage may have to be re-routed.

Engineering structures will be a necessity in the restoration of floodplain lakes, such as Riley Lake. Local interests excavated the outlet of Riley Lake in the past to promote agricultural production in the area. This excavation resulted in a lower lake elevation and thus decreased fish habitat (See RSEIS 2 Section 2.6.2.3). A simple engineering structure, such as a rock weir, will be required to plug the modified outlet of the lake to restore surface water elevations and fish habitat.

The Corps will take advantage of engineered structures that are necessary to the project as set out in Zedler Response 4, Paragraph A.2 above, such as using the operation of the levee closure to create the spawning and rearing pool. The NRC (2001) report states, "Avoid hydraulic control structures and other engineered structures that are vulnerable to chronic failure and require maintenance and replacement." The closure levee and associated outlet gates are the critical components of the flood damage reduction project and these structures will be built to appropriate engineering design that limits vulnerability and failure. These areas will also undergo routine monitoring and maintenance to ensure they are functioning as designed. Required maintenance will be conducted as necessary to maintain the integrity of the levee system. It is highly unlikely that the structure will be vulnerable to chronic failure. Therefore, it is highly likely that the creation of spawning and rearing pool will provide the expected mitigation benefits to mid-season fish rearing habitat.

Zedler Comment 7:

The importance of preserving or reestablishing natural hydrologic variability is closely related to the importance reflected in landscape position. The NRC report notes that "[l]andscapes have natural patterns that maximize the value and function of individual habitats." The report also encourages the preservation of "large buffers and connectivity to other wetlands," and generally recommends locating mitigation sites in comparable landscape positions and with comparable hydrology as the impact site. NRC Report p. 124. Noting that "slight differences in topography," i.e., elevation, have major impacts on hydrology and resulting plants and animals, the report also calls for providing "appropriately heterogeneous topography." Ibid p. 127. The Corps has endorsed this recommendation as well in the 2003 Mitigation Memo. For example, it writes, "attempting to place mitigation in a dissimilar ecological complex than that of the impact water is expected to result in a wetland/water unlikely to replace the

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functions of the wetland/water that was lost." Memo p. 6. It also emphasizes the need for varied topography Memo p. 8-9.

For this project, the Corps has proposed to create small areas to be managed in uniform ways as replacement for lost functions on an extensive expanse of wetlands and floodplain habitats with varied topography, extensive contiguity and, for much of the land, open hydrologic connectivity. This proposal violates the NRC panel's recommendations as well.

Zedler Response 7: See Response to Zedler Comment 4 above. The comment is inaccurate in three ways.

(1) There is no extensive expanse of wetlands under pre-project conditions. Please refer to Table 3.1 and Figure 4 of the RSEIS 2. There are extensive expanses of soybean fields, not wetlands (See RSEIS 2 Figures 4 – 17). NRCS has stated that 0.4% of this farmland is classified as farmed wetlands (See RSEIS 2 Sections 4.2.1 and 4.5.1).

(2) The Corps concurs that it is floodplain habitat; however, the floodplain consists of leveled farmland. Most of the historical characteristics of floodplains such as bottomland hardwoods, varied topography, and a network of streams, bayous, and wetlands have been cleared, plowed, leveled, and drained to promote production of agricultural commodities (RSEIS 2, Figures 4-17).

(3) The only extensive contiguous habitat within the project area is cleared farmland. Existing high valued habitat in the New Madrid Floodway consists of Big Oak Tree State Park, Ten Mile Pond Conservation Area, and the Bogle Woods tract that the Corps has acquired for compensatory mitigation, but these areas are not contiguous under pre-project conditions (RSEIS 2, Figures 1-17).

The open hydrologic connectivity that is currently found in the project area consists of the 1,500-foot gap and a network of channelizied drainage ditches.

The Corps concurs with the NRC report and intends to implement its recommendations on the majority of mitigation sites. The mitigation plan recommends 64 miles of buffer strips and a wildlife corridor to create contiguous habitat. Furthermore, the Corps intends to establish microtopography to create heterogeneous topography (See RSEIS 2 Section 5.2.2.1) and conduct mitigation activities in the project area as the NRC report recommends.

The Corps does propose to manage relatively small areas in uniform ways to replace lost functions to fish and shorebirds (RSEIS 2, Section 2.6.1.2).

Zedler Comment 8:

The rationale for the NRC panel's recommendations applies fully to the proposed project. The project area, according to the 2002 EIS, supports a wide range of fish, bird and amphibian species. These diverse species will use different kinds of habitats affected heavily by variable flood regimes, are adapted to take advantage of natural flood variability, and will therefore benefit from different aspects of that natural hydrology. Artificial flooding, even if it were to benefit some species, will almost certainly disadvantage others. The levees and water control structures designed to achieve ponding will obviously serve to obstruct fish passage. Extensive flooding over a large number of acres for many days, as occurs today, will also do more to trigger water quality filtration functions than somewhat longer flooding over a very small number of acres. Existing flooding will create a range of microhabitats, and interactions between floodplain and stream networks, that could not be mimicked by extended ponding on a small number of acres. The NRC has recommended the importance of these variations in microhabitat explicitly on floodplains:

> "River-floodplain systems have a lateral structure that begins at the main channel and progresses through undefeated and vegetated channel borders and floodplain habitats (backwaters and seasonally flooded vegetation types. Backwaters and large-scale eddies provide refuges from the high velocities and colder winter temperatures of the main channel. Within each of the border and floodplain areas, there are distinct patches, usually determined by small differences in land elevation, that in turn determine the period of inundation (or water depth, in permanently flooded areas) and soil saturation."

National Research Council, Restoration of Aquatic Ecosystems p. 181 (citation omitted). The NRC emphasized the importance of this patchiness, writing that "restoration necessarily involves maintenance or recreation of the original patchiness." p. 183, and emphasizing that floodplain connectivity is critical because "[a]nother way in which the character of rivers is drastically altered is by cutting off interactions with the riparian zone and floodplains." Ibid p. 169.

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Zedler Response 8: The backwater flooding that occurs within the New Madrid Floodway cannot be described as "natural." The backwater flooding is due to the

construction of the Mississippi River Mainline Levee System. Flooding backs into the Floodway from a 1,500-foot gap in the levee system. The area would experience Mississippi River headwater or overland flooding, as presently occurs in the batture area, if it were not for this levee. See Responses to Sparks Response 4 and Bohlen Responses 26.

Additionally, virtually every water course has been channelized and the vast majority of the area's bottomland hardwood wetlands have been drained, cleared, leveled, and are intensively farmed (RSEIS 2, Figures 4-17). As the 2002 RSEIS states, the area still supports a wide range of fish, bird, and amphibian species. However, the species residing in the project area are not dependent upon a natural flooding regime; they are adapted to a highly modified environment that is characteristic of intense farming and habitat fragmentation. Compensatory mitigation, including the creation of a spawning and rearing pool, will significantly benefit the remaining fish and wildlife resources found in the project area.

The comment concerning "artifical flooding" is misleading since all flooding; natural or artificial adversely impacts some species. The Corps intends to flood areas to mimic natural hydrology and to provide significant habitat for fish and wildlife resources. The Corps intends to prolong flooding events in the sump area to create a stable spawning and rearing pool for fish. Additionally, groundwater pumps will be used to ensure that moist soil management areas are flooded. Flooding both of these areas will result in significant gains to fish and wildlife habitat. Obviously, prolonged flooding on farmland may impact some area species that thrive in soybean fields. However, this effect is not significant and mitigation is not intended for these species. Mitigation is intended to enhance populations that naturally occur or have historically occurred in the project area.

The closure gates in the St. Johns Basin or the New Madrid Floodway will be operated to allow for fish passage while providing the economic benefits to the area (See Sparks Responses 6-9).

The Corps' mitigation will improve water quality in the project area. See RSEIS 2 Section 5.3 and Woltemade Responses 5 and 7.

The Corps acknowledges the importance of floodplain variation and microhabitat as cited in the NRC report (1992). However, these variations are found only to a very limited extent in the New Madrid Floodway. There are very small differences in land elevations because the majority of land has been leveled for agriculture. Additionally, the area has extensive drainage features that remove floodwaters very efficiently after floods recede. Therefore, the distinct patches the comment mentions are already largely absent from the project area. Proposed mitigation entails creating these distinct patches as the NRC report emphasizes. This will be accomplished by removing drains, plugging ditches, and creating microtopography that will result in converting thousands of acres of homogenous soybean fields into highly functioning bottomland hardwood habitat with

heterogeneous topography and patches (RSEIS 2 Section 5.2.2.1 and Zedler Response 4 above).

Zedler Comment 9:

> There is also the real risk of a range of additional unintended adverse environmental consequences. Artificially prolonged flooding could also result in a range of biochemical impacts that are hard to anticipate. In the face of the limitations of our understanding, and the repeated demonstration that alterations to natural hydrologic variability tend to have highly adverse consequences, the accepted understanding is that mitigation and other forms of environmental restoration should focus on reestablishing natural hydrologic variability.

Zedler Response 9: As previously stated, there is little remaining natural hydrologic variability in the New Madrid Floodway (See Zedler Response 8 above). Mitigation activities will accommodate hydrologic variability to the extent practical (see Zedler Response 4 Paragraph (1)). Mitigation activities will be monitored to ensure that they are producing the desired outcomes. Through adaptive management, mitigation activities may be modified in the event of unanticipated (and the Corps believes unlikely) biochemical impacts. Additionally, monitoring will also determine any other impacts such as unanticipated impacts to jurisdictional wetland status, bottomland hardwood survivability, aquatic biological communities, and fish access.

Monitoring is a requirement of the WQ Certification. The certification states that "[i]f monitoring reflects that any additional wetland acres are impacted by the project (other than those already planned for mitigation), additional mitigation shall be required." (See RSEIS 2 Appendix G, Water Quality Certification, paragraph 5 a).

It is interesting to note that creation of a spawning and rearing pool could result in a range of biological and biochemical improvements that are also hard to anticipate. Creation of a spawning and rearing pool will take a significant amount of agricultural land out of production. The generally accepted understanding is that taking farmland out of production usually results in environmental benefits. As an example, taking farmland out of production usually results in benefits to water quality due to a reduction of fertilizer application and reduced soil erosion. Additionally, depending on vegetation present, creating a spawning and rearing pool will most likely create additional areas for shorebirds. Monitoring will also quantify these unanticipated benefits.

Zedler Comment 10:

> In this matter, the Corps has proposed to do the opposite of these recommendations. It would dramatically reduce or eliminate flooding according to a relatively natural pattern on tens of thousands of acres of wetlands and other valuable floodplain areas, and replace them primarily by artificially manipulating the hydrology on a small number of acres of already existing wetlands. According to established understanding, that mitigation should itself be viewed as harmful, and according to accepted scientific understanding, it cannot offset the impacts of this project.

Zedler Response 10: See Zedler Response 4 above. As previously stated, there are not tens of thousands acres of wetlands in the project area. The project will reduce or eliminate backwater flooding on thousands of acres of soybean fields (See RSEIS 2 Figures 4-17). Utilizing NRCS' estimate of farmed wetlands in the project area, there are a total of 8,940 acres of wetlands below an elevation of 300 feet NGVD, which corresponds to a 30-year event. See Zedler Responses 1 above. For a response to the "small number of acres of mitigation" assertion, see Sparks Response 21.

This mitigation proposal cannot reasonably be considered "harmful" considering any reasonable examination of the facts. See Sparks Response 22. Wetland mitigation alone will convert a minimum of 7,121 acres of cropland (prior converted) into jurisdictional wetlands (RSEIS 2 Section 5.2) resulting in a net increase of 6,499 acres of jurisdictional wetlands. As stated in Section 2.6.1 of the RSEIS 2, mitigation includes reforesting 3,619 acres of cropland, creating 765 acres of moist soil units, restoring vegetative buffer strips along 64 miles (671 acres) of channels, creating a 266-acre wildlife corridor, and reforesting 1,800 acres of cropland surrounding Big Oak Tree State Park. Additionally, compensatory mitigation involves restoration of hydrology to Big Oak Tree State Park. The additional mitigation techniques that are intended to compensate for mid-season fish rearing impacts will most likely increase the overall acreage and functions of restored wetlands. As seen in the previous responses, mitigation measures comply with the NRC's recommendations.

Zedler Comment 11:

2. Inappropriate Use of Habitat Models

A related flaw with the Corps analysis is its misuse of its habitat models, which go under the general category of Habitat Evaluation Procedures or HEP. By using these models to quantitatively estimate mitigation acreage requirements for dramatically different kinds of habitat under dramatically different hydrologic conditions, the Corps has used these models beyond any scientifically accepted level.

HEP models attempt to evaluate habitat for animals on the basis of very few criteria. For example, the fish model used by the Corps for this project is based entirely on numbers of average daily flooded acres and the different kinds of vegetation on those acres. In and of itself, it does not factor in such obviously critical factors as extent of contiguous habitat, hydrologic variability, microhabitats, temperature, water velocity, relationships among habitat types, and conditions under extreme flooding or drought. It also ignores the values of habitat diversity for the broad range of species being evaluated.

Because of their simplicity, HEP models have generally come into disrepute, particularly if used for more than one target game species. The HEP models for this report are intended to cover a range of species that in reality have different needs. Thus, when the National Research Council evaluated analytical tools for wetland mitigation, it noted that HEP models have often been used in the past, but did not recommend their continued use. *Compensating for Wetland Losses*, ch. 7. The National Research Council has recommended the use of

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assessment techniques that meet eight conditions, few of which are met by HEP models.[6]

Zedler Comment 11 (continued):

> [6] Key recommendations include that the assessment technique "includes reliable indicators of the important wetland processes (hydrology, sedimentation and primary production)"; that it "incorporates effects of position in landscape"; that it "assess all recognized functions"; that it is "sensitive to changes in performance over a dynamic range" (such as differences in conditions in both very large and very small floods). *Compensating for Wetland Losses* p. 136-137. None of these conditions is met by the HEP models used by the Corps for this project. The RSEIS2 also provides a separate analysis using a different wetland assessment model, the so-called HGM. But there is no need to address the results of this model, since it assessed only the direct filling of vegetated wetlands, and therefore disregarded the thousands of acres of vegetated wetlands that would be impacted through drainage, and it also assessed only a small number of acres of cropped wetlands.

Zedler Response 11: See Bohlen Response 28. HEP has been cited as applicable in all 50 states by the report referenced in the comment. Please refer to page 131 of *Compensating for Wetland Losses Under the Clean Water Act*.

> "Some procedures, such as habitat evaluation procedure (HEPs) (USFWS 1980, 1981, Sousa 1985), have become operationally codified in regulatory procedures as either required or recommended elements of wetland assessment. HEP was one of the two functional assessment procedure that Bartoldus (1999) considered applicable in all 50 states."

Contrary to the comment, the model did not account for contiguous habitat, hydrologic variability, microhabitats, temperature, water velocity, relationship among habitat types, and conditions under extreme flooding and droughts. The fishery HEP model did account for all of these conditions (See RSEIS 2 Section 4.3.1.1).

Impacts to fish spawning and rearing were quantified by Envirofish and HEP. Envirofish addressed overall landscape (farmland, fallow, bottomland hardwoods, large and small permanent waterbodies), hydraulics (depth and duration of flood events including extreme droughts and floods), and hydrological conditions (flows) over the 32-year period of record. Envirofish provided average daily flooded acres for the existing conditions of the project area and several project alternatives. HEP was used to assign a Habitat Suitability Index to the different habitat types produced by Envirofish. HSI values were assigned from evaluation species that were made up of distinct guilds of fishes common to the project area. Many factors went into the development of the HSI values that included life history of selected species (spawning and rearing requirements, timing of reproduction, temperature), field data from Lower Mississippi River Valley floodplains (Yazoo Basin, Mississippi), and professional opinion of an interagency team that is familiar with the project area (Delphi technique). Please refer to Appendix A of the RSEIS 2 for further information concerning Envirofish and HEP.

See Sparks Response 17 on the use of Envirofish and the availability of other models. Envirofish was specifically developed to compare different habitats and flood regimes within the 2-year floodplain. The Corps is not aware of any models that meet the recommendations referred to in footnote 6 and the commenter provides no alternatives. The Corps has already responded to the mischaracterization of "thousands of acres of vegetated wetlands that will be drained" mentioned in this footnote. See Zedler Responses 2 and 10 above.

For a discussion of artificial flooding see Zedler Responses 4-7 above. For a discussion of fish access, see Sparks Responses 6-9.

Zedler Comment 12:

To illustrate the problem, imagine an accurate model used to assess the number of annual calories needed by adults of different weights and heights. Such a model would not imply that adults would be equally healthy regardless of whether they received those calories through balanced meals or through candy bars. Neither would it imply that adults would be healthy whether they eat these calories in three meals a day or in one meal in a single day.

Zedler Response 12: Your illustration is noted. However, this simple illustration misses many points of the complex fish model. Envirofish and HEP accounted for many variables to account for fish habitat quantity, quality, transition periods, and availability that your simple illustration misses (see Response to Zedler Comment 11 above).

Zedler Comment 13:

There is no evidence that the fish HEP model was peer-reviewed. At best, the Corps is attempting to use a habitat model for fish that was developed by comparing sites with comparable hydrology and landscape to evaluate mitigation sites with completely different hydrology and landscape position. Even if the HEP model has validity when used properly, it lacks scientific validity when used in this manner.

Zedler Response 13: See Response to Zedler Comment 11 above and the references therein for a transferability discussion. The HEP model that was used to quantify impacts and develop mitigation for this project was developed by a consensus of fish and wildlife biologists from several resource agencies who are familiar with the project area. This RSEIS 2 calculates benefits from compensatory mitigation features precisely the same way in which impacts were quantified. The Corps has diligently sought review from responsible resource agencies such as USFWS, MDNR, and (See RSEIS 2 Section 8.4, last comment).

Zedler Comment 14:

> 3. Incorrect Understanding of Restoration
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> Restoring natural hydrology is considered to be a, and perhaps the, critical component of mitigation. But as the above discussion implies, artificial manipulation of one aquatic habitat, even if intended to benefit a particular target species, is not considered proper mitigation either by the National Research Council panel's report or by the Corps memo endorsing the panel's views. Artificial hydrologic manipulation is normally considered an environmental harm because even if, in some circumstances, it might benefit one particular species, it can have a range of adverse effects. The RSEIS 2 states (p. 40) that "[r]estoration usually involves replacing the existing habitat with another habitat that is of greater benefit to the target species." This is not an accurate representation of the field of ecological restoration. Rarely is a single species the target, and even if it were, it would not be considered "restoration" to replace thousands of acres of habitat by making a fraction of that area artificially wetter.

Zedler Response 14: For this project, compensatory mitigation will accommodate natural hydrology (See Zedler Responses 4-7). As previously stated, the overall compensatory mitigation proposed by this project involves many different aspects (such as reforestation, buffer strips, wildlife corridor, restoration of hydrology to Big Oak Tree State Park, moist soil units, and borrow pits) in addition to the creation of the spawning and rearing pool (See RSEIS 2 Table 2.2 and 2.7).

The Corps agrees that restoration does not usually involve a single species and the fisheries compensatory mitigation for this project included guilds of species intended to represent the majority of species present in the project area. The Final RSEIS 2 (page 40) has been modified to state that "Restoration usually involves replacing the existing degraded habitat with a habitat appropriate to the site that is of greater benefit to the target community."

Artificial hydrologic manipulation may be considered an environmental harm in some circumstances, such as the attempt to replace an upland ecosystem with a wetland. Such attempts are often unsuccessful. However, creation of a spawning and rearing pool in the sump of either the St. Johns Basin or New Madrid Floodway will take a significant amount of cropland out of production, plant appropriate vegetation that can tolerate the flooding regime, and significantly increase fish spawning and rearing habitat for fish. Additionally the spawning and rearing pool will offer greater amounts of habitat for amphibians, reptiles, birds, and mammals than the current frequently flooded soybean fields provide.

Additionally, restoration of a floodplain lake includes restoring the permanent water habitat. It is a natural phenomenon for floodplain lakes to gradually fill in and become terrestrial habitat. However, many floodplain lakes are "filling in" rapidly due to anthropogenic factors that are contributing to high sediment loads in the nation's

waterways. The LMRCC has published a list of potential restoration sites, including floodplain lake restoration similar to that which is proposed for Riley Lake.

Conversion of thousands of acres of predominantly cropland (See RSEIS 2 Figures 5-17) to areas such as reforested areas, borrow pits, restored floodplain lakes, buffer strips, wildlife corridors, and moist soil units that is of greater ecological significance to numerous fish and wildlife resources is considered to be an environmental improvement by the Corps and many individuals in the scientific community as well as the general public. See RSEIS 2 Tables 2.2 and 2.7.

Zedler Comment 15:

4. Failure to Specify Particular Mitigation Site or Other Attributes of Detailed Mitigation Plan

Virtually all assessments of wetland mitigation, as summarized in *Compensating for Wetland Losses Under the Clean Water Act*, have found that most wetland mitigation projects have shortcomings to differing degrees, in that the target wetland mitigation has not fully replaced the lost wetland area and functions. The reasons for their shortcomings include the fact that compensating for wetland losses is technically very challenging and subject to a range of difficulties for even the most promising projects. Another reason is that the degree of commitment to wetland mitigation sites tends to wane once the underlying project has gone forward. The degree and likelihood of a project achieving its stated objective depends on the characteristics of the proposed mitigation sites.

One of the questions addressed by the panel in *Compensating for Wetland Losses* was whether mitigation projects should therefore be completed prior to authorizing project impacts. The panel rejected this requirement on practical reasons, while noting that this level of certainty is one of the potential benefits of wetland mitigation banks. But the report emphasized the critical importance of providing a detailed mitigation plan before approval of project impacts. NRC Report p. 101.

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Review of a specific mitigation site and reasonably detailed restoration plans are critical to any assessment of the likelihood of mitigation compliance and the degree of that compliance. These are not minor details that can be resolved later. Given the challenges facing mitigation, there can be no legitimate determination that mitigation is likely to offset project impacts without this information. The NRC panel also recognized that mitigation ratios i.e., the amount of mitigation, needed to be adjusted to reflect the prospects for achieving compliance. NRC Report p. 150. That too cannot occur properly without detailed advance information about mitigation sites and restoration plans.

Zedler Response 15: The Corps concurs with the findings summarized in *Compensating for Wetland Losses Under the Clean Water Act.* The Corps cannot identify precise locations at this time because mitigation lands have to be obtained from willing sellers. Willing sellers cannot be identified until there is an authorized and appropriated project. Federal Law dictates how a Civil Works project is constructed and unavoidable impacts compensated.

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

Compensatory mitigation will occur concurrently with project construction. To comply with Federal Law and to address the concerns of not only Environmental Defense but the interagency mitigation team the WQ certification states the following:

> 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.

Therefore, construction of the project will commence as mitigation planning, acquisition, and implementation commences. The interagency mitigation team will vote on potential tracts of mitigation lands. The site-specific tract will be acquired if it is desirable to the interagency mitigation team. Once acquired, a site-specific detailed mitigation plan will be coordinated with the team and submitted to MDNR for approval. The flood damage reduction project can not be operated (closing gates or pumping interior flooding) until all lands are acquired and all detailed mitigation plans have been approved that demonstrate that all unavoidable impacts to fish and wildlife resources have been compensated.

For example, the first item of work consists of partially constructing the closure levee (a section will be left open) and box culverts across Mud Ditch. This specific construction item will impact 12 acres of wetlands and its associated habitat value (*i.e.,* terrestrial AAHU). This construction item will not be built until the Corps has developed and MDNR has approved a detailed mitigation plan that shows that the 12 acres of wetlands and its associated habitat value are compensated. The remaining section of levee, closure of the gates, and the operation of the pumps will not take place until MDNR has approved detailed mitigation plans that demonstrate all significant impacts (*i.e.,* wetlands,

terrestrial wildlife, waterfowl, shorebirds, and mid-season fish rearing habitat) have been compensated.

Additionally, monitoring will be conducted on all mitigation sites to ensure that they are functioning as designed. Monitoring will also be conducted to ensure that impacts described in previous NEPA documents and this RSEIS 2 were adequately quantified. Overall mitigation needs may be increased if monitoring reflects additional impacts. Therefore, the Corps will mitigate for all unanticipated impacts that is reflected by monitoring (See RSEIS 2 Appendix G, WQ Certification, paragraph 5 a). Proposed monitoring includes biological communities, extent of jurisdictional wetlands, freshwater mussels, fish passage, and fish spawning and rearing usage. Monitoring will be developed and coordinated with the interagency mitigation team.

In regard to the "waning degree of commitment to mitigation" your comment references, the Corps believes that the existing water quality certification provides sufficient language to ensure that all significant unavoidable impacts are compensated prior to the operation of the project. See Bohlen Responses 48-52.

Zedler Comment 16:

In the RSEIS2, the Corps does not propose a specific mitigation plan but instead proposes a range of conceptual options. In effect, the sites and restoration plans remain up to future decision-making. Even the four mitigation scenarios specifically analyzed are only some of the possible mitigation options permitted under the analysis. Moreover, even the scenarios are highly general and fail to specify for the most part specific mitigation sites or to offer detailed mitigation plans about the work to be performed on those sites. This uncertainty would remain until well after the decision to proceed on the project, and even until after heavy investment in project construction. Such levels of details do not support any legitimate judgment about the extent to which mitigation will truly offset project impacts, and it is inconsistent with Corps-recommended practice as represented to the NRC panel.

Zedler Response 16: The proposed mitigation methodology is consistent with Civil Works regulations and guidance and Federal Law. The RSEIS 2 provides four conceptual mitigation scenarios that demonstrate that compensatory mitigation is achievable and the project is economically justified. Please see Zedler Response 15 for further discussion. The mitigation will proceed concurrently with construction, not "after heavy investment" in project construction. In fact, some investment in mitigation has already taken place, before any construction at all. See Section 1.4.6 of the RSEIS 2. To date the Corps has acquired 1,657 acres of land for mitigation. The Corps was in the process of formulating site-specific detailed mitigation plans for these tracts prior to the ROD being withdrawn.

In summary, the Corps of Engineers intends the following:

- The Corps is committed to mitigate for all unavoidable impacts to significant fish and wildlife resources.
- Compensatory mitigation is based on the same relevant science and methodology that was used to determine impacts. Impacts were based on the best scientific tools and models available. These models were developed and coordinated with an interagency team that has expertise with Lower Mississippi River ecological functions.
- Mitigation techniques are based upon recommendations and guidelines developed by the National Research Council (2001).
- Mitigation planning, implementation, and monitoring will be coordinated with an interagency mitigation team.
- The flood damage reduction project will not be operated until MDNR approves all site-specific detailed mitigation plans that demonstrate that all impacts from the flood damage reduction project are adequately compensated.
- Adaptive management and monitoring will be conducted to ensure that impacts were adequately quantified and mitigation is functioning as intended.
- Additional mitigation will be required if monitoring reflects additional impacts.

Literature Cited

National Research Council. 1992. Restoration of aquatic ecosystems: science, technology, and public policy. National Academy Press. Washington, D.C. 552 pp.

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Dr. Richard Sparks Comment 1:

REPORT OF DR. RICHARD SPARKS ON THE DECEMBER 9, 2005 REVISED SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT 2 (RSEIS2) FOR THE THE ST. JOHNS BAYOU/NEW MADRID FLOODWAY PROJECT

(27 January, 2006)

I currently serve as the Research Director of the National Great Rivers Research & Education Center in Godfrey, Illinois. I have previously submitted comments on the St. Johns Bayou/New Madrid Floodway project, which described my qualifications and included my curriculum vitae. I have also testified extensively under direct and cross-examination regarding my opinions about the project before the Missouri Clean Water Commission. I submit this report to supplement these comments in response to a new Draft Supplemental Environmental Impact Statement issued by the U.S. Army Corps of Engineers dated December 9, 2005. Except as otherwise addressed, all my prior comments remain applicable.

Sparks Response 1: Noted.

Sparks Comment 2:

In general, the proposed changes to the mitigation, although they mostly fix the most prominent basic math error, continue to contradict the requirements and assumptions of the fish model used by the Corps to estimate needed mitigation for fish. The judgment that the mitigation plan would fully offset fish impacts is also scientifically unjustified and in critical respects contradicts common sense when fully understood.

Sparks Response 2: Mitigation as calculated by the model was initially based on impacts to spawning habitat. The model used depth and duration of flooding to delineate functional habitat. However, through negotiations with USFWS, rearing habitat was eventually used to provide the maximum number of mitigation acres (See RSEIS 2 Section 4.3.1.1). The HEP team defined spawning habitat as the acres that are flooded 8 consecutive days and at least one foot in depth. This requisite depth and duration is necessary for river fish to move onto the floodplain, construct nests, and for fry to develop. See 2002 RSEIS Page G-8. Conversely, rearing habitat, which is habitat necessary for yolk-sac and post yolk-sac larval phases, was defined as any inundated area at any depth for at least one day. Since larval fish can potentially use any area of the floodplain as long as there is some water on it, there were no hydrologic restrictions used to delineate rearing habitat. By delineating fish habitat based on rearing instead of

spawning criteria, the model over-compensates impacts to fish because it looks at the most conservative criteria (potential larval-use habitat) that resulted in the maximum number of impacted acres for the project. See, Tables 9 and 11, 2002 RSEIS at G-19 and G-21.

This RSEIS 2 remedies the inconsistency in how habitat units were expressed for compensatory mitigation measures. As the RSEIS 2 demonstrates, all significant unavoidable impacts to fish and wildlife resources can be compensated by implementing various mitigation techniques as outlined in the document. These techniques are based on relevant science and an understanding of the project area. This understanding is not confined to the Corps since the development of the fisheries model used to quantify impacts and calculate potential mitigation was coordinated with an interdisciplinary team of scientists who were familiar with the project area.

Sparks Comment 3:

I. CHANGES TO THE MITIGATION PLAN

The 2005 Draft RSEIS2 fixes the basic mathematical problem associated with the prior proposed fish mitigation. It recognizes that the Corps is required, if it wishes to use reforestation as a mitigation technique for fish, to provide 8,375 average daily flooded acres not just 8,375 actual acres that may not be flooded and accessible to fish in a given year. That similarly means the Corps is required to provide a certain number of habitat units as a daily average not merely as a total. How many average daily flooded acres or how many fish habitat units a mitigation site provides depends on how often it floods. For example, a mitigation sites flooded only 5% of the mid-season only provides 5% of average daily flooded acres, and only 5% of the average daily habitat units. Having corrected this result mathematically, the Corps now reports that the mitigation it proposes through reforestation alone would provide an insufficient number of fish habitat units.

Sparks Response 3: The calculations provided in the RSEIS 2 concerning compensatory mitigation for mid-season fish rearing habitat are clearly presented and follow methodology consistent with the project impact calculations. The Corps is committed to compensating for impacts to habitat (appropriately expressed as FCU, AAHU, DUD: please see Table 2.2 and Table 2.7 in the RSEIS 2 and appropriate descriptions that were used to describe impacts in previous NEPA reports) not to providing a certain quantity of acres, average daily flooded acres, or daily flooded acres. The number of mid-season fish rearing habitat units a mitigation site provides is based on habitat quality (HSI) and quantity (ADFA). The comment refers to "average daily habitat units." This is not a unit of measure defined or used in the RSEIS 2. It appears, therefore, this comment confuses the defined terms.

Sparks Comment 4:

According to each of the four different mitigation scenarios now actively contemplated, reforestation of 2,326 acres in the New Madrid Floodway would still be part of so-called base mitigation (RSEIS2 at 118), but it would only

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provide around 2% of the required fish mitigation habitat units according to the Corps' analysis (basic mitigation provides 51 mid-season fish habitat units out of 2,246 to 2,469, depending on scenario, RSEIS2 at 117, Table 5.7). These mitigation sites provide little fish habitat in part because these mitigation sites are rarely flooded. Reforestation sites in the St. Johns Basin would flood more frequently and therefore provide a little more habitat value, according to the Corps, but they would still provide only 15% of the mid-season fish rearing habitat units (281 out of 1,884 required, Table 5.6, page 116).

To make up the deficiency, the Corps now proposes to obtain between 93% and 98% of its mid-season fish mitigation by artificially and unnaturally extending the flooding on a limited number of acres (between 1,854 and 2,430 acres, depending on the scenario, Table 5.7, page 117 RSEIS2). Every year, these acres would be flooded every day during the 45-day mid-season (Table 5.7, page 117 RSEIS2).

The Corps would accomplish this by closing gates to the Floodway and/or St. Johns Basin after they flood, when water would otherwise be running out of the floodplain during the mid-season rearing period for fish (April 1st to May 15th). In two of the four scenarios, the Corps would also build a levee or weir to block water from receding after flooding 430 to 700 acres of cropland outside the levees in a backwater area known as Riley Lake.

All of these sites that would be permanently flooded already provide fish habitat whenever they are flooded by the Mississippi River. The premise behind this mitigation is that this artificial flooding will dramatically increase the fish habitat value of each acre. For example, the unnaturally extended flooding in the New Madrid Floodway would, according to the Corps, increase the habitat value of these acres by 2.7 to 4 times, compared to the habitat value for the same acres in the plan (Alternative 3-1B) originally recommended in the 2002 RSEIS.[1]

Sparks Comment 4 (continued):

[1] The method for calculating the increase in fish habitat is described in § 5.4.3.5.1 on page 115 of the RSEIS2 and the results are shown for the New Madrid Floodway in Table 5.5 at page 116. The text on page 115 states that gate operations will "provide 1 ADFA (average daily flooded acre) for every 1 acre of pooled habitat behind the structure." For this to be true, all acres must be flooded all 45 days of the mid-season every single year. It also states that habitat scores (so-called 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." In other words, by keeping these acres flooded all 45 days during the mid-season, the RSEIS2 assumes that it can assign these acres the habitat value of permanent water bodies, which the RSEIS2 further assumes are the score of oxbow lakes in the original fish model. The mathematical calculation presented here for the New Madrid Floodway follow these assumptions.

Sparks Response 4: Conservative estimates (*e.g.*, assignment of low estimates of flood duration during the mid-season fish rearing period) of the number of mid-season fish rearing AAHUs provided by reforestation have been made throughout the RSEIS 2. It is likely that sites will provide a greater amount of AAHUs than what is stated in the RSEIS 2. Actual gains in habitat will be calculated during the development of site-specific detailed mitigation plans and verified through monitoring.

The reference location and the percentage and quantity of mid-season fish rearing habitat provided by the St. Johns Bayou Basin through reforestation is incorrect. Reforestation of 1,293 acres of cropland in the St. Johns Bayou Basin is estimated to provide 312 AAHUs, which is 17% of the required mitigation for mid-season fish rearing impacts in the St. Johns Bayou Basin. The information is provided in Table 2.7 of the RSEIS 2.

The RSEIS 2 utilizes a variety of techniques to compensate for significant impacts of the flood damage reduction project. The mitigation plan includes restoration of bottomland hardwoods, restoration of hydrology to Big Oak Tree State Park, construction of borrow pits, construction of moist soil units, and additional techniques that restore/create Permanent Waterbody habitat or increase flood durations during the mid-season fish rearing period.

Regarding the reference to 2,246 AAHUs as provided in Table 5.7 of the Draft RSEIS 2, the draft document provided an incorrect value. The correct number should be 2,505 AAHUs as presented in Table 2.7 of the Draft RSEIS 2. The Final RSEIS 2 has been revised to reflect this correction.

As previously stated in numerous locations in the 2000 FSEIS, the 2002 RSEIS, and this RSEIS 2, nothing is natural about existing hydrology in the project area. It has been manipulated due to wide scale clearing, draining, channelization, and levee construction (RSEIS 2 Figures 5 through 17). The existing backwater flooding condition in the New Madrid Floodway exists only because of the construction of the levee system. While some historical Mississippi River backwater flooding existed into the mouth of St. Johns Bayou, the historical flooding of the area prior to the construction of levees was due to headwater flooding.

Additionally, 85% of the project area is agricultural lands (See RSEIS 2 Table 3.1 and 3.2). Clearing historical bottomland hardwood habitat has further degraded the existing hydrology in the area by the construction of extensive drainage features to promote agriculture. These hydrologic manipulations and the construction of the Mississippi River Levee System have altered hydrology in remaining high quality habitat areas such as Big Oak Tree State Park. Big Oak Tree State Park is experiencing an altered hydrologic regime that has led to the regeneration of species that prefer drier as compared to historical habitat. The hydrology restoration aspects of this project will preserve and restore historical habitat.

The use of the phrase "artificially and unnaturally extending the flooding," implies that a "real and natural flood condition" presently exists. It does not. However, to maximize the aquatic habitat value of the area, the RSEIS 2 proposes creation of a flood regime that will increase the chances of successful fish rearing. Without the project there is a higher probability that premature dewatering will strand eggs and larvae. The spawning and rearing pool will provide significant mid-season fish rearing habitat throughout the entire mid-season rearing period.

Restoration of Riley Lake is intended to restore the lake elevation to historical conditions. Restoring floodplain lakes to historical levels results in significant gains to mid-season fish rearing habitat.

Regarding footnote #1, there is a misinterpretation concerning the analysis. The quote "provide 1 ADFA (average daily flooded acre) for every 1 [acre] of pooled habitat behind the structure" is incomplete. The complete sentence from Section 5.4.3.5.1 of the RSEIS 2 reads: "Continuous duration, therefore, will provide 1 ADFA for every 1 acre of pooled habitat behind the structure." The RSEIS 2 utilized EnviroFish to calculate mitigation benefits from modifying the gate operation to create a spawning and rearing pool at various elevations. The same period of record data that was used to quantify impacts of the flood damage reduction project was used in the current analysis. As can be seen in Table 2.5 of the RSEIS 2 creating a spawning and rearing pool at an elevation of 284.4 feet NGVD in the New Madrid Floodway provides 1,531 ADFAs. The actual acreage at and below an elevation of 284.4 feet NGVD is about 2,000 acres. If the assumption had been made that the entire sump would be flooded for the entire 45 day mid-season fish rearing period in every year, then the ADFAs reported in Table 2.5 would be 2,000.

Sparks Comment 5:

According to the Corps, this artificially prolonged flooding provides a large increase in fish habitat for two reasons. First, the structures and operations of the gates will extend flooding somewhat longer, depending on the scenario, from around 50% longer to 10% longer on average during the mid-season. That would, under the Corps' model, increase the amount of fish habitat by increasing the number of average daily flooded acres (2005 RSEIS2 at 116). But even more significantly, by flooding these areas every day (all 45 days) during the mid-season, the Corps claims these areas are thereby transformed from floodplains into "permanent lakes." According to the Corps fish model, floodplain lakes that are truly flooded year-round regardless of water from the river, have dramatically greater habitat value for rearing fish in mid-season than even flooded forests. In the New Madrid Floodway, for example, creating a lake, according to the model, provides 5.9 times as much additional habitat.[2] The enormous added value claimed by the Corps comes from multiplying these two benefits – longer flooding and the alleged transformation in the kind of habitat by doing so. In short, by extending the flooding artificially, the Corps not only claims more habitat days, but also much more valuable habitat.

There are a number of fundamental flaws with these claims, both from the standpoint of logical consistency with the fish habitat model and from the standpoint of basic biology.

[2] According to the Corps fish model, reforesting an acre of flooded cropland in the New Madrid Floodway (or outside the levees) provides an extra .33 habitat units for each day flooded. For example, see 2005 RSEIS2, p. 70, Table 4.3. The cumulative score for three evaluation species (smallmouth buffalo, white crappie and freshwater drum) goes from .37 to .70, an increase of .33. By contrast, turning such land into a a large permanent lake would increase habitat value by 1.83 units -- the cumulative score goes from .37 to 2.20, an increase of 5.9 times (Ibid.). The original Corps fish model has the same numbers but labels the larger score "permanent oxbow lakes" (2002 RSEIS at G-13). Thus, creating a "permanent oxbow lake" from cropland provides nearly six times as much habitat value per acre for each day flooded, according to the Corps, and under the new RSEIS2, the same would be true simply by extending flooding during the mid-season to 45 days even though those acres would dry up subsequently and thus are not actually permanent.

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Sparks Response 5: Creation of a spawning and rearing pool provides a greater number of ADFAs by providing Permanent Waterbody habitat during the mid-season fish rearing period. The period of flooding is a critical point in establishing impacts of the flood damage reduction project. The methodology used to evaluate impacts in the project area focused on mid-season spawning and rearing, which encompasses 45 days from April 1 to May 15 (2002 RSEIS Appendix L Section 8.2).

The comment (and many subsequent comments) suggests that a "lake" will be created, but this is only one of several kinds of permanent waterbody on the Mississippi River floodplain. Lakes are permanent waterbodies but not all permanent waterbodies are lakes.

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 spawning and rearing 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 that are useful for floodplain fish
3. Reduced occurrence of rapid decreases in water levels as floods recede 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 *a* 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 and a commensurately high HSI index. 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. The portions of the waterbodies that are remote from the river are flooded later for shorter durations and flooded 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 of these transiently flooded lands 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 created by the modified gate operation 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).

Sparks Comment 6:

II. REASONS THE NEW MITIGATION WOULD NOT OFFSET EVEN MIDSEASON FISH HABITAT

1. The Corps Mitigation Would Bar Fish Access

Habitat is only useful to fish if they have access to it, and the greatest flaw in the Corps' mitigation proposal is that the gates into the New Madrid Floodway will be closed much of the time during the spawning and rearing season. Under the Corps' plans, gates to the Floodway must be closed whenever water would extend beyond the sump area (284.4 feet NGVD in elevation). When the river stage exceeds 284.4 feet, the gates must be closed. When the river stage is low enough for water to recede from the Floodway, the Corps claims in the RSEIS2 that fish could move through the culverts (fighting the current) to access the Floodway. But under the Corps' new proposal, the gates would be closed to keep water in the sump area. In other words, under this new proposal, the gates will be closed when water would otherwise be above the sump area (284.4 feet) and also when water drops below that level for the entire duration of the mid-season. The Corps proposes five alternative water levels, which would require gate closures whenever the river was lower than the target water level: 284.4 (the maximum level, at which water begins to extend beyond the sump area); 283.4; 283; 282; and a combination of 284.4 from April 1 to April 30 and 283.4 from May 1 to May 15 (pages 116-117, Tables 5.5 and 5.7, RSEIS2).

Sparks Response 6: Fish will have ample opportunities to access the Floodway prior to and during the reproductive season (See RSEIS Section 5.4.3.5). The comment does not take into account the variety of habitat preferences of fish in selecting areas for reproduction. There are over 100 species of fish that can potentially utilize Mississippi River floodplains for spawning and rearing (See 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 gates 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 (i.e., stages that rise and fall over the season). 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 during or after the mid-season fish rearing period. Therefore, adult and young of the year fish will be able to access the mainstem river. Best Management Practices (BMP) for gate operation will be developed to maximize access during the entire reproductive period of fishes.

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 (See 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 modifies the gate operations to maintain water levels throughout the mid-season fish rearing period. This action provides significant spawning and rearing habitat for fish that have accessed the Floodway prior to gate closure. Depending on river stages, gates will be opened during or after the reproductive season to allow for dispersal into the Mississippi River. This modified gate operation converts a transient habitat into a Permanent Waterbody. See Sparks Response 5.

Fish do not necessarily "fight the current" during spawning movements. 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 swift water 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). See RSEIS 2 Section 4.3.2.1.

Sparks Comment 7:

> What this means is that in a year when the entire sump area (up to 284.4 feet) could actually be flooded for the entire mid-season, the gates will be closed the entire mid-season. According to analysis by Dr. Curtis Bohlen of Corps data, that would occur in 18 of the 32 seasons analyzed. These are precisely the years when the sump area could be flooded all 45 days – precisely the years when the conditions would exist that according to the Corps transform these areas into the equivalent of permanent lakes. In other words, in any year in which the project area would naturally be the equivalent of a permanent lake, according to the Corps, the gates would never be open to allow fish access during the actual midseason. Even if fish can and will move through the culverts that will be constructed in the New Madrid levee (and I have earlier testified that the box culverts may restrict access), they obviously cannot do so when the culverts are closed.

Response 7: The comment assumes that access is required during, and only during, the entire 45-day rearing period, but this is not a valid assumption. 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 (2002 RSEIS Table 2.1). The potential to be open means that there would be no flood damage reduction rationale to close the gates when the river stage was below those elevations. A histogram is provided as RSEIS 2 Appendix F, Attachment 3 that illustrates periods when the outlet gates have the potential to be open. See RSEIS 2 Section 5.4.3.5.

Therefore, fish will have ample opportunities to access the area prior to and during the reproductive season. Intermittent access is a naturally occurring hydrologic characteristic of large floodplains with a pulsed hydrograph. Consequently, 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. The creation of a spawning and rearing pool will provide significant mid-season fish rearing habitat even though the closure will limit access during certain river stages.

With the exception of borrow pits and restoration of a floodplain lake such as Riley Lake, the mitigation strategy does not propose to transform areas into lakes. The modified gate operation creates a spawning and rearing pool by transforming an area made up of mostly farmland into Permanent Waterbody habitat. Please see Sparks Response 5.

As part of the management of 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) 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 providing stable sump elevations to ensure successful rearing.

Sparks Comment 8:

> If the gates are not open during the mid-season, then the opportunity for the mid-season spawners to utilize the habitat is lost for that year. To my knowledge, it is universally accepted among Mississippi River fish biologists that the majority of fish that spawn or rear in floodplains will only seek to move into those floodplains when the river is in flood during their reproductive season. In other words, fish that use the floodplain during the so-called mid-season, will generally seek access to the floodplain when flooding occurs during the mid-season. The ripening of the gonads of the fish and the urge to migrate and spawn are stimulated by rising water temperatures (and in some species, probably also by increasing day length). Once the fish are ready to move and spawn, the final trigger is the rising water, which makes it possible for the fish to enter the floodplain. The mid-season spawners are usually ready around 1 April. A few fish may occasionally seek to move into the floodplain at other times, but not the bulk of fish. Therefore, even if the gates were opened to the river at other times of the year (other than mid-season), the mid-season spawners would not move from the river into the New Madrid Floodway to spawn at an inappropriate time.

Sparks Response 8: The comment accurately notes the three main triggers for fish reproduction (flood pulse, temperature, and daylight length). However, there are over 100 species of fish in the Mississippi River and floodplain, each exhibiting different responses to these triggers. For example, backwater or wetland fishes (such as golden topminnow or pirate perch) respond primarily to water temperature to initiate spawning (Hoover and Killgore, 1998). Conversely, facultative floodplain spawners that are mostly riverine during the non-spawning period, such as buffalo, likely respond to all three triggers to initiate spawning (Johnson 1963; Burr and Heidinger 1983). Therefore, the comment "that the majority of fish that spawn or rear in floodplains will only seek to move into those floodplains when the river is in flood during their reproductive season" does not take into account the variation in response to reproductive triggers by different species. This is precisely the reason the interagency mitigation team developed reproductive guilds to identify different types of spawning and rearing behavior in the analysis of impacts and mitigation. Typically temperature is the primary cue that will

influence spawning and will be enhanced by the management of the Permanent Waterbody. See also Sparks Response 6.

Sparks Comment 9:

According to the analysis by Dr. Bohlen of the Corps data set forth in Appendix C to the 2002 RSEIS, there are some years when flooding cannot occur

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all 45 days during the mid-season even with the proposed gates. In these years, fish will only have access during the mid-season as water levels rise and before they exceed the sump area. But once water levels start rising, they approach 284.4 very quickly, so there is relatively little time for fish to enter before the gates must be closed.

There is an inherent trade-off between water level management to hold water in an area and fish access. If levees are built and gates closed to hold water in, then fish cannot gain access. The Corps has provided an extreme proposal in which fish could gain no access at all during the mid-season in the majority of years (which are precisely the years that would otherwise be of alleged greatest value), and only limited access in others.[3]

[3] The RSEIS2 indicates that the Corps may claim fishery habitat credit for Big Oak Tree State Park and/or the shorebird mitigation impoundment if it can determine a way of providing fish access. True fish passage for these sites is even more likely to be limited than for other areas because of the great distance from the Mississippi River of Big Oak Tree State Park and the fact that for the shorebird impoundment to impound water, it must at those times keep water and fish out. All of the problems I have previously raised about passage through culverts apply with particular force to these sites. Of course, a full analysis of the potential fish passage into these areas cannot be made without a detailed explanation of how the Corps would propose to provide such access.

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Sparks Response 9: See Sparks Response 6 and 7 for the discussion of fish passage. See Bohlen Responses 17 and 18 for a discussion on the hydrology.

It is necessary to reiterate that a 2-year frequency flood was used to evaluate hydrology of land use of the floodplain because flooding that occurs every 1-2 years regulates long-term population trends of floodplain fishes. Gates will obviously be closed for floods above the 2-year frequency (elevation 290 feet NGVD). However, these flood events are not necessary for long-term population trends. See RSEIS 2 Section 4.3.1.1.

Although Big Oak Tree State Park is less than one mile from the Mississippi River (RSEIS 2 Figures 1-17) no habitat credit was counted for planning purposes and will not be taken unless monitoring demonstrates fish passage. Additionally, see Section 2.6.1.5

of the RSEIS 2 for a discussion of the likely design of the Big Oak Tree State Park Hydrologic Restoration. Fish passage will be considered in the overall design of the water delivery system that will be necessary to restore the hydrology to Big Oak Tree State Park. Credits to fish mitigation for Big Oak Tree State Park will be calculated only if fish passage is confirmed by monitoring. Additionally, moist soil management areas will be inundated during the spring (and mid-season fish rearing periods) to provide suitable habitat for shorebirds. These areas will be designed to allow for fish access to the extent feasible. Credits to fish mitigation will be calculated if moist soil units provide gains to mid-season fish rearing habitat (See RSEIS 2 Section 2.6.1.2).

Sparks Comment 10:

2. Riley Lake Manipulation Would Create Not only Access But Egress Problems

Under some scenarios, the Corps also proposes to get much of its needed fish habitat by creating, restoring, or enhancing large permanent water bodies. For example, two of the four scenarios in Table 5.7 (p. 117 of RSEIS2) include building a levee or weir along the southern end of Riley Lake, a former floodplain lake that is somewhat silted in and that is now cropped. Once large enough floods have inundated Riley Lake, this levee would keep the water from receding, extending flooding throughout the mid-season according to the Corps.

Unfortunately, for this to work, the levee must also be high enough to block water (and therefore fish) from reaching Riley Lake until it is overtopped since it will not apparently have gates (the RSEIS2 does not mention gates). To provide a net gain of 774 average annual habitat units (AAHU), for example, the weir or levee would have to be high enough to block water from entering the lake until the water level in the river reached 287 feet (Table 5.4, p. 114 RSEIS2). Only if flood levels exceed the height of that weir would water and fish reach the Lake. This means that there are obstacles to fish entry that are not present today.

The same weir is also an obstacle to fish exit. The weir would keep Riley Lake or portions of it flooded while water receded all around the lake – that is its purpose. This means that once water levels in the river recede, Riley Lake becomes isolated, and fish will not be able to leave the lake until the river again rises above a level of 287 feet. That is a problem compared to existing conditions, and becomes an even greater problem because, as I describe below, Riley Lake appears unlikely to be able to support fish year round until the next flood.

The restricted fish entry and exit means that the Corps proposal would decrease the capacity of Riley Lake to produce fish that contribute to Mississippi River populations.

Sparks Response 10: Local interests excavated the outlet channel of Riley Lake in the past to drain the lake and promote agricultural production in the area resulting in a degraded habitat. Restoration of Riley Lake is intended to restore the lake to historical conditions, in particular, historical surface elevations and habitat.

The RSEIS 2 describes the construction of a low level weir across the existing outlet located in the northern (downstream) end, not the southern (upstream) end as stated in the comment. The elevation of the Mississippi River will have to exceed the height of the weir for fish to access the restored Riley Lake. All weir elevations presented in the RSEIS 2 are several feet below the two-year flood frequency, and therefore there will be connection with the Mississippi River in most years. A pulsed hydrograph will provide numerous opportunities for fish access between the lake and the Mississippi River throughout the winter and spring. Please refer to Bohlen Response 12.

Naturally-occurring permanent waterbodies in the lower Mississippi River floodplain typically have varying periods of connectivity due to a pulsed hydrograph. Once the waterbody is disconnected, larval fish and other aquatic organisms benefit from conditions that support higher productivity due to elevated water temperatures compared to the river (*e.g.*, abundance of zooplankton, which is the primary food source for larval fishes), and stable water levels that would normally drop in temporarily flooded areas (as opposed to permanent waterbodies), enhancing survival of young fishes.

The comment provides no evidence to support the assumption that a restored Riley Lake will not support fish. It is highly likely that a restored Riley Lake will support fish throughout the entire year. The greater surface area and water depths will increase productivity and provide significant mid-season fish rearing habitat and thus, contribute to Mississippi River populations. See SCI Response 4 and 5. Additionally see Sparks Response 19.

Sparks Comment 11:

3. The Corps Proposal Would Not Actually Create Continuous Mid-season Inundation

The Corps mitigation assumes that the manipulated areas could be kept continuously wet during the mid-season, i.e., flooded from April 1st to May 15th every year. But the Corps' pumps only pump water out, not in, and to keep water in the sump area, it must first be flooded, and that flooding must first occur from the natural rise of the Mississippi River (sufficient water apparently does not come from within the Floodway itself). The Corps analyzed when this flooding will occur in the 2002 RSEIS, Appendix C. In many years, flooding of the sump area does not occur until well after April 1st, and in many years, flooding of the full sump area never occurs. For example, according to analysis of these data by Dr. Bohlen, flooding will never occur throughout the sump area in 5 of the 32 years analyzed, or roughly 14%, and will hardly occur at all in 3 of the 32 years analyzed, roughly 10%. In only 18 of 32 years could the Corps' proposed closure of the gates keep the sump area flooded for all 45 days (which, as noted above, are also the years without fish access during the mid-season). And in five years, this flooding would already occur under current conditions, so the Corps would only add 13 years.

The Corps fish mitigation analysis is therefore factually wrong and dramatically overstates added mitigation in at least two ways.

First, the Corps has miscalculated the gain in average daily flooded acres from gate manipulation. It assumes flooding for all 45 days every year, when in fact, average flooding would be significantly less.

Second, the Corps' claim that these acres qualify as permanent lake habitat because they are flooded for all 45 days <u>every year</u>, is simply not true.

Third, to the extent the Corps claims that these acres qualify as permanent lake if they are flooded for all 45 days in any single year, the Corps overstates that number of years significantly. Moreover, since these areas would be flooded all

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45 days under current conditions during several of these years, the Corps cannot claim mitigation benefits in those years.

Sparks Response 11: The Corps did not assume that the spawning and rearing pool would be kept continuously wet during the mid-season every year. Compensatory mitigation benefits that a spawning and rearing pool provides are calculated in the same manner that impacts were quantified.

The output of EnviroFish is an average condition and does not assume the target pool is flooded the entire mid-season period every year. Gains in ADFAs that the spawning and rearing pool provide utilizes the same methodology that was used to describe impacts (See RSEIS 2 Table 2.5). This approach considers average conditions based on years of hydrographic data. Average conditions are more appropriate for long-term mitigation planning than single events that skew interpretation of flood requirements. See Bohlen Response 9.

As previously stated in Sparks Responses 6 and 7 above, the gates do not have to remain open during the entire 45-day mid-season rearing period. There are numerous opportunities for fish to access the area prior to and during the mid-season period.

Concerning the first statement, the ADFAs for the spawning and rearing pool were calculated correctly. Please see Sparks Response 4. Additionally, Mississippi River backwater flooding will inundate the sump area up to an elevation of 284.4 feet NGVD and, depending on the river stage and headwater amount, the pool will be maintained throughout the mid-season fish rearing period. This will occur from gate operation, interior drainage, and precipitation. Pumps will be necessary to evacuate interior drainage when the Mississippi River is above an elevation of 284.4 feet NGVD. Pumps will not be necessary to maintain the minimum spawning and rearing pool elevation.

Concerning the second statement, the habitat provided by the creation of a spawning and rearing pool is correctly classified as a Permanent Waterbody. Please see response 5 above for the definition of a permanent waterbody in the context of this project.

Concerning the third statement, the Corps did not overstate any figures and mitigation benefits were calculated properly. Mitigation benefits were calculated by subtracting post-project/pre-mitigation conditions from post-project/mitigated conditions (See RSEIS 2, Section 2.3.4, Section 2.6.2.5, and Section 5.4.3.5). Additionally, see Bohlen Response 14.

Sparks Comment 12:

4. Flooding Throughout the Mid-Season Does Not Transform Seasonally Flooded Lands into Permanent Lakes

The critical premise behind the Corps' new mitigation is that keeping acres of fallow land flooded all 45 days during the mid-season effectively transforms these seasonally flooded lands into a permanent water body from the standpoint of fish. True, permanent water bodies, as the name indicates, hold water year round and can serve many other functions besides providing mid-season spawning and rearing habitat. For example, many species of fishes overwinter in permanent water bodies where they do not have to spend metabolic energy swimming against a current at a time of year when food may be relatively scarce and their rates of digestion low. Permanent water bodies may have entirely different soil chemistry and soil structure from seasonally flooded lands. For example, the sediment deposits in permanent lakes may be soft and easily resuspended by wind-driven waves whereas floodplain soils have a chance to dry out and compact and are therefore less easily resuspended during seasonal flooding. Depending on soil type, and the size and orientation (in relation to direction of prevailing winds) of the lake basin, a permanent lake may be relatively clear and therefore have submersed aquatic vegetation, or it may be a turbid "desert" where wind-driven waves repeatedly stir up bottom sediments and prevent light from penetrating the water. These pronounced physical differences in turn govern water and soil chemistry (dissolved oxygen levels, for example), which influence the plankton and the bottom-dwelling worms, mollusks, and aquatic insects, which in turn provide the food for fishes. Permanent lakes also have permanent aquatic residents, including the fishes themselves and the mollusks and other benthic organisms the fishes may feed upon. The resident fishes may compete for nest sites and food with the transients that enter from the river. In contrast, seasonally flooded lands do not have permanent aquatic residents that may compete with new arrivals. It is clear that flooding for 45 days, from 1 April to 15 May, does not create the soil and water chemistry, the plant community, the plankton and benthic communities, nor the fish communities characteristic of permanent lakes.

Sparks Response 12: The premise for this comment appears to be that the Corps equates what it has defined for fisheries model purposes as a permanent waterbody with a lake, which the comment defines as an area that remains flooded for 365 days in every year. On the contrary, the model was designed only to evaluate spawning and rearing habitat for fishes during the spring, not during other seasons of the year and to make valid comparisons of those values pre- and post-project. Therefore, the term "Permanent" is applicable to a specific time period and is characterized by continuous flooding rather than intermittent or temporary flooding.

Impacts to mid-season rearing habitat were analyzed for each land cover type including fallow, cropland, bottomland hardwood, large permanent waterbody, and small

permanent waterbody. The mitigation analysis for the spawning and rearing pool intended to compare and contrast, for example, potential habitat gains associated with the habitat value of occasionally flooded agricultural land with values associated with areas that tend to be continuously flooded during the defined spawning and rearing period each spring. See Response 5 (comparing the attributes of permanent waterbodies with those of transient flooding). Nothing about the additional habitat values that may (or may not) be provided by various kinds of 365 day "lake" habitat invalidates that comparison.

The Corps does not question that lakes (that exhibit 365 day fish habitat) may provide additional benefits, some of which are listed in the comment. The fact that these additional benefits may be associated with such lakes does not, however, invalidate the quantification of spawning and rearing habitat used to evaluate project impacts and mitigation. Similarly, the proposed amendments to the hydrologic regime at Riley Lake may well provide some or all of the additional benefits mentioned in this comment. No "credit" for those additional benefits was taken because they are considered to be already included in the calculation of benefits for Permanent Waterbodies.

The comment treats the term permanent waterbody as being synonymous with lake. A lake is only one type of permanent waterbody. Please see Sparks Response 5, which provides a definition of a permanent waterbody. There has never been a contention that any permanent waterbody proposed to provide mitigation benefits in the RSEIS 2 is a lake. The Permanent Waterbody provides a spawning and rearing pool during the critical 45-day mid-season period.

Sparks Comment 13:

This is true not only as a matter of biological fact but also as a matter of methodology. The Corps fish model relied heavily on the professional opinion of a small team of fish biologists that included Jane Ledwin at the U.S. & Wildlife Service and Mark Boone of the Missouri Department of Natural Resources. Habitat scores were based on a kind of averaging of this professional opinion. Consistent with this methodology, the Corps cannot after the fact assign one kind of habitat a different value than assigned by the Fisheries Technical Group. I have spoken to Jane Ledwin, for example, and she does not agree that flooding for 45

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days during the midseason makes acres equivalent to a permanent water body (telephone conversation 26 January 2006).

Sparks Response 13: As explained in Sparks Response 12, the Corps does not maintain a 45-day flood duration provides all the benefits of a 365-day lake (referred to in Comment 12 as both a "permanent waterbody" and a "permanent lake"). Presuming that this understanding was conveyed to USFWS biologist Jane Ledwin, we would concur with the answer attributed to her. However, as also explained in the previous response,

that fact does not affect the validity of the Corps' conclusions concerning the effectiveness of the mitigation for fish spawning and rearing impacts associated with the project. Please see Section 4.3.2.4 of the RSEIS 2 and response to Sparks Response 5.

Sparks Comment 14:

> One example proves the flaw with the Corps assumption even as a matter of logic. Under current conditions, the same sump areas that the Corps proposes to manipulate in the New Madrid Floodway already floods all 45 days during the mid-season in 5 out of 32 years according to Corps data analyzed by Dr. Bohlen. For the Corps mitigation analysis to be valid, this habitat in these same years would provide six times the habitat value because of extended flooding even though the Corps would not actually extend the flooding one day in those years. These acres of habitat are already provided by nature, not by the Corps, and should not be credited toward mitigation. In addition, under current conditions, there are extensive parts of the floodplain beyond the sump area that are now flooded all 45 days in some years but that would not be flooded under the proposed project. The Corps fish model calculated the loss of this habitat based on their cropland or forest value, not on their value as permanent lakes. If the Corps truly believed that 45-day flooding converts acres to permanent lakes, it would have analyzed these losses in the same way. It is axiomatic that for mitigation to work, mitigation sites and impact sites must be evaluated using the same methodology.

Sparks Response 14: The comment misinterprets the HEP analysis. The comment suggests that the analysis has taken a pre-project condition as a mitigation credit. That is not the case. In fact, the model begins by measuring the impact of the project on existing conditions -- in this case, the loss of flooding in the sump area. It is this calculation that is used to establish the scope of mitigation (See RSEIS 2, Section 4.3.1). As it happens in this instance, the approach is to mitigate by reflooding an area that physically overlaps an area that was flooded in the pre-project condition.

Mitigation credit, however, depends not on this physical overlap, but on the mitigation acres that will be provided and their associated HSI value. In this instance, transient flooding (the pre-project condition) will be replaced by a spawning and rearing pool that differs both quantitatively (ADFAs) and qualitatively (HSI value) from the pre-project condition. (Habitat Gains = AAHUs per tract with mitigation – AAHUs per tract without mitigation, see RSEIS 2, Section 2.3.4) Gate operations will be used to retain more water in the sump, providing more ADFAs. Further, this will prevent periodic dewatering of the area, giving the area the characteristics of a permanent waterbody as described in Sparks Response 5. There is no false credit for mitigation in the post-project condition as the commenter appears to believe (see RSEIS 2 Table 5.5; Response to Bohlen 14).

Sparks Comment 15:

III. REASONS THE PROPOSED MITIGAITON DOES NOT MEET THE REQUIREMENT OF THE FISH MODEL TO OFFSET EARLY AND LATE SEASON HABITAT

A fundamental flaw with the new proposed mitigation that would extend flooding on some areas during the mid-season is that it does nothing to offset habitat loss for early and late-season fish. This means that the mitigation proposed does not meet the requirements of the fish mitigation model.

Fish use the project area from late winter to early summer, with different fish generally using the floodplain at different periods. The project area provides important habitat all these times. The Corps' fish analysis decided to segregate for analytical purposes fish habitat into three seasons, early (March 1st to March 31st), middle (April 1st to May 15th), and late (May 16 through June 30). The project area today provides extensive habitat for fish in all seasons, and in fact, provides almost the same number of acres for fish rearing in the early season (5,433.7) as mid-season (5,613) (2002 RSEIS at G-21, Table 11). Measured by fish habitat units, the project area provides significantly more rearing habitat during the early season than mid-season (4,719 versus 2,999). Ibid. The project would cause more than a 90% loss of habitat measured either way. Ibid.

The Corps has consistently acknowledged its obligation to offset habitat in all seasons. It has focused on replicating mid-season rearing habitat only on the

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Sparks Comment 15 (continued):

theory that the mitigation it would undertake to do so would also offset early and late season habitat. In my 2003 Declaration submitted to the Corps, I explained that this was not necessarily true, depending on the nature and hydrology of mitigation sites, and the Corps needed to analyze specific mitigation to assure that this was in fact true.

The new proposed mitigation greatly exacerbates this problem. None of the four analyzed mitigation scenarios would provide more than minimal early or late season habitat as measured by the model even under the theories now advanced by the Corps.

The obvious, primary reason is that artificially extending flooding during the midseason does nothing to extend flooding or increase habitat in any way during the early and late seasons. It therefore does nothing to provide fish habitat to early and late season fish as measured by the Corps' own model. Since almost all the actual fish mitigation now proposed is supposed to come from this kind of artificial flooding in the mid-season, it follows that there is almost no mitigation for early and late season fish.

It should be acknowledged that the present plan includes a base mitigation that includes roughly 6,000 acres of reforestation. But these reforestation acres cannot provide much early or late season mitigation for the same reason they provide minimal mid-season mitigation: they are only rarely wet.[4]

Even more fundamentally, the fish model uses different fish to evaluate habitat values in the early and late season than in the mid-season. According to this model, simply reforesting flooded cropland or even converting that cropland to lakes provides no additional habitat value for the early season fish used for the New Madrid Floodway. According to the fish model, flooded cropland provides equally good or better habitat for the evaluation fish (white bass) for that purpose. Thus, the proposed reforestation does not address fish mitigation at all for rearing habitat in the New Madrid Floodway. The only way to provide this habitat would be to restore flooding to presently dry areas, which is not proposed.[5]

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[4] The 2005 RSEIS2 at 104 states that typical mitigation tracts identified in the New Madrid Floodway would flood an average of 6% during the mid-season. There is no reason to believe they would be flooded much more extensively during the early or late-season, which under natural conditions, produce roughly the same number of average daily flooded acres per actual acre in the project area during the early season as the mid-season.

[5] According to the pure math of the model, extending flooding during the early season could also provide more habitat units in the early season, putting all other problems with this approach aside, but not as now calculated by the Corps for the mid-season. For example, if the Corps were to extend flooding from one third of the early season to the whole early season, it would increase the number of average daily flooded acres but these acres would not gain any value for additional quality because permanent water

Sparks Comment 15 (continued):

> If the Corps were to propose to artificially prolong flooding in the early and late seasons as well, that approach would be subject to all the same kinds of problems discussed above for the mid-season. Moreover, this approach would have the effect of further constricting fish access because gates would be closed more often. In other words, even if the occasional mid-season fish might be induced to try to access the Floodway during an early season flood, closed gates in the early season would make that impossible.

Sparks Response 15: The Corps agrees that the floodplain can offer habitat for different guilds of fishes from late winter to early summer. However, the Floodway does not provide habitat continuously during this time. Water is critical for fish survival (*i.e.,* fish cannot live out of water). It is an extremely rare event for the Floodway to remain inundated for the entire late winter to early summer period. For example, in some years the Mississippi River experiences an early (*e.g.,* February – March) rise (such as 1949 and 1971), in other years the Mississippi River experiences a late (*e.g.,* May – June) rise (such as 1958), and in additional years the Mississippi River experiences a rapid rise and fall in the early, mid, and late periods (such as 1957 and 1968) (See 2002 RSEIS Appendix C, Plates 65 to 87). In most years, flooding occurs during the mid-season. On average, over the period of record, the mid-season period (April 1 – May 15) provides the greatest amount of habitat for floodplain fishes.

Envirofish and HEP quantified existing habitat conditions in each time period to determine the most significant impacts of the flood damage reduction project and calculate appropriate mitigation. Different numbers and kinds of evaluation species were used to quantify impacts. Therefore it is not appropriate to compare habitat units from the early season with the mid-season.

The commenter cites information from the RSEIS 2 Appendix G, Table 11. This table presents the existing condition, the authorized condition, and the avoid and minimize condition (3-1.A), not the recommended plan. Table 13 is the appropriate location to view the impacts of the recommended plan (Alternative 3-1.B). However, impacts described in Table 13 were only quantified for the mid-season period. Therefore, the Corps cannot determine how the commenter made the statement, "[t]he project would cause 90% loss of habitat measured either way." The commenter either used Table 11 that does not reflect the recommended plan, or conducted independent analysis that was not included in the comment.

The Corps has never acknowledged an obligation to offset fish habitat in all seasons. This statement may have been misinterpreted in the past. However, this RSEIS 2, specifically this comment, clarifies there is no obligation to offset fish habitat in all seasons. The RSEIS 2 focused on the mid-season fish rearing period because of the following reasons:

- Mitigation is not based for one particular species or one particular time period, but for the community as a whole. The mid-season period on average represents the period when most species found in the study area spawn. Thus, on average the mid-season is the period when most species are impacted by the flood damage reduction project (See 2002 RSEIS Appendix L, Section 8.2). The Corps originally maintained that spawning is the appropriate resource to mitigate because logic suggests that fish have to spawn successfully prior to rearing. However, the Corps intends to mitigate for rearing impacts because this results in more acres of mitigation (See RSEIS 2 Section 4.3.1.1).

- As agreed by the interagency team, a single reference species (white bass) was used to develop the HSI model to quantify the early season impacts to rearing habitat in the New Madrid Floodway (See 2002 RSEIS Appendix G, Table 3). White bass is an ubiquitous species found throughout the project area and the Lower Mississippi River watershed. Hamilton and Nelson (1984) and Pfleiger (1975) reported that white bass prefer to spawn in running water but will also spawn in lakes and reservoirs. Additionally, they reported that white bass will spawn over silt and mud, but rock, gravel, firm sand substrate, or vegetation is preferred. Silt and mud were assumed to be less than optimum spawning substrates. The Delphi group assigned HSI values for the white bass as follows, agriculture = 1, fallow = 0.75, bottomland hardwoods = 0.5, large permanent waterbodies = 1.0, and small permanent waterbodies = 0.5 (See 2002 RSEIS Appendix G, Table 6). Although agricultural lands received an optimum HSI score due to the observed presence of white bass in the study area, cleared lands in slackwater conditions are not the preferred spawning habitat of white bass

  Therefore, by looking only at one season and utilizing the HEP model that was used to quantify impacts, one could construe that the reforestation of thousands of acres of cropland, as recommended in the current mitigation, would result in additional impacts to early season rearing habitat. Likewise, one could construe that clearing vast acres of bottomland hardwoods and planting soybeans could count as mitigation benefits. The USFWS recognized this issue in their 2000 Coordination Act Report (page 38-39). This report states the following:

  > In addition, according to the HEP model, agricultural fields, rather than forested wetlands, appear to have a higher suitability index for larval white bass, which would derive minimal benefit from reforestation as a compensation measure. Therefore, we believe mid-season habitat losses better reflect habitat changes to a large number of both floodplain and riverine species, and compensation based on those losses would benefit the majority of the fish fauna.

- Mitigation techniques that compensate for mid-season fish rearing impacts will also provide, in part, habitat for fish that spawn and rear during the early and late

periods. Potential mitigation areas that compensate impacts to fish will be located within the two-year floodplain, provide appropriate levels of inundation (rearing habitat requires at least one day duration at any depth - See RSEIS 2, Section 4.3.1.1), and provide fish ingress and egress during portions of the year (this may be accomplished through operation of the gate). Therefore, depending on the timing of river stages, compensation measures will provide habitat during other periods of the year.

Through adaptive management and based on monitoring results, adjustments may be made to some mitigation features. As previously stated in Responses 6 and 7, BMP will be developed that maximize fish access, usage, and project economic benefits during the entire reproductive period of fishes. BMP will be developed during the formulation of detailed mitigation plans and coordinated with the interagency mitigation team. For example, depending on flood forecasts, a BMP may include closing the gates and maintaining stable elevations during an earlier period of the year if the Mississippi River is experiencing an earlier flood. Likewise, a spawning and rearing pool may be maintained during the late season if the Mississippi River does not reach flood stages during the early and mid season. Therefore, on average, creation of a spawning and rearing pool will benefit all seasons of fish reproduction.

Sparks Comment 16:

IV. MATHEMATICAL FLAWS WITH ANALYSIS OF ST. JOHNS BASIN BORROW PITS

In the St. Johns Basin, the Corps proposes to provide five sixths of the needed mid-season habitat (1,571 out of a total of 1,884 habitat units) by constructing 387 acres of borrow pits (2005 RSEIS2 p. 32, 37, 110). These are to be areas excavated to provide material for a levee that the Corps now claims it will grade and otherwise design to provide the equivalent of permanent fish habitat. This proposal has at least the advantage that it will in fact provide permanent water.

Apart from any biological flaws with this approach, the Corps has mathematically miscalculated the benefits to be derived by assuming that these borrow pits will provide habitat every day of the mid-season regardless of whether they are in fact subject to backwater flooding in those days. This assumption contradicts the way habitat impacts were analyzed in the project area. The flaw is explained in the Report of Dr. Bohlen (2006).

Sparks Response 16: With respect to the reference to Dr. Bohlen's report, see Bohlen's comments and responses in their entirety.

Borrow pits provide high quality rearing habitat for a variety of species. Adult fish are attracted to borrow pits because of deep, slack water and abundant forage fishes that often concentrate in these areas (See 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 (Aggus and Ploskey, 1986). Borrow pits meet all of the criteria of a Permanent Waterbody as defined at Sparks Response 5 above. Additionally, borrow pits will be designed to function as lakes as described in Sparks Comment 12. Borrow pits, like all Permanent Waterbody habitat, do not have to be continuously connected. They only have to be periodically connected to the river to provide suitable spawning and rearing habitat.

Borrow pits were always a part of the flood damage reduction project. However, the Corps did not consider this type of mitigation feature earlier for reasons discussed in Section 2.6.1.7 of the RSEIS 2. In the RSEIS 2, the Corps expanded the analysis to include multiple types of mitigation features that will have a greater holistic benefit than just one type of mitigation. Therefore, this RSEIS 2 quantifies the appropriate habitat borrow pit construction provides.

The mitigation benefits that borrow pits provide were calculated properly and are consistent with the methods that were used to quantify impacts to mid-season fish rearing habitat. There is no contradiction as the comment incorrectly states. See Bohlen Responses 20 - 22.

Sparks Comment 17:

V. DEEPER ECOLOGICAL FLAWS WITH THE CORPS PROPOSED MITIGATION

In my earlier Declaration, I described deeper ecological flaws with the Corps' mitigation and its reliance on the fish model. There are a few points worth expanding upon in light of the newly proposed mitigation.

The Corps' fish model is a very simplistic model that essentially is designed to compare habitat according to one variable, the kind of plants on the land. To develop the model, scientists contemplated the different value for different fish of flooded cropland, forest and floodplain lakes assuming all other conditions being equal. The data that went into the model, for example, derived

bodies are not considered more valuable per day flooded than cropland under the Corps model, which uses white bass as the evaluation species for the early season (Table 6 at G-13 in 2002 RSEIS).

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Sparks Comment 17 (continued):

from sampling one floodplain area in the state of Mississippi. Within this area, fish use of habitats with different types of vegetation was assessed during the same flood event. Using this model to compare different kinds of habitats under very different conditions is not legitimate.

That was a problem with the earlier proposed mitigation, which among other things took no account of differences in fish access, but it is an even bigger problem for the new proposals. The Corps is now attempting to use the fish model to compare: (1) habitats flooded under a relatively natural, variable flood regime with habitats where water levels will be maintained as static as possible for at least 45 days during the flood season by operating gates; (2) habitat well removed from the current of the main channel with habitat right next to the main channel in the so-called batture. The model is being extended beyond its applicability.

Sparks Response 17: Models by definition seek to predict results based on particular variables deemed important for evaluating the resource of interest. EnviroFish, is not based on a single variable. The model evaluates hydrology (*e.g.*, 2-year floodplain), hydraulics (depth and duration of flooding), land cover (*i.e.,* type of vegetation), period of the year (*e.g.,* temperature, day length, etc.), and connectivity to the mainstem river to provide a fair basis for delineating functional floodplain habitats (See 2002 RSEIS Appendix C and RSEIS 2 Appendix A). Most scientists would agree that these are the driving variables influencing timing and location of fish spawning and rearing, as selection of those variables by the HEP team confirms.

The data that were used by the interagency team to determine appropriate HSI values that went into the model utilized fish surveys from the study area (Sheehan et al., 1998), surveys from similar Lower Mississippi River floodplains (Killgore and Baker, 1996 and Hoover and Killgore, 1998), surveys and published life history parameters for evaluation species within the State of Missouri (Pflieger, 1975), and surveys and published life history parameters for evaluation species from adjacent states (Robinson and Buchanan, 1988; Etnier and Starnes, 1993), as well as the expertise of the interagency team that is familiar with fish resources within the Lower Mississippi River. Transferability was an important consideration in the planning process since it was known that potential mitigation lands might be located anywhere within the 2-year floodplain of the lower Mississippi River (see 2002 RSEIS Appendix C and RSEIS 2 Appendix A).

No alternative model has been proposed or produced by this or any other of the many commenters on the Corps' NEPA documents. The Corps is not aware of any other model that specifically calculates functional reproductive habitat in large riverine floodplains, and the comment does not provide any recommendations on alternative approaches to impact and mitigation analysis.

Sparks Comment 18:

> The same is true about the general concept to use "permanent water bodies" to replace flooded forest and cropland. In theory, the fish mitigation model permits trade-offs between these different kinds of habitat because it assigns different scores to each. But in the earlier EIS versions for this project, the Corps agreed that it would pursue the use of "permanent water bodies" for mitigation only to offset impacts on existing permanent water bodies. (And when doing so, it proposed to create truly permanent water bodies through excavation.) I agree with this earlier judgment. The reality is oxbow lakes that are seasonally flooded by the river may be quite different habitat from flooded forests and flooded cropland and will consequently support different assemblages of fish for different periods.

Sparks Response 18: The Corps and the USFWS agreed that construction of borrow pits was an appropriate measure to compensate for impacts of reduced inundation to permanent waterbodies from the construction of the flood damage reduction project. The 2002 RSEIS, Appendix L, Section 8.2 states the following:

> USFWS and the Corps agree that the construction of *borrow pits* that are *accessible to river and floodplain fishes* during the spawning/rearing season is an appropriate compensation measure for losses of *seasonally-connected* large and small permanent waterbodies *on the floodplain*.

This RSEIS 2 supplements the earlier NEPA reports and agreements and concludes that the creation or restoration of Permanent Waterbodies, such as a spawning and rearing pool or restoration of a floodplain lake, adequately compensates for fisheries impacts regardless of impacted habitat type (*i.e.,* agricultural, fallow, bottomland hardwoods, permanent waterbodies). The fish HEP model is explicitly designed to facilitate these trades, and within these sorts of habitats. Additionally, reforesting frequently flooded cropland is still an integral part of the overall compensatory mitigation (see RSEIS 2 Table 2.2 and 2.7). Proposed mitigation compensates for all resource categories identified (*e.g.,* wetlands, terrestrial wildlife, shorebirds, waterfowl, mid-season fish rearing).

Sparks Comment 19:

There are specific, additional problems with the proposal to "enhance" Riley Lake to provide mid-season rearing habitat. The Lake currently has a low point (at an elevation of 280 feet) at the northwestern end that serves as the inlet and outlet to the Mississippi River for both water and fish (SCI Engineering Report 26 January 2006 at p. 3). The proposed impoundment structure (weir) will be located south of the natural low point and at a considerably higher elevation of either 286 feet or 288 feet (Scenarios A and C in Table 5.7 at p. 117 in 2005 RSEIS2). After the weir is constructed, water and fish can only be exchanged between the river and the impoundment at these higher elevations. When the river is at lower elevations, the fish do not have access, nor can they leave the impoundment. Once fish are in the impoundment and the flood recedes, the fish and their young-of-the-year are trapped in the impoundment until the next flood that exceeds 286 or 288 feet. In the interim between floods, the SCI report indicates that the water in the impoundment will seep out through permeable soils when the river levels are low, potentially decreasing the acreage of the impoundment from 538 acres at an elevation of 288 feet to 100 acres or less (SCI Engineering Report 26 January 2006 at p. 2). The impoundment is likely to trap organic debris from the river and if the plankton also are as productive as the 2005

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RSEIS2 claims, their oxygen demand at night, coupled with the oxygen demand of decaying organic debris, could deplete the dissolved oxygen levels in the impoundment, killing the fish. Under these conditions, the "enhancements" to Riley Lake make it likely to be a fish death trap, rather than an area that contributes to fish populations in the river.

Sparks Response 19: Although fish mortality due to drawdown in floodplain lakes is a commonplace part of the natural processes operating in the riverine environment, the Corps disagrees with the conclusion presented in this comment. First, data derived from the period of record strongly suggests that the River will rise above the 288 foot level frequently enough to provide regular opportunities of fish ingress and egress from Riley Lake following installation of the proposed weir. As explained in Sparks Response 10, a pulsed hydrograph will provide numerous opportunities for fish to access the lake and disperse into the Mississippi River throughout the winter and spring. For more details pertaining to fish access, see Sparks Response 10.

Second, soil permeability will be investigated during data collection for the purpose of developing a design. If soil borings suggest permeable soils, alternative sites may be selected. For a better understanding of the Riley Lake restoration technique proposed, see RSEIS 2 Sections 2.6.2.3, 5.4.3.3, and Table 5.4. See SCI Responses 4, 5, and 6 for other factors relating to Riley Lake. There is no reason to believe that the project will increase biological oxygen demand (BOD) due to decomposition of organic debris,

plankton respiration, or otherwise. Restoring historic conditions will instead increase the volume of water in the lake and average depth, tending to reduce the probability that the lake will become hypoxic in the summer and fall due to these common processes.

Sparks Comment 20:

> More broadly, fish need to be able to reproduce in a variety of different years – both small and large flood years, for example. Many fish are highly sensitive to temperature and need relatively warm waters to be available in the spring. The warmest parts of the inundated floodplain are likely to be the shallowest parts that are warmed by the sun and not directly connected to the river current. By allowing floodwaters to spread over a very broad area, the project area greatly increases the likelihood that water temperatures will be appropriate in even very large floods. Moreover, shallow habitats during large floods are at a high premium on the lower Mississippi River now because most of those floodplain habitats have been leveed off and drained. The habitat provided in the project area is of particular value because it is rare. Riley Lake and the great majority of other batture lands are unlikely to be able to reproduce these values because of their proximity to the river and the likelihood that river water will flow continuously through these areas during larger floods.[6]
>
> [6] This does not mean that Riley Lake does not now provide valuable fish habitat at these times, but it does mean that it neither now nor under the Corps proposal could provide the exceptionally valuable slack water rearing habitat that is the basis of the Corps's fish analysis at these periods. These periods are a significant quantity of overall flood periods. (For example, by mathematical definition, two thirds of all floods that reach a 2-year level also reach a 3-year level: a 2-year flood occurs 3 times in 6, while a 3-year flood occurs two times in six, which means two out of three 2-year floods are 3-year floods.) For rearing purposes, Riley Lake now probably provides valuable habitat during more modest floods. It is the combination of habitats like Riley Lake that are lower and closer to the main channel of the river with backwater habitats like the project area that is needed to support the Mississippi River fishery.
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Sparks Response 20: It is true that fish will reproduce in both small and large floods. However, large floods do not regulate long-term population trends. Generally, flooding that occurs every 1-2 years regulates long-term trends (see RSEIS 2 Section 4.3.1.1).

Mitigation in areas such as batture that are surrounded by high quality habitat (*i.e.,* bottomland hardwoods, permanent waterbodies) has more benefits to fish than mitigation in the Floodway that has essentially been cleared of most trees. Riley Lake is also closer to the river, whereas much of the flooded portions of the Floodway are far removed. Therefore, the proximity of Riley Lake is also a benefit. In terms of water temperature, there is ample shallow water habitat in the batture, which encompasses millions of acres

in the Lower Mississippi River Valley. The ebb and flow of floods create a variable temperature regime, and fish respond based on habitat preference. A restored Riley Lake will have extensive littoral areas that are subjected to rapid warming. Overall, the Corps considers restoration of Riley Lake, or other floodplain lakes, a significant environmental improvement and anticipates that this project will have direct benefits to the fish community.

The statement was made in the comment that "[t]he habitat provided in the project area is of particular value because it is rare." However, it is important to reiterate that over 85% of the project area is agricultural fields (See RSEIS 2 Tables 3.1 and 3.2 and Figures 1 through 17). Soybean fields are not rare, and are, in fact, a predominant land use throughout the Lower Mississippi River Valley (RSEIS 2 Figures 3 and 4).

Regarding Footnote 6, Riley Lake is inundated by the Mississippi River nearly every year. If the weir is constructed, the lake will still be flooded nearly every year, since the weir elevation is several feet below the 2-year flood stage. The weir will restore historical habitat that was present prior to drainage attempts. See Sparks Response 10 above.

Sparks Comment 21:

> Lastly, the Corps is now proposing to replace a broad and varied area flooded under relatively natural conditions with small, highly managed habitats. In addition to the specific problems addressed by this report, this proposal is inconsistent with the consensus scientific understanding of the importance of natural hydrologic variability. These natural variations have important ecological effects whose nature we can often only generally predict but whose details we often cannot. Our knowledge of the importance of these variations is based on the subtle differences different hydrology has for different species and ecological processes, as well as on a long history of chronicling ecological harm as a result of modified hydrology. Until we can trace these subtle effects, the most prudent policy is to preserve the natural hydrology in the few places it still exists. The Corps' new proposed mitigation contradicts this important ecological understanding.

Sparks Response 21: The Corps agrees that hydrologic variability is important, and that such variability commonly occurs in natural habitats. The project area that will be protected by the flood damage reduction project is almost entirely characterized by topography and hydrological conditions that are already highly modified for agricultural purposes in ways that largely or completely eliminate the "natural hydrologic variability" the commenter references. Approximately 85% of the project area is made up of leveled farmland (see RSEIS 2 Table 3.1, Table 3.2, and Figures 1-17) that have extensive drainage features. Additionally, many of the streams and channels that naturally occurred in the project area have undergone past channelization that has resulted in waterways that

are characteristic of highly degraded habitat types. See RSEIS 2 Figures 1-17. The existing backwater flooding regime is attributed to the construction of the frontline levee system.

Mitigation is proposed to compensate for unavoidable impacts to significant fish and wildlife resources that mostly occur over large tracts of highly uniform leveled soybean fields and mitigate them by restoring thousands of acres of highly variable bottomland hardwoods, restoring hydrologic variability to Big Oak Tree State Park, and creating/restoring Permanent Waterbody habitat that provides significant mid-season fish rearing habitat. Compensatory mitigation is based on sound ecological principles.

The creation and restoration of Permanent Waterbodies proposed for mitigation will provide stable water levels during the mid-season fish rearing period. While the comment may be correct regarding the lack of complete understanding in the current knowledge base of interrelationships of hydrology, species variation, and ecological processes, the Corps provided a model that addresses the lack of understanding by using relevant science-based decisions and assumptions, professional opinions of scientists familiar with the project area, and reasonable goals. No other alternative was proposed or suggested by other scientists and reviewers of the RSEIS 2.

Sparks Comment 22:

VI. PROPOSED NEW MITIGATION IS ON BALANCE ENVIRONMENTALLY HARMFUL IN ITSELF

For the various reasons discussed above, the proposed deliberate extended flooding in either the sump areas or Riley Lake is not only incapable of providing offsetting mitigation for fish impacts, but is environmentally harmful to the existing habitat in those areas in its own right. The areas manipulated are now functioning habitat. (Indeed, the SCI report indicates that Riley Lake has now been planted in trees able to withstand the frequent flooding levels, which increases their habitat value according not only to the Corps model but in reality, a change the Corps has not taken account of.) But the Corps' proposed new manipulation would further block fish access even beyond those already contemplated by the project and is intentionally designed to kill off the trees on the site. The unnaturally extended flooding in the sump area will, according to the 2005 RSEIS2 itself, kill the bottomland trees. The manipulation of Riley Lake will serve to trap fish where they cannot return to the Mississippi River in areas that will generally dry up before reflooding. That is not necessarily a completely adverse effect, in that these fish can be consumed by birds and other animals, but it certainly does not contribute to Mississippi River fish populations. Most generally, the functions of these areas depends on natural hydrologic variability in a variety of ways, and that variability will be removed by these additional manipulations.

Sparks Response 22: This comment is a summary of previous comments and previous responses apply. There are two additional points that require clarification.

The SCI Engineering, Inc. report provided misinformation concerning planted trees in the Riley Lake area. A cottonwood plantation does exist near Riley Lake. However, this plantation is outside of the expanded lake elevation (see site visit report, RSEIS 2 Appendix F, Attachment 1).

The Corps acknowledges that restoring Riley Lake to historical levels will most likely kill the black willows that are currently found within the restored lake's footprint. The existing habitat the black willows provide has been accounted for in the calculation of mitigation benefits (RSEIS 2 Table 2.4 and Table 5.4). However, the restoration is intended to provide historical permanent waterbody habitat, not frequently flooded black willow habitat that is a result of past modifications to the outlet channel.

Black willow makes up the majority of non-agricultural vegetative species found in the sump area. It is not likely that maintaining water levels for 45-days during the fish reproductive season will kill the existing black willow habitat because black willows can tolerate prolonged flooding such as the intended 45-day period. The existing black willow habitat has been accounted for in the calculation of mitigation benefits. However, the existing habitat will be monitored. Mitigation may be adjusted in the event that black willow habitat is being impacted.

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Dr. Curtis Bohlen declares as follows:

1. I am a wetland ecologist with special expertise in wetland identification and mitigation. I testified regarding the 2002 Revised Supplemental Environmental Impact Statement for the St. Johns Bayou/New Madrid Floodway Project before the Missouri Clean Water Commission and described my qualifications as part of that testimony and provided a copy of my curriculum vitae.

2. I have reviewed the December 2005 draft Revised Supplemental Environmental Impact Statement for the project in great detail. In doing so I have reviewed major elements of the 2002 RESEIS. I have performed analyses from files provided by the U.S. Army Corps of Engineers regarding the project as described in the attached report. I have a variety of other materials as described in that report.

3. I have prepared the attached report entitled Assessment of the Newly Proposed Mitigation Options Advanced in the December 9, 2005 Draft Supplemental Environmental Impact Statement for the St. Johns Bayou/New Madrid Floodway Project.

I declare under penalty of perjury that these statements and the views expressed in the attached report are true to the best of my knowledge, information and belief.

Dr. Curtis Bohlen

January 30, 2006

Dr. Curtis Bohlen Comment 1:

ASSESSMENT OF THE NEWLY PROPOSED MITIGATION OPTIONS ADVANCED IN THE DECEMBER 9, 2005 DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR THE ST. JOHNS BAYOU/NEW MADRID FLOODWAY PROJECT

By Dr. Curtis Bohlen
(January 2006)

On December 9, 2005, the U.S. Army Corps of Engineers released a new draft supplemental environmental impact statement for the St. Johns Bayou/New Madrid Floodway project (RSEIS2). The core of the environmental impact statement remains the document released in June 2002, and the new draft neither changes the proposed project nor reevaluates different project alternatives. Instead, the new draft proposed some modified mitigation options, with a primary focus on offsetting impacts to fish during the period from April 1 to May 15, called the mid-season in the draft and in the 2002 RSEIS. The draft offers four mitigation scenarios, and bases its cost/benefit analysis for the project on those scenarios (as calculated by the fisheries model used to evaluate project impacts) without identifying even one conceptual mitigation plan

This report analyzed the new draft. It concludes that the new mitigation findings remain inconsistent with the mathematical structure, requirements and core assumptions of the fish model. It also concludes that the new analyses of wetlands and mitigation to offset wetland impacts continue to ignore vast quantities of wetlands impacted, that the new analysis of farmed wetlands is technically indefensible and contradicted by other analysis already in the accepted record.

Bohlen Response 1: The Corps believes that each of the four mitigation scenarios presented in RSEIS 2 Section 2.6.2 is fairly described as a "conceptual mitigation plan," but as the term is not defined, the Corps cannot respond to the comment in greater detail. The Corps' mitigation approach will be adaptable and be based on the techniques discussed in the RSEIS 2 (See Section 1.4.7).

The Corps disagrees with the conclusions in the second paragraph of the comment and provides responses to each particular issue where the issues are raised in these comments.

Bohlen Comment 2:

I. PROPOSED NEW MITIGATION

The previous mitigation proposed for the project in 2002, among other flaws, mathematically misinterpreted the Corps' own results of the fish model. This model required 8,375 acres of reforested lands be flooded on an average daily basis during the mid-season to offset fish impacts. The 2002 EIS treated this requirement as though it were only 8,375 actual, total acres.

The RSEIS2 still proposes to use more than 4,000 acres of reforestation to help offset fish impacts but acknowledges that these forested sites are rarely flooded. According to the RSEIS2 (page 104), the potential mitigation sites the Corps has identified in the St. Johns Basin are flooded only 20% of the time on average during the midseason period that the Corps has focused on for evaluating fisheries impacts. These lands, therefore produce 20% of an average daily flooded acre per acre of land, and the nominal per acre improvement in fisheries habitat quality due to any restoration activity (as measured by the HSI values) must be discounted by, on average, a factor of 5. The sites in the New Madrid Floodway are, on average, flooded only 6% of the time and nominal increases in habitat quality due to restoration must be discounted even more

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steeply, by a factor of more than 16. Put together, and assuming that other sites could be found that flooded as frequently as sites already found, it would take more than 124,000 acres of reforestation to offset mid-season impacts on fish for the mid-season.[1]

[1] The Corps's calculation of the project's fisheries impacts requires 2,329 AA HUs mitigation in the New Madrid Floodway and 1,884 AAHUs in the St. Johns Bayou (see table 4.4 and 4.5 in the RSEIS 2). If each New Madrid acre were flooded only 6% of the mid-season, that would require over 117,600 acres of reforestation to offset New Madrid mid-season fish impacts. An additional minimum of 6500 acres of reforestation would be required to offset St. John impacts, for more than 124,000 acres overall. The values for acres of reforestation required in table 4.6 are incorrect because they fail to account for the duration of flooding. Acres required should read "average daily flooded acres required from April 1st to May 15th."

Bohlen Response 2: Please refer to Environmental Defense Response 1.

The RSEIS 2 addresses the transposition of units noted in the comment.

As presented in RSEIS 2 Table 2.2, the basic mitigation feature includes but is not limited to reforestation of 6,356 acres. The deliberatively conservative percentages of duration referred to in the comment were used only for planning purposes. Actual flood duration and benefits will be revised during development of site specific mitigation plans (RSEIS 2 Section 5.4.2.1).

Bohlen Comment 3:

> The Corps states that one purpose of the RSEIS2 was to try to figure out a mitigation method that would pass the benefit/cost analysis. The Corps has developed a new proposal that primarily relies on artificially flooding existing wetland areas. The proposal is packaged in four separate "scenarios," but all four scenarios rely for fish mitigation on three major components.

Bohlen Response 3: The Corps agrees this project, like most Civil Works projects, must pass a benefit/cost analysis.

Bohlen Comment 4:

> By far the most significant component of the new mitigation would come from modified management of the gates and pumps in levees at the two basins. In particular, the Corps proposes to keep the small "sump areas" above the proposed levee closure in the New Madrid Floodway flooded somewhat longer during the mid-season, and offers the possibility of doing the same in the St. Johns basin. All of these sump areas are wetlands according to Corps data, so this proposal involves artificially extending the flooding on these wetlands.[2] The Corps acknowledges that doing so would kill the trees now present. The Corps would manipulate these areas by holding water in them after they have already flooded due to the flooding of the Mississippi River. According to the new Corps proposal, when river stage declines after the start of this mid-season, and the Corps previously proposed to open the levee gates so water could flow out of the basins, the Corps would now keep the gates closed to retain water on the sump areas. These gate operations would provide up to 98% of the mid-season fish mitigation for the New Madrid Floodway under the different mitigation "scenarios."
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> [2] The Corps analysis showed the elevation at which flooding occurs at least fifteen consecutive days during the growing season at least every other year, the criterion required to identify a crop field as a farmed wetland, and lesser hydrologic requirements apply to vegetated lands. These elevations were 289 ft in the St Johns basin and variously reported as 288.3 and 290 ft in New Madrid. The sump areas in both basins that would be manipulated by the new proposed mitigation are no higher than 284.4 ft and thus are entirely below these elevations.

Response 4: The Corps agrees that the creation of a 2,000 acre spawning and rearing pool within the sump area is a significant component of the RSEIS 2. Section 5.2.3.5 of the RSEIS 2 states that the existing tree vegetation (Black Willow) may be distressed

although not killed as the comment states (see Appendix F, Attachment 1 and Whitlow and Harris, 1979).

The comment states that "all of these sump areas are wetlands according to Corps data." The Corps agrees the elevation noted is consistent with the 15-day flood duration criterion for farmed wetlands. However, the Corps never attempted to classify these areas as farmed wetlands so it is inappropriate to state that these areas are wetlands based on Corps analysis. Please see RSEIS 2 Sections 4.2.1.2 and 4.2.1.3.

Bohlen Comment 5:

> A second form of new mitigation would claim benefit from the holes ("borrow pits") the Corps needs to dig to generate material to raise levees. The Corps proposes to modify such pits to create 387 acres of "permanent waterbodies" for fish in the St. Johns Basin. These borrow pits would provide (according to the Corps' analysis) 83% of the mid-season fish mitigation needed in the St. Johns Basin.

> The third form of mitigation would take an old, oxbow lake outside the levee system known as Riley Lake and build a small levee across it. Once floodwaters inundated this lake, the levee would retain more water in the lake. The DSEIS does not make claims about how long water would remain in it except to claim that water would remain at least throughout the 45 day mid-season for fish.

Bohlen Response 5: For a description how the Corps intends to enhance borrow pits (referred to as "holes" in the comment) for fish habitat, see RSEIS 2 Section 2.6.1.7. For a description of the Riley Lake restoration, see RSEIS 2 2.6.2.3, 5.4.3.3, and Table 5.4. See Responses to Sparks Comments 5, 10, 16, and 18.

Bohlen Comment 6:

> All this new mitigation is, relatively speaking, cheap. For the "sump areas," for example, the cost is essentially only the cost of acquiring flood easements on the 2,000 to 3,000 acres of frequently flooded land in the sump depending on the scenario. The proposed extended flooding can be achieved entirely through operations of the project gates. According to the Corps, this slight change in project management produces great quantities of mitigation per acre. This deal looks too good to be true and indeed it is. The calculations on which this apparent windfall is based are rife with both mathematical and conceptual (ecological) errors.

Response 6: Some would question characterization of approximately $30 million in mitigation (approximately 30% of total project costs) as "cheap." Moreover, there would seem to be no legitimate reason to criticize mitigation techniques merely because they are not the most expensive available. The identification of mitigation projects that provide

high habitat value at reduced costs is a laudable goal, and we do not take the comment to suggest otherwise.

The project must satisfy both mitigation requirements and the required cost benefit ratio (1:1). RSEIS 2 evaluates whether mitigation efforts are "too good to be true" by means of the HEP mathematical analysis, and the Corps believes that the model disproves the allegation in this instance. The Corps also disagrees that there are either mathematical or conceptual errors, as explained in response to the comments recorded below.

Please refer to the Response to Environmental Defense Comment 2.

Bohlen Comment 7:

> The apparent increase in habitat value generated by this small change in project management rests on two pillars. First, the artificially extended flooding means that acres would be flooded longer during the mid-season, increasing the average daily flooded acres (ADFAs), which according to the pure math of the model implies more habitat. But the various gate scenarios analyzed by the Corps would at most produce a relatively small increase in habitat value solely by changing the duration of flooding, increasing it by 50% under one scenario and 10% under another, and even decreasing it under a third.[3] Most of the claimed increase in habitat value stems from the Corps' curious claim that by flooding these sites for 45 days during the mid-season (after which they will dry out as they do now), the Corps will transform these lands from flooded agricultural and forest lands into a permanent waterbody or lake, i.e., a lake that is flooded all-year round.
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> [3] See RSEIS2, page 116. Tables 5.5 and 5.6. The maximum increase in average daily flooded acres for a New Madrid scenario is from 1036 to 1531 and for St. Johns gate operations is from 428 to 726.

Response 7: This comment and many others express confusion of the Corps' use of the term "Permanent Waterbody." To address this confusion, the Corps has inserted the definition of a Permanent Waterbody in RSEIS 2 Section 4.3.2.4 and Response to Sparks Comment 5. That discussion makes clear that the Corps is not proposing a "lake that is flooded all-year round."

Having established that principle, the Corps agrees that credit is taken for increased quantity (ADFAs) and quality (HSI) in connection with the spawning and rearing pool. For a discussion of the HSI value, see Response to Sparks Comment 5.

Bohlen Comment 8:

According to the fisheries model used by the Corps, large permanent waterbodies provide several times the habitat value per day of flooding of other floodplain lands. According to the Corps fish model, for example, large "permanent" backwater lakes in the New Madrid Floodway offer roughly six times as much habitat value for each day flooded as do flooded agricultural lands and about three times the habitat value of flooded forest.[4] Thus, according to the Corps, this mitigation would increase fish habitat in part by flooding the wetlands in the sump area longer but primarily by making each flooded acre of wetland score dramatically higher in the fisheries model for each day of flooding.

[4] Put another way, counting mitigation in this optimistic way implies that the Corps can gain more than five times as much added value from each mitigation acre manipulated in this way as it would gain through reforestation.

Bohlen Response 8: Permanent waterbodies were identified by the interagency team as optimum habitat for rearing of most larval fish used in the HEP analysis and they assigned the HSI accordingly (2002 RSEIS Appendix G).

Bohlen Comment 9:

II. INCONSISTENT OR INACCURATE MATH WITH THE PROPOSED NEW MITIGATION

There are a number of basic flaws with this proposed new mitigation.

A. The sump areas and Riley Lake would not actually be flooded all 45 days during the mid-season each year as claimed.

A key assumption behind the Corps' proposed mitigation is that flooding an acre for all 45 days during the mid-season turns it into a permanent water body, i.e., a lake flooded year-round. Such a claim is not defensible on ecological grounds, but even if it were, it would only be true if the lands in the sump areas that the Corps counts on to provide this habitat were in fact going to be flooded all 45 days during the mid-season every year. Analysis of the Corp's own hydrologic data shows that this assumption is wrong.

Bohlen Response 9: The Corps agrees that the spawning and rearing pool in the "sump" areas referenced in the comment will not be flooded for all 45 mid-season rearing days every year, and that even if that were the case, that would not justify defining the areas as year-round habitat. Neither admission, however, undermines the mitigation analysis provided in the RSEIS 2.

The model results verify that flooding will be limited in some years, which is why fewer than the maximum number of ADFAs have been claimed as mitigation credit for the

spawning and rearing pool in the New Madrid Floodway. See RSEIS 2 Table 2.5 (Pool elevation of 284.4 feet NGVD produces a 2,000 acre pool. If the area was continuously flooded, this would produce 2,000 ADFAs, but the RSEIS 2 only claims 1,531 ADFAs) (See RSEIS Table 2.5).

Additionally, the characteristics used to define a mid-season "Permanent Waterbody" and qualify it for a higher HSI do not depend on 45 continuous days of inundation every year. See Response to Sparks Comment 5.

Bohlen Comment 10:

> Closing gates when water would otherwise flow out of the floodplain can help keep the sump areas flooded, but it cannot flood them in the first place. Flooding in the project area results from flooding of the Mississippi River.[5] Thus flooding of the sump areas does not occur until and unless the Mississippi River rises high enough to lead to flooding of the sump. But flooding does not occur every year during the mid-season, so in dry years, the sump areas ("permanent water bodies") will not be flooded at all even under the Corps' proposal. In addition, in many years flooding does not occur at the beginning of the mid season, which means flooding cannot occur all 45 days of the midseason in such a year. The Corps' assumption is therefore wrong.
>
> [5] The New Madrid Floodway and the St. Johns basin work somewhat differently. In the New Madrid Floodway, Mississippi River water flows directly into the basin. In the St. Johns basin, local runoff fills up the basin but only once the gates are closed during Mississippi River floods to prevent water for moving into the floodplain. Under either scenario, the areas will not flood unless the Mississippi River is flooding.

Response 10: The Corps agrees that RSEIS 2 assumes that the dominant source of flooding for the New Madrid Floodway spawning and rearing pool in most years is backwater from the Mississippi River, and that such flooding in some years will not reach the target pool elevation or that the same flooding occasionally will not occur prior to the beginning of the mid-season spawning and rearing period on April 1 (so that the entire area will not be flooded for all 45 mid-season spawning and rearing days). The mitigation analysis, however, does not make the "assumption" referenced in the final sentence of the comment, for the reasons stated in response to the preceding comment (Bohlen Response 9). For years when flooding is "reduced" in this sense, "credit" – expressed in ADFAs – is reduced accordingly.

Although the Corps did not count credit for habitat provided by capturing interior events during years of low Mississippi River elevations, the potential exists to create a spawning and rearing pool that would benefit fish through retaining interior rainfall in years of low Mississippi River stages.

Please refer to RSEIS 2 Sections 2.6.2.5, 2.6.5.1, and 2.6.2.5.2 for a succinct discussion of advantages of the modified gate operation comparison over existing conditions.

Bohlen Comment 11:

The Corps analysis for this project assumes that a 32 year "period of record" illustrates future flood patterns. The Corps analysis of all economic and environmental effects of the project is based on these data, which present flood conditions in the project area over a 32 year period under current conditions, and how it would occur under various project alternatives. To be consistent, all analyses of fish habitat, mitigation, and other features of the project have to use the same period of record. Analysis of this data shows the following:

In 5 out of 32 years (16%), the New Madrid Flood area would never be fully flooded because flooding sufficient to fill the sump areas to a design elevation of 284.4 ft never occurs in those years during the mid-season. In only 18 out of 32 years (56%), could the sump area be flooded all 45 days, which means that in 44% of the years, the sump area could not be flooded all 45 days.

In 31% of years, conditions are either so wet or so dry that modified gate operations cannot increase the number of days of full flooding of the sump area at all. (In those years, the sump area would either not be fully flooded at all under either existing conditions or the new proposal or the sump area would be flooded all 45 days under either scenario.) In all these years, the Corps claims enormous additional habitat value but there would be no change in flooding duration to the sump areas at all.

On average, the New Madrid sump area is flooded 20.5 days during the mid-season under current conditions. Under the proposed mitigation for the scenario with the largest increase in flooding, flooding would only be extended on average to 32.9 days, and in other scenarios by less.[6]

In short, the mitigation cannot succeed in flooding the New Madrid sump area all 45 days every year, only increases the average annual period of flooding by about 50% to 32.9 days at most, and fails to affect the flooding of the sump areas during the midseason at all in about one third of all years. A similar situation holds in the Saint John Basin.

[6] RSEIS 2, page 116.

Bohlen Response 11: The hydrologic data is accurate for the example described and, as previously noted, the credit taken for the duration of inundation in the Corps' analysis (calculated in ADFAs) is entirely consistent with the facts stated. Again, no credit is taken for the difference in surface area between that provided by the actual pool elevation in any given year, and the target elevation at which the gates would be closed to accomplish the flood damage reduction that is the purpose of the project.

The Corps also agrees that it will apply the HSI value for a permanent waterbody to the spawning and rearing pool in the presence of varying pool elevations year-to-year (what the comment refers to as "enormous additional habitat value"). This is the only point at

which the comment references habitat quality measurements in what is primarily a discussion of habitat quantity. For an explanation of the additional benefits associated with the managed spawning and rearing pool, see Sparks Response 5.

Please refer to Bohlen Response 10. The comparisons made between existing conditions in the New Madrid Floodway and project conditions considering modified operation of the outlet gates to pond water are noted.

Bohlen Comment 12:

The basic factual premise behind the Corp's claim of extraordinary benefits for this proposed mitigation for the New Madrid Floodway – that these intermittently flooded lands function as permanent waterbodies and thus have many times the habitat value of the same lands under the existing flood regime – is untenable as a matter of hydrology and therefore false.[7]

[7] The Corps has not produced similar data for Riley Lake to permit such precise analysis, but there is reason to believe it would be flooded less frequently even than the New Madrid sump area. For example, The Corps has proposed different levee configurations to keep water in Riley Lake up to 286, 287 or 289 feet NGVD (elevation above sea level). The levee would only keep water in if it would also keep water out. Flood levels would therefore have to exceed 286, 287 or 289 feet to flood Riley Lake respectively. By contrast, the New Madrid sump area only needs to be flooded to 284.4 feet. Flood frequency is somewhat different for Riley Lake, however, and cannot be calculated directly using the Corps data contained in Appendix C of the 2002 RSEIS.

Bohlen Response 12: Regarding Footnote 7, since 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 (RSEIS 2 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. The Corps' assumption regarding Riley Lake is that construction of a weir near the outlet of the lake would maintain a pool during the mid-season period at the elevation of the weir crest and would substantially increase the fisheries habitat value of the lake in comparison to the existing condition.

Bohlen Comment 13:

The critical new assumptions is inconsistent with the fish model.

Another critical assumption behind the proposed new mitigation is that an acre of seasonally inundated floodplain that is flooded for all 45 days during the mid-season should be treated as though it were a permanent lake. I do not accept this idea from an ecological perspective but apart from these concerns, this assumption remains inconsistent with the model and the methodology used to produce the model.

Bohlen Comment 13 (continued):

First, it is fundamental that the same assessment technique must be used to analyze the mitigation sites as are used for project impacts. Under current conditions, the thousands of acres in the project area flood for all 45 days during the mid-season in several years. For example, in a year similar to 1944, the minimum elevation of water in the sump area during the mid season would be just above 285 feet. At that elevation, a total of 2416 acres are flooded for all 45 days during the mid-season. But these acres were not valued as "permanent waterbodies" in those years for purposes of assessing the habitat value of the project area under current conditions. Valuing habitat that way solely for purposes of mitigation is inconsistent and values the same habitat more for mitigation than for assessing project impacts.

The comparison is especially dramatic if a year like 1973 is examined. In a year like 1973, more than 41,000 acres of land would be flooded for all 45 days of the critical midseason. If the Corp's logic were applied consistently, this "permanent water body" in this one year alone would produce more than 91,000 habitat units, requiring mitigation to produce more than 2800 average annual habitat units during the mid-season to make up for project impacts on fish from this one year alone. Nearly all of this putative habitat value would be extinguished by the project, which would dramatically increase the amount of mitigation required if habitat were consistently assessed as the Corps now proposes. Even limiting consideration to lands below the two year floodplain flooded in 1973 would still require mitigation to produce an extra 2400 AAHUs , more than the entire mitigation the Corps now calculates would be required to address mid season fisheries impacts in the New Madrid floodway. This example shows that if all acres in all years flooded for 45 consecutive days each year were assessed as "permanent water bodies" in a consistent manner, the amount of mitigation required for the project would increase substantially.

Bohlen Response 13: Please see Sparks Responses 5 and 15. With the exception of borrow pits and the restoration of floodplain lakes, such as Riley Lake, the Corps does not intend to provide lake habitat by the creation of a spawning and rearing pool. Although lakes that are seasonally connected to the Mississippi River can be classified as Permanent Waterbodies, not all Permanent Waterbodies are lakes. Lakes provide a number of limnological functions that differentiate them from other types of Permanent Waterbodies.

The comment suggests that, using the Corps' analysis, in an average year like 1944 and the flood year of 1973, thousands of acres of the floodplain that were inundated for an extended period of time should also be classified as permanent waterbodies and impacts should be calculated for these acres using that HSI. The comment is incorrect for a number of reasons. First, the floodplain that normally undergoes transient flooding does not meet the definition of a Permanent Waterbody found in Response to Sparks Comment 5. For example:

1. The "waterbody" does form during rising water levels, but does not retain water on the floodplain after floods recede as river stages fall.
2. Although Permanent Waterbodies located within the floodplain do remain sufficiently deep to retain significant volumes of water for a prolonged period, this is not true for the floodplain itself.
3. The floodplain does experience water level fluctuations and stranding of eggs and displacement of larvae is likely.
4. There are warmer water levels at the fringes of the floodplain inundation where the water is shallow, but the main body of the floodwaters is connected to the river and the water temperature is lower than that of a Permanent Waterbody.
5. There is periodic connection to the mainstem river prior to or during the rearing period permitting access by spawning adults.
6. Although material is deposited during the flood, the floodplain does not acquire the characteristics of the bottom of a Permanent Waterbody: a nutrient rich substrate that leads to higher cholorophyll *a* content and rapid biochemical cycling.
7. There is structural diversity of the littoral zone.

So, the floodplain has only 2 of the 7 characteristics of a Permanent Waterbody and would not be classified as such, even in a flood year like 1973.

Second, the comment fails to take into account the calculation of ADFA. By definition, the analysis considered both flood years and drought years to arrive at an average flood condition over the period of analysis. The comment seeks to call out a single flood year and calculate impacts and mitigation solely on the basis of that year. It would be just as logical to select a drought year and calculate impacts and mitigation for that year. By way of illustration, the higher stage and duration of flooding in 1973 was reflected in the impact analysis since Envirofish included the daily stage levels from 1973. Envirofish also included the impacts to the fish resource in years such as 1954, when stage level affects from Mississippi River backwater never exceeded the top bank of floodway ditches.

Third, the interagency team selected the 2-year flood event for analysis because it is this event that is critical for maintaining fish populations over the long term, not the rare extreme flood event (RSEIS 2 Section 4.3.1.1). The comment suggests that the Corps adopt an analysis technique that would be inconsistent with the manner in which impacts and mitigation have been calculated throughout the document.

Bohlen Comment 14:

Another way of viewing this inconsistency is that in some years, the New Madrid sump area is already flooded all 45 days.[8] The Corps therefore cannot extend flooding on these acres at all in these years, but its mitigation plan would claim a dramatic increase in habitat for those years when it did not extend flooding at all. This is especially ironic because under current conditions, not only would the entire sump area be flooded for all 45 days, but fish would have free access to the area from the Mississippi River, while under the Corp's proposed modified gate operation, they would never have access as the gates would be closed throughout the midseason to exclude floodwaters.

[8] Under the Corps proposal, the Corps would be able to maintain flooding for all 45 days in 18 out of 32 years. In two of those years, the entire sump area would also be flooded all 45 days, and in two others, almost the entire sump area would be flooded for all 45 days. In short, in more than 20% of the years that flooding would last all 45 days under Corps management, virtually all the acres are already flooded under existing conditions.

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Bohlen Response 14: The comment seems to misunderstand the difference between the pre-project and post-project conditions. Even assuming the area floods for 45 days in its current state, after the project is constructed, both the area and duration of flooding will be reduced. These are the impacts of the project and they have been quantified through the use of Envirofish and HEP (2002 RSEIS Appendix G). These impacts will be compensated for, at least in part, by increasing the extent and duration of flooding in the "sump" over the post-project pre-mitigation condition by forming the spawning and rearing pool (See RSEIS 2 Table 5.5). This longer, more regular flood regime results in a change in habitat quality, yielding the HSI for Permanent Waterbody. It is this change that provides the AAHUs needed for compensation.

The comment may also object to the use of the HSI for Permanent Waterbody for the spawning and rearing pool, or put another way, may suggest that this HSI should also have been used for those parts of the floodway that sometimes currently experience extended periods of flooding. This has already been addressed in Bohlen Comment 13 above, and in the Response to Sparks Comment 5. Forty-five days of continuous flooding is not one of the characteristics of a Permanent Waterbody identified in that Response (Sparks Response 5).

To further clarify the RSEIS 2's analysis, consider the following example:

Imagine a 100-acre tract of farmland (HSI = 0.37) that is inundated 25% of the time during the mid-season fish rearing period. Therefore, this tract of land has a habitat value of 9.25 HU (100 acres * 0.37 * 0.25). Additionally, assume that conditions are not likely to change under a future without a project scenario. Therefore, this tract provides 9.25 mid-season fish rearing AAHUs under existing conditions.

Next, assume a flood damage reduction project reduces the flooding to the area to 5% during the mid-season fish rearing period. Therefore, this tract of land has a habitat value of 1.85 HU (100 acres *0.37 * 0.05). Likewise, assume that the area will stay in agricultural production for the life of the project. Therefore, this tract of land provides 1.85 mid-season fish rearing AAHUs under post-project conditions.

Impacts are calculated by subtracting post-project conditions from existing conditions (future without project conditions). Therefore, this hypothetical project would impact 7.4 mid-season fish rearing AAHUs (9.25 AAHUs – 1.85 AAHUs). Therefore, we need to mitigate for 7.4 AAHUs.

Assume that mitigation will take place on the same 100-acre tract of farmland. Mitigation includes restoring bottomland hardwood habitat (HSI = 0.7) by reforesting the area, creation of microtopography, removal of farm drains, and plugging a drainage ditch. By implementing these mitigation measures, duration of flooding will be 10% during the mid-season fish rearing period. Additionally, for simplicity reasons only, assume that the habitat gain from planting trees is immediate (Note: The Corps has accounted for transition periods in mitigation calculations). Therefore, the mitigated tract of land provides 7 mid-season fish rearing AAHUs (100 acres * 0.7 * 0.10).

Benefits are calculated by subtracting pre-mitigation conditions from post mitigation conditions. This is where the flaw in logic occurs in the comment. The comment implies that 7 AAHUs are subtracted from 9.25 AAHUs. Therefore, the tract provides 2.25 mid-season fish rearing AAHUs. Thus, 5.15 AAHUs (7.4 AAHU – 2.25 AAHUs) still require compensation. However, this is not correct.

To correctly calculate mitigation, one must subtract 1.85 AAHUs (post-project/pre-mitigation) from 7 AAHUs (post-project/with mitigation). Therefore, the tract correctly provides 5.15 AAHUs. It is not appropriate to utilize pre-project conditions (existing conditions) when calculating mitigation benefits. Thus, 2.25 AAHUS (7.4 AAHU – 5.15 AAHU) still require compensation.

The effect of the mistake in the comment is to include the impacts of the reduced inundation in the mitigation calculation. However, impacts have already been accounted for. Therefore, the impact of reduced inundation would be calculated twice.

The issue of the percentage of time fish have access over the period of record has been addressed. See Response to Sparks Comment 7.

Bohlen Comment 15:

Reassigning habitat categories as the Corps has done in this RSEIS2 is also unjustified based on the methodology used to develop the fisheries model. The methodology used to generate the habitat values that drive the model was a "Dephi" process, in which a few experts met together and assigned these values based on a kind of negotiated judgment. In the best scenario, the Delphi process used in this context has serious scientific limitations, particularly in the absence of any formal model validation or external peer review. But the claim to legitimacy of this process stems from the fact that a group of professionals sat down together and hammered or averaged out differences of opinion. The claim to legitimacy from the product of these negotiations stems from that consensus and from the participation of representatives of resource agencies that are charged with protecting aquatic resources. Consistent with this methodology, neither the Corps as a whole nor any one or limited number of participants in that process can unilaterally change the results of the Delphi process and lay claim even to the limited form of legitimacy derived from that negotiated consensus.. By unilaterally assigning agricultural and forestland flooded for 45 days a habitat value originally agreed to for oxbow lakes, the Corps has done exactly that.[9]

[9] In many of the tables of Appendix G in the 2002 RSEIS, the table header "Oxbows" was used to designate what the Corps now calls "large waterbodies." That raises the question of whether another unnegotiated category reassignment (from "oxbows" to "large waterbodies") may already have occurred.

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Bohlen Response 15: The Delphi technique (Crance, 1987) can be used in the application of HEP models. The Delphi technique as employed in this case combined the knowledge and opinions of subject matter experts familiar with the project area to develop habitat suitability index curves for species where an index curve had not been published. The use of the Delphi approach was agreed upon by the interagency HEP team. The team was composed of biologists from the MDC, USFWS, the Memphis District, and WES (2002 RSEIS Appendix G, page G-1). There is no standard requirement for the sort of peer review this comment recommends. Further, this comment alludes to 'serious scientific limitations' and a need for 'formal model validation.' The interagency team agreed to the use of the Envirofish model because of its inclusion of aspects of hydrology, timing, and land use, as well as spawning and rearing requirements for different guilds of fishes. During the period of project impact and mitigation credit analyses, and even at the present there is no better model available, regardless of formal model validation.

The term "oxbow" was used as an example of a large, permanent waterbody. The HEP Team was fully aware that large floodplain permanent waterbodies represented a variety of habitats including oxbow lakes, large borrow pits, depressional lakes, herbaceous wetlands, swamps, and other geomorphic features that form in the floodplain of

meandering rivers and can be restored or created as part of mitigation. Please refer to Appendix G of the 2002 RSEIS. Tables 10 and 12 in that Appendix clearly use the term "large permanent waterbodies." Tables 5 and 6 refer to "oxbow" for the same habitat types. See also the definition of "floodplain and river bank habitat" in the 2002 RSEIS Appendix G, page G-2.

The comment charges that the Corps unilaterally assigned the HSI for "oxbow lakes" (Permanent Waterbody) to agricultural and forested lands flooded for 45 days. See Response to Sparks Comment 5.

Bohlen Comment 16:

> The proposed mitigation would block mid-season fish access.
>
> Under the Corps original proposed New Madrid gate operations (the "recommended plan" or option 3-1.B of the 2002 RSEIS), the gate would have to be closed whenever water levels would otherwise push beyond the New Madrid sump area, at a design elevation of 284.4 feet. Pumps would then draw the water down to a holding pool elevation of 283 feet until such time as the elevation of the Mississippi River (the river stage) dropped below that, when the gates would again be opened to allow water to drain out of the sump by gravity.
>
> Under the modified gate operations proposed in the RSEIS2 to mitigate fisheries impacts, operation would be similar, except that during the midseason, water levels would not be pumped below the design elevation (284.4 or 283 feet, depending on the mitigation scenario) and the gates would have to remain closed whenever river stage dropped below the design elevation. As a result, the gates would have to be closed both when Mississippi River flooding would exceed the sump area (to reduce flooding) and when the Mississippi stage was below the sump area (to retain water in the sump). In other words, under the Corps' proposed mitigation, the gates to the New Madrid Floodway would have to be closed nearly all the time when the sump area would be flooded.

Bohlen Response 16: The comment accurately describes the proposed modified gate operation. For a response to the question of fish access please see Response to Sparks Comment 7.

Bohlen Comment 17:

As the analysis described above shows, these modified gate operation strategies could keep the New Madrid sump area flooded all 45 days during the mid-season in 18 out of 32 years. However, precisely during these years, the gates would also have to be closed all 45 days during the mid-season, either to reduce flooding or to retain water in the sump. This means fish that spawn in the mid-season will not be able to access the sump area precisely in the years when the Corps claims the sump area would function as an exceptionally valuable habitat, equivalent to a permanent water body.

In five out of the other 32 years, the gates would be open throughout the mid-season, but the floodplain of the sump area could provide little habitat in those years because most of it would not be flooded.

In the remaining 9 out of 32 years, water levels start to rise after the start of the mid-season, so if fish would move through the culverts into the Floodway, they would have a period of access to the floodplain. But in these years, flooding could not occur for all 45 days, so the Corps could not claim permanent water body habitat even under its own theories.

Bohlen Response 17: The Permanent Waterbody (spawning and rearing pool) does not have to be connected to the river during the entire rearing period. Most "natural" floodplain permanent waterbodies do not have a continuous period of connection. See Responses to Sparks Comments 5, 6, and 7. Adult fish move into the waterbody before or during the spawning period and spawn in response to the three "triggers" as appropriate for their species (See Response to Sparks Comment 8). Also, refer to Bohlen Responses 10 and 16 above. Even during years the target spawning and rearing pool elevation could be achieved on April 1, the gates would be opened whenever the Mississippi River was between the target elevation and elevation 284.4 feet NGVD (RSEIS 2 Section 2.6.2.5)[1].

Fish access is not required during the entire 45-day rearing period. Fish will have ample opportunities to access the Floodway prior to and during the reproductive season. See Responses to Sparks Comments 7 and 8.

The comment also suggests that 45 days of continuous flooding is necessary to apply the Permanent Waterbody HSI. This is incorrect for the reasons stated in the Responses to Sparks Comments 4 and 5 and in Response Bohlen Comment 14 above.

[1] The "target elevation" is the elevation at which the spawning and rearing pool would be held during the mid-season rearing period. The RSEIS 2 evaluates more than one target elevation. See RSEIS 2 Section 2.6.2.5.

Bohlen Comment 18:

> In addition, analysis of the water level data shows that once water levels start to rise during the mid-season, they tend to quickly rise to a point where they would induce flooding beyond the sump area, requiring that the gates be closed. Analysis of the data for these 9 years shows that when rising flood waters begin to inundate the sump area in any meaningful amount, they would remain open for only 4.2 days on average before the gates had to be closed, and the area would then remain flooded on average with the gates closed for 27.1 days. In other words, fish would only have access to a flooded sump area at all in slightly more than one quarter of all years, and even in those years, potential access through the culverts would only exist for a few days. Put more simply, in even the minority of flooded years when gates are open at all, access will be dramatically reduced.

Bohlen Response 18: Please refer to Bohlen Response 17 and Sparks Responses 6, 7, 8, and 9.

The statement that only 4.2 days of inundation in any meaningful amount would be available on average improperly implies that fish will only access the area during flood conditions. Depending on the target elevation chosen, on average, up to 17.9 days during the mid-season would be available for fish access before that target elevation is reached in the 9 years to which the comment refers. The comment also does not consider that fish could access the area during the early season period.

Bohlen Comment 19:

> The proposed mitigation would not offset early or late-season fish habitat
>
> The HEP analysis used to examine impacts of the proposed project to fishes was described in some detail in Appendix G of the 2002 RSEIS. The complete HEP analysis examined breeding and rearing habitat requirements of a select group of twelve evaluation species out of the 93 species of fishes that have been collected in the project area. Evaluation species were selected to include species using floodplain habitats in a variety of ways during the early, mid and late seasons. During the course of later analysis, the Corps determined that the most severe impacts to fisheries resources would occur during the midseason. It reasoned that mitigation that addressed the midseason impacts would be expected to simultaneously address the early and late season impacts.

Bohlen Comment 19 (continued):

The logic of focusing on the mid-season was therefore founded on the expectation that mitigation strategies that benefited midseason habitat would also address early and late season requirements. There was never any judgment made that early and late season fish impacts could be ignored – and neither is there any rationale for doing so. When the predominant mitigation technique was expected to be reforestation of agricultural lands, the assumption that compensating for midseason fisheries impacts would simultaneously address early and late season effects , while technically incorrect, was at least more justified. However, this assumption is even more unjustified with respect to the proposed gate manipulations. By definition, the Corps's proposed gate manipulations during the mid-season do nothing to offset project impacts to early or late season fish. This is true not only biologically, but also under the mathematical structure of the HEP fish model.

Manipulating the gates to extend the period of artificial inundation of the sumps into the early and late seasons would be of no real help, because if the Corps were try to retain water in the sumps in the early and late seasons, it would face the same types of problems as I have described above for the mid-season.

Bohlen Response 19: Please refer to Section 8.2 and Appendix L of the 2002 RSEIS. The Corps and the USFWS determined the most appropriate way to mitigate the fishery losses would be to mitigate fishery rearing losses on all habitat types (See 2002 RSEIS Appendix E, pages E-99-100). It was determined that mid-season (April 1 to May 15) habitat losses affect the greatest number of floodplain and riverine species, and that compensation based on these losses would be of the greatest benefit. The Corps did not "[reason] that mitigation that addressed the midseason impacts would be expected to simultaneously address the early and late season impacts." This particular response clarifies this position.

Depending on when elevated Mississippi River stages occur, certain mitigation techniques will benefit early, mid, and late season spawning and rearing habitat. For instance, given appropriate river stages, restoring Riley Lake and the creation of borrow pits will benefit all fish reproductive seasons. The RSEIS 2 takes a holistic approach to compensatory mitigation and believes that compensating for mid-season rearing impacts will result in benefits not just to mid-season fish rearing habitat but to the overall ecosystem as well. The USFWS agreed with this approach (See 2002 RSEIS Appendix E at pp. E-99-100 for the 2000 Coordination Act Report and the Response to Sparks Comment 18).

Regarding gate operations, during the winter waterfowl season, the gates can remain open up to 286.0 NGVD in the St. Johns Basin and to 285.4 in the New Madrid Floodway. In the mid-season fish rearing season, the gates will be open as described in Sections

2.6.2.5.1 and 2.6.2.5.2. Within these parameters, best management practices will be developed during mitigation planning for gate management that allows maximum opportunities for fish access, consistent with recommended flood control measures (See Responses to Bohlen Comments 17 and 18).

Bohlen Comment 20:

The Corps has mathematically miscalculated mid-season benefits from the creation of a borrow pits in the St. Johns basin

Most of the proposed mitigation for the St. Johns basin is now supposed to derive from one or more "borrow pits." These pits are to be constructed to generate material to increase the size of the levee, and the Corps claims that it will shape the pits to work like backwater lake habitat. According to the Corps, this will now provide 83.4% of the mid-season fish mitigation needed for the St. Johns basin at the small additional cost of redesigning the pits.

Regardless of the biological merits of using borrow pits to substitute for seasonally flooded floodplain, the Corps analysis is based on an incorrect application of the HEP fisheries model. The fish analysis focuses on rearing and spawning habitat generated by floodplain flooding. It therefore assigns fish value for lakes only on the days they are flooded by backwater.[10] Thus, if an acre of backwater lake generates 4 habitat units for each day flooded by backwater, and it is flooded by backwater one fourth of the mid-season on average, then it generates only one habitat unit. Based on this model, the science team that assigned habitat values for backwater lakes (oxbow lakes) and flooded forest, found that oxbow lakes produce roughly twice as many habitat units as flooded forest for each day of backwater flooding.[11]

The Corps analysis now claims that the habitat value of the borrow pits it proposes to create should be counted in a manner inconsistent with the way all other habitat values have been calculated. In particular, the way the Corps proposes to determine the habitat value of these borrow pits is inconsistent wit the way the fisheries analysis evaluates the habitat value of other permanent water bodies. The Corps proposes that the habitat value of borrow pits – as distinct from the natural ponds that they are intended to mimic – be counted throughout the mid-season regardless of whether they are covered by backwater. Thus the Corps proposes to count habitat value in artificial ponds in a different manner than the Corpscounts habitat value of the natural ponds that they are intended to mimic. The Corps's interpretation of the HEP model thus substantially and unfairly overestimates the mitigation value of the proposed Borrow pits.[12]

Bohlen Comment 20 (continued):

[10] Page G-10 of Appendix G of the 2002 RSEIs states "Seasonal estimates of average daily flooded acres *for each habitat* and alternative were modeled by MVM using ENVIRO-FISH, and these acres were multiplied by the seasonal HSI values to obtain HU lost." (Emphasis added.)

[11] See RSEIS2 Table 4.3, p. 70, assigning St. Johns "Large Waterbodies" 4.2 habitat units compared to 1.95 for flooded forest. There is a mathematical error in table 4.3. The Cumulative HSI score for agricultural lands is reported as 0.52. It should be 0.42.

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[12] For an acre of borrow pit flooded by backwater one fourth of the season, for example, the Corp's new analysis assigns that acre roughly 8 times the value of an acre of comparably flooded forest although the interagency Delphi team instead assigned permanent water bodies only around twice as much value.

Bohlen Response 20: There is ample scientific evidence to confirm that borrow pits are highly productive habitats and support a diverse array of resident and riverine fishes (Aggus and Ploskey, 1986). Many of the large permanent waterbodies that will be impacted by the flood damage reduction project are borrow pits that were used during the construction of the frontline and setback levee system. Impacts to these pits were appropriately calculated.[2]

First, the impact of the project to currently existing permanent waterbodies is the reduced inundation and therefore a loss of connectivity. The waterbodies will continue to exist and provide whatever habitat value they have, but they will not be connected as often or at all. So, the impact of the project was correctly calculated as reduced period of inundation, *i.e.*, fewer ADFAs.

Second, the proposed mitigation will create permanent waterbody habitat where it does not now exist by building borrow pits in agricultural areas. Just like the existing permanent waterbodies, these waterbodies will also provide value to fish, whether they experience periodic inundation or not. Therefore, these borrow pits should receive the HSI value for permanent waterbodies.

Third, the new pits will experience periodic inundation. Continuous inundation throughout the entire spawning and rearing period is not necessary (See Bohlen Response 17). The commenter would calculate benefits only for the days of inundation, but that ignores the change from agriculture to permanent waterbody habitat.

[2] However, these borrow pits were not constructed according to the design criteria that the Corps will use for the current project. For example, many of the existing borrow pits are rectangular in shape with no variable depth or shoreline. The proposal to construct borrow pits that have variable depths and shorelines will benefit multiple floodplain fish species. Therefore, benefits are appropriately calculated and there is no mathematical miscalculation as the comment states.

Since the habitat value of the agricultural fields was included in the impact calculation, and that value was subtracted from the benefits gained by converting those fields to permanent waterbodies, both impacts and benefits were calculated in the same manner as all other impacts and benefits. There is no inconsistency.

The text and accompanying footnote 10 misrepresent the analysis. The existing permanent waterbodies have value at all times. But, the impact of the project is correctly calculated in terms of the days of lost inundation. By the same token, the new borrow pits will have habitat value for fish at all times. In addition, they will receive periodic inundation.

Footnote #11 erroneously states that the Cumulative HSI for agricultural lands should be 0.42. The correct value is 0.52 as presented in the RSEIS 2.

Regarding Footnote #12, please refer to the earlier portion of this response. The Corps' mitigation increases both the habitat value (HSI) of the lands, but also the flooding duration (ADFAs).

Bohlen Comment 21:

> There are two problems with this. First, the Corps is counting habitat values of the proposed mitigation action in a manner that is inconsistent with the way habitat impacts of the project have been evaluated. It is fundamental to any effort to determine the needed extent of compensation that the same methods be used to estimate environmental impacts and the benefits of mitigation. The Corps analysis fails to do so.

Bohlen Response 21: See Response to Bohlen Comment 20.

Bohlen Comment 22:

> Second, the Corp's new analysis arbitrarily overturns the judgment of relative habitat values produced by the interagency "Delphi" group that drew up the HSI scores at the heart of the fisheries analysis. While it is undoubtedly true that permanent water bodies provide some habitat value for some fish species on a year round basis, the Delphi panel was aware of that and were also aware of how the HSI scores they estimated would be used. The Delphi panel had the opportunity to adjust the species-by-species HSI scores and the selection of indicator species used in the HEP analysis with the full knowledge that permanent waterbodies hold water year round, but would be scored as midseason rearing habitat in proportion to the fraction of the midseason they are flooded by backwater. The Corps cannot rely on Delphi process for the legitimacy of its model and then unilaterally change that analysis.

Bohlen Response 22: The interagency team agreed that borrow pits are properly classified as permanent waterbodies and assigned the HSI for those waterbodies (See 2002 RSEIS, Appendix E, page E-63, the USFWS Coordination Act Report (CAR);

Appendix L, Section 8.2; and Appendix G, page G-2). To the extent that the comment raises questions about the appropriate HSI for permanent waterbodies, see the Response to Sparks Comment 5.

Bohlen Comment 23:

The fish model does not provide a valid basis for St. Johns Bayou habitat to be substituted for New Madrid habitat or visa versa.

The 2005 DSEIS claims that the Corps may choose to locate and calculate mitigation in the St. Johns Bayou basin to substitute for New Madrid losses. Apart from biological flaws, this cannot be done mathematically. Not only different fish but different numbers of evaluation fish are used to calculate habitat value in the different basins. This resulted not from a belief that habitat in the St. Johns basin is more valuable, but rather, from an analytic decision to use a different suite of fish species – and in particular a different number of species – to guide the calculations. Five fish species are used to calculate habitat values in the St. Johns basin and 3 fish species are used in the New Madrid basin.[13] The overall habitat score for each habitat category is simply the sum of the scores of all species that were included in the analysis. Thus habitat scores in the New Madrid basin are all lower than scores for equivalent habitat types in the St. Johns Basin. That is an artifact of the model structure, and does not represent any biological judgment.

In effect, different models were used to assess fisheries habitat in the two basins. They both rest on the HEP analytic structure. They rest on similar species-by-species HSI scores for different floodplain habitats, but they counted different things, so the results are incommensurable. The HEP model was simply not constructed to make comparisons across the two basins. By the same token, the HEP model was not designed to make comparisons across different seasons.

[13] Appendix G of the 2002 RSEIS suggests that decisions on which species to include in the analysis in each basin were based in part on their presence and relative abundance, however in this context, the selected indicator species are acting as surrogates for an entire fish fauna and absence of a particular indicator species should not be interpreted as implying poor habitat quality.

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Bohlen Response 23: The Corps does not agree that there are unspecified "biological flaws" in its mitigation analysis.

The St. Johns Bayou Basin can be used to provide mitigation for impacts to the New Madrid Floodway. The basins are ecologically similar (intense agricultural production, fragmented tracts of bottomland hardwoods, limited buffer strips, and unnatural hydrological regime due to channelization and levees). The basins were part of the historic Mississippi River floodplain and were separated only when the Setback Levee

was constructed. However, the basins have different species assemblages for fish. Therefore, these different assemblages resulted in different HSI values. The Corps treats the basins separately in terms of impacts and mitigation requirements.

If the St. Johns Basin is used to compensate for New Madrid Floodway impacts, New Madrid Floodway HSI values will be used in the calculations. Please see Section 2.6.2.5.2 of the RSEIS 2. Table 2.6 of the RSEIS 2 displays AAHU gains that could be generated by modifying the St. Johns Bayou gate operation. A comparison is made utilizing both St. Johns Bayou HSI values and the New Madrid Floodway HSI values. Benefits were appropriately calculated.

Bohlen Comment 24:

> I should add that the information presented in the various drafts of the EIS describes major differences in the two fisheries and characteristics that probably explain those differences. The St. Johns basin extends a long way, retains substantial riparian forest in places, with significant relictual floodplain inundation., and the St. Johns Bayou itself is healthy enough to support numerous mussel species. That is why the impacts of the project on the St. Johns basin are significant despite the fact that it is already partially disconnection from the Mississippi River. The New Madrid Floodway does not share these characteristics, and does not support a significant residential fishery and contains different fish species. The New Madrid's primary fisheries value is as a reproductive site for Mississippi River fish. Thus from an ecological as well as purely analytic basis, there is no appropriate basis for using one basin to offset impacts in the other.

Bohlen Response 24: The comment incorrectly characterizes land use in the St. Johns Basin. There is riparian vegetation in places but it is hardly substantial. Table 3.1 and figures 4 - 17 in the RSEIS 2 demonstrate that the predominant land cover type is agricultural. The RSEIS 2 proposes through mitigation to increase the habitat value of the basin recognized by the comment and by the Corps (See RSEIS 2 Table 2.2). However, the Corps also intends to manage the St. Johns Bayou outlet to increase the connectivity of the St. Johns Basin with the Mississippi River (See Response to Bohlen Comment 23). This action would result in added reproductive value for Mississippi River fishes in the St. Johns Basin. Therefore there is an ecological basis to use the St. Johns Basin to offset fisheries impacts in the New Madrid Floodway. Each will contribute to the overall health and productivity of the Mississippi River.

Bohlen Comment 25:

III. THE CORPS PROPOSES TO USE THE FISH MODEL IN WAYS THAT EXTEND IT OUTSIDE OF THE SCIENTIFIC ASSUMPTIONS ON WHICH IT WAS BASED.

The Corps fisheries HEP analysis model, even used appropriately, rests on limited scientific foundations. The key parameters of the model, the Habitat Suitability Index scores, were developed through a form of group best professional judgment in which a small group of biologists came to consensus on the relative value of floodplain habitats for different fish species based primarily on differences in vegetation. The group assigned numerical scores to express the relative value of each habitat type for different fish species. These habitat values have no statistical underpinning; indeed, they are not based on any measurable quantity at all. While the biologists involved in drawing up the models reviewed some data on relative fish abundances among different cover types, the HSI values were not directly determined by those data and there is no claim that the data were adequate for doing so. The legitimacy of the model is therefore tied to the scientific consensus that attempted to evaluate the relative value of different habitat types under conditions that were otherwise the same for each type.

Bohlen Response 25: The fishery model is based on the best available scientific information on floodplain ecology, land use delineation, and hydrologic/hydraulic variables that influence habitat value and function. There are no other methods available that clearly identify impacts to fish reproduction. Although several commenters have criticized the methodology, no one has offered a substitute. See the Response to Bohlen Comment 15 above.

Bohlen Comment 26:

HEP models are limited tools, and they must be used with care to ensure that their inherently limited predictive value is not further degraded. In particular, the fisheries HEP model and the relative HSI scores on which it depends were developed for

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habitats within a specific ecological context. It is inappropriate to apply the model to situations beyond the scope for which it was originally intended. In a trivial example, it would generally be inappropriate to apply a HEP model developed in one region of the country outside of that region. In a similar way, application of these fisheries models to situations – even within the project area – that are ecologically quite different from the situations on which the original HSI values were based is likely to lead to significant error.

The relative habitat values in the HSI score habitat quality based solely on land cover type. It is a broad ecological principle that the patterns of flooding have profound implications for habitat quality and use. It is widely understood that the habitat value of areas with managed hydrologic regimes differs from those with natural hydrologic variation. It is widely understood that habitat in the higher energy batture lands next to the river differ from areas with similar duration of flooding within the basins. It is widely understood that habitat value depends on landscape context, and in particular on the type, diversity and proximity of other contiguous habitats. It is also widely understood that the habitat value of bottomland hardwoods varies depending on characteristics such as species composition and age structure of the vegetation.

Yet none of these important components of habitat quality were included in the fisheries HEP model. The model was simply not designed to compare such differences in habitat. A scientifically necessary justification for omitting such well understood and important components of habitat value was that project impact sites and mitigation sites would generally be similar in these important characteristics. It follows that the model will, under these circumstances, provide poor estimates of relative habitat value and thus should not be used to justify trading off habitat losses in the project area for mitigation sites that clearly differ not only in land cover, but also to a significant degree with respect to hydrology, connectedness and proximity to other habitat features.

Bohlen Response 26: The HEP is not being applied to a situation beyond its original scope. The interagency team including the Corps, considered the variation in habitat types. The entire process, as illustrated in the RSEIS 2 Appendix A, was based on a habitat classification system that considers hydrology (*e.g.*, 2-year floodplain), hydraulics (depth and duration of flooding), land cover (type of vegetation), and connectedness to the main stem river. Habitat value (HSI scores) was rated in the context of the

Mississippi River floodplain, not just a specific location within that floodplain. In this manner, the HSI scores are transferable to any habitat within the 2-year floodplain. The 2-year floodplain includes both the batture and portions of the backwater. Transferability was an important consideration knowing that mitigation lands could occur anywhere within the 2-year floodplain of the Lower Mississippi River.

The Corps agrees that patterns of flooding have implications for habitat quality and use. Underlying land use also has implications for habitat quality and use.

The Corps disagrees that the New Madrid Basin has a natural hydrologic variation. See Response to Sparks Comment 21. The current backwater flooding regime is a function of the levee system. If the frontline levee was not in place, the entire floodway would only experience Mississippi River headwater flooding. The hydrology of the floodway is not currently intensively managed. The proposed mitigation will increase the level of hydrologic management in the interest of increasing habitat value. To the extent that the current hydrologic regime represents an "unmanaged" condition, that was taken into account in the Envirofish calculation of ADFAs. See also Response to Bohlen Comment 13 above.

The Corps recognizes that there are some differences between habitat in the batture and habitat within the floodway. However, the batture is not a homogenous area. There are areas that experience high energy flows from the Mississippi River. However, there are also slackwater and backwater areas within the batture. For example, tributary mouths are backwater areas within the batture (RSEIS 2 Section 4.3.2.3). The same landcover types are present in both areas and the interagency team assigned the same habitat value to those types in the batture and the basins.

Flooded batture land that is reforested will have physicochemical characteristics similar to forested areas in the New Madrid Floodway: slackwater, structural diversity, direct accessibility. 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 reduce hypoxia that can occur in large backwaters, such as the New Madrid Floodway, 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. Those fishes that are "not truly stream or large river species" are either habitat generalists or permanent inhabitants of wetlands that prefer isolated waterbodies. High species richness in the St. Johns basin indicates that these groups of fishes will continue to inhabit streams and wetlands of New Madrid Floodway. The New Madrid 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. Thus, the Corps considers batture land suitable mitigation sites.

The model did not have a specific variable assigning value to landscape context, particularly the type, diversity and proximity to other contiguous habitats. Nevertheless, it is clear that the only contiguous habitat of any real significance in the floodway is agricultural fields. Over 80% of the landuse is agricultural. Other habitat types are widely dispersed and fragmented (See 2002 RSEIS Appendix A, Figure 6). As a conservative measure, the Corps did not discount the value of this fragmentary habitat when determining impacts, but counted all areas within the existing 2- year floodplain as having fish rearing value regardless of distance from the river or permanent water areas. It is highly unlikely that all these areas, far removed from the river, have any significant value to spawning riverine fish because there are no depth or duration criteria (*i.e.*, it may be a mile from permanent water; flood for one day and to a depth of one inch). In addition, agricultural lands become more common at higher elevations which provide little, if any, value to most spawning and rearing fishes (See 2002 RSEIS Appendix G, page G-10). However, the interagency mitigation team will take the elements of landscape context such as type, diversity, and proximity into account in developing site specific mitigation plans, including increasing the area of contiguous forested tracts (See 2002 RSEIS Appendix L, Section 10.1).

Species composition and age structure of vegetation were accounted for in the HEP model by annualizing the Habitat Suitability Index values as a function of the growth patterns of planted trees. Please refer to Section 2.3.2 of the RSEIS 2. There are two broad categories of bottomland hardwoods in the project area as they relate to the structure they provide for fish spawning and rearing habitat. These two broad categories are fast growing species such black willow and cottonwood and slow growing species such as bald cypress and red oaks. The annualized HEP model accounted for the transition period that is required of these two broad categories in determining mitigation benefits for reforestation.

The comment assumes that the impact and mitigation sites differ. Although this may be so in some cases, the Permanent Waterbody will actually overlay the area of impact and will thus be identical.

Bohlen Comment 27:

> The proposed mitigation in the 2002 RSEIS already extended the fish model to the limits of reasonable use and beyond by, among other things, using it to justify replacement of habitat with floodplain fish access by mitigation sites that lack such access (floodplain access is another important component of fish habitat that was not explicitly evaluated in the HEP model). Application of the model to estimate mitigation requirements was justified at the time by the Corps in part by assertions that the selection of final mitigation sites would ensure that mitigation sites would be generally similar in important respects to the areas of impact. But the proposed new mitigation plan can make no such claim. Instead, the RSEIS2 proposes to replace tens of thousands of acres of seasonally inundated fish habitat that will be lost in the sense that they will no longer experience any or virtually any backwater flooding and replace them with a few hundred acres that have no hydrologic or ecological similarity to the lost habitat.

Bohlen Response 27: Mitigation sites will in fact be similar to the impact sites since, with the potential exceptions of batture lake restoration and use of the St. Johns basin for New Madrid floodway impacts, the mitigation sites will be located in the same area as the impacts. For example, the Permanent Waterbody will be located in the sump of the New Madrid floodway and overlays one of the prime areas of impact.

Of course, after mitigation measures are in place, these sites will differ substantially from their current condition. Bottomland hardwoods that provide significant habitat to multiple species (fish, amphibians, reptiles, mammals, and birds) will make up the vast majority of compensatory mitigation acreage. They will replace thousands of acres of soybean fields that provide limited habitat. Mitigation sites will provide equal or greater fish rearing habitat than what is currently found under existing conditions in the impacted farmland.

On the question of fish access, see Responses to Sparks Comments 6 and 7. The value of the proposed mitigation in the Permanent Waterbody is clearly set out in RSEIS 2 Section 5.4.3.5. It is expected that most mitigation sites will provide access for fish. Monitoring will reveal if fish have access to other sites in which the Corps has not taken mitigation credit (specifically, restoring hydrology to Big Oak Tree State Park, restoring 1,800 acres of cropland surrounding Big Oak Tree State Park, and the moist soil units). These mitigation measures will likely provide fish access and thus, significant gains to mid-season fish rearing habitat.

The comment "the RSEIS 2 proposes to replace tens of thousands of acres of seasonally inundated fish habitat that will be lost in the sense that they will no longer experience any or virtually any backwater flooding and replace them with a few hundred acres that have no hydrologic or ecological similarity to the lost habitat" is incorrect on its face and is stated in a pejorative fashion. The "tens of thousands of acres of seasonally inundated fish habitat" are in fact soybean fields. The "few hundred acres that have no hydrologic or ecological similarity to the lost habitat" will be prime fish habitat, more than several

hundred acres, and both hydrologically and ecologically similar to, yet superior than, the lost habitat. See Response to Sparks Comment 5 and previously in this Response.

Impacts of the flood damage reduction project are attributed to a reduction of flooding. Leveled, extensively drained agricultural areas make up 65% of the impacted areas in the St. Johns Bayou Basin and 69% of the areas in the New Madrid Floodway (2002 RSEIS Appendix G, Tables 10 and 13).

In addition, the proposed mitigation does not consist of a few hundred acres. As the RSEIS 2 clearly states in Table 2.2, the proposed basic mitigation feature entails the following:

- Provide Mississippi River surface water to the approximate 1,000 acres of Big Oak Tree State Park that would mimic natural flooding conditions.
- Reforest 3,619 acres of cropland.
- Construct 765 acres of modified moist soil units on farmland.
- Plant vegetative buffer strips along 64 miles (671 acres) of New Madrid Floodway channels.
- Create a 266-acre wildlife corridor between Big Oak Tree State Park and Ten Mile Pond CA.
- Reforest 1,800 acres of cropland surrounding Big Oak Tree State Park.
- Construct 387 acres of modified borrow pits.

The implementation of various additional techniques such as restoration of Riley Lake or the creation of a spawning and rearing pool will provide additional mitigation that will fully compensate for mid-season fish rearing impacts. This restoration has the potential to provide from 245 to 538 acres of permanent waterbody habitat (RSEIS 2 Table 2.4). The spawning and rearing pool in the New Madrid floodway alone will provide from 853 to 2000 acres of habitat (RSEIS 2 Table 2.5).

Bohlen Comment 28:

Any model must be used with sensitivity and awareness of its limitations. The analysis presented in the RSEIS2, fails to do so and thus is scientifically flawed. Indeed,

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the way the model has been used here appears almost perverse in the lengths to which it goes to reinterpret the model and stretch the limits of its applicability.

Bohlen Response 28: The Corps has provided explicit responses to earlier comments fully explaining and elaborating on the science-based approach to evaluate impacts and mitigation of flood control projects. The Corps does not agree with the claim that the Corps "stretched the limits of [the model's] applicability" when the model was developed specifically for the purpose of comparing and contrasting different floodplain habitats in the Lower Mississippi River.

Bohlen Comment 29:

> I am aware that other concerns with the biological basis of the fish model have been raised by Dr. Sparks, including the restriction of the analysis just to fish habitat available within the two-year floodplain. Obviously, any such weaknesses in the models biological underpinnings carry over to the analysis of the new proposed mitigation and call its results into question. Furthermore, my analysis of Corps data supports previous comments that the two-year floodplain elevation used in the fisheries analysis has been incorrectly estimated. See Attachment. Correction of this error will require corrections to the fisheries and other analyses. The changes in the RSEIS2 do nothing to address these concerns.

Bohlen Response 29: The Corps has responded to Dr. Sparks' concerns (see Responses to Sparks Comments).

The comment and others have previously expressed an opinion on the appropriateness of using the 2-year floodplain as the basis of fisheries impact analysis. Justification of using the 2-year floodplain (2002 RSEIS Page G-8) has been explained. The use of the 2-year floodplain for fishery impact analysis is again explained in Section 4.3.1.1 of this RSEIS 2.

Having determined that the 2-year event was the event that regulates the baseline/long term populations of fish, it was necessary to determine the elevation at which that event occurs. The Corps began its analysis that was included in the 2000 SEIS by determining the elevation of the 2-year event in the floodway with the project in place ("with project" also sometimes called the "authorized elevation") and the elevation of the 2-year event for at least one of the project alternatives (also called the "avoid and minimize condition"). With the project in place, the physical characteristics of the floodway, whether the project structures are open or closed (which depends on Mississippi River stages), and interior rainfall are the controlling factors to determine the stage of the 2-year event.

The Corps also determined the without project (also called the "existing condition") elevation of the 2-year event. This elevation was determined, based on the same assumptions as above, that is, that the stage of the 2-year event was primarily a result of Mississippi River stages and interior rainfall (characteristics of floodway). Using this method, the 2-year without project stage was set at 292.9 feet.

As the draft SEIS was undergoing quality control review, the Corps determined that the method used to set the with-project and avoid and minimize elevations was correct.[3] With the project in place, it is the characteristics of the floodway and interior rainfall that control elevation. However, the QC review revealed that the method used to calculate the without-project flood elevation was not correct. The Corps recognized that, without the project in place, the elevation of the 2-year event in the floodway is determined by the Mississippi River, not by the characteristics of the floodway. The Mississippi River has a drainage area of approximately 920,000 square miles at New Madrid, while the floodway has a drainage area of only 183 square miles. The influence of the Mississippi River simply dominates the effects of local conditions and controls the 2-year flood elevation in the floodway.

The Corps had already separately conducted a comprehensive frequency analysis of the Lower Mississippi River for the Mississippi River and Tributaries Project (MR&T). This analysis was based on annual peak flows at stations along the river that maintain continuous discharge records. Using that analysis, a flow of 1,000,000 cubic feet per second (cfs) was determined to be the 2-year frequency flow in the reach of the Mississippi River that includes New Madrid.

The Corps then determined the elevation at New Madrid represented by this flow. The Corps employed a synthetic rating curve for the period 1993-1997 based on computed flows at Hickman, Kentucky (the closest point at which discharges are measured, and which in fact sets flows for the entire lower river) and corresponding stages at New Madrid. This means that the Corps computed the flows at Hickman and compared them with the measured elevation (stages) at New Madrid and generated a curve to illustrate the relationship between the two. This analysis established the elevation of the 2-year event without project at New Madrid at 290 feet.

The USFWS also raised this as an issue in their comments on the draft 1998 DSEIS, as presented in the 2000 FSEIS in Appendix J in the 13 page section immediately preceding the Water Quality discussion. The Corps responded in a facsimiled memo (referred to following the USGS Letter and on the sixth page of this section) that sets out the information above. That memo has been included in the RSEIS 2 Appendix F, Attachment 2.

The comment suggests that the Corps should have used only the stages at the New Madrid gage to set the elevation of the 2-year without project event. However, stage data varies from year to year, even with the same flow in the river, due to a variety of conditions. For example, for a flow of 1,000,000 cfs, the stage might be influenced by the temperature of the water (higher temperature yields higher stages), or changes in the channel from year to year as the river degrades and aggrades the bed, or there may have been a flood on a tributary downriver from the gage that would result in a backwater

[3] The existing condition for the St. Johns Basin was computed using this method and is correct since that basin was already cut off from the river.

effect and higher observed stages. Changes in vegetation from season to season and year to year can also influence the stage. In short, any number of events can influence local stage observations. This means that stage data, while useful, are very susceptible to influences that may skew the analysis.

The Corps recognizes these effects and prefers to use flow data to compute flood frequency information, since it is the most reliable tool for this application. This judgment is formalized in Engineer Manual 1110-2-1415. Flow is a much more stable variable and is not so easily influenced by local conditions. That is what was done in this case, but the Corps took the local conditions into account by developing the synthetic rating curve. The Corps of Engineers has years of experience with the hydraulics and hydrology of the Mississippi River in general and in the project area in particular. The Corps has been studying the river intensively since the inception of the MR&T Project in 1928. The Corps used this experience and training and its professional judgment in making the decisions described above.

Bohlen Comment 30:

IV. THE VAROIUS ANALYSES OF WETLAND IMPACTS ARE FUNDAMENTALLY FLAWED

A. The new claims that the project only impacts a few hundred acres of wetlands are contradicted by the Corps' own analysis.

Through the different draft and final environmental impact statements produced as part of planning for this project, the Corps has steadily decreased the area of wetlands it states that the project will impact. In the 2000 Final SEIS the Corps stated that the project would impact 36,000 acres of wetlands. In the 2002 RSEIS, it stated that roughly 18,000 acres of wetlands would be impacted. In places, the RSEIS2 now claims, implausibly, that only 622 acres will be affected by the project, of which 102 acres are vegetated wetlands, and 520 acres are farmed wetlands.

Bohlen Response 30: See Response to Bohlen Comment 58 below. Estimates of wetland acre impacts have been revised to correct and clarify previous information as a result of public comments and also as a result of an updated analysis of potential farmed wetlands and prior converted cropland. In spite of the reductions in project impacts to which you refer, wetland mitigation has not changed from the 2002 RSEIS to this RSEIS 2 (See Response to Bohlen Comment 40 below). Construction of flood damage reduction features in the St. Johns Bayou Basin and closure of the New Madrid Floodway would directly impact a total of 102 acres of jurisdictional wetlands. Additionally, closure of the New Madrid Floodway would impact jurisdictional status to a maximum of 520 acres of farmed wetlands. Therefore, the comment concerning 622 acres is partially correct. Construction of the project will impact jurisdictional status on 622 acres of wetlands.

However, the project will also decrease backwater flooding to additional jurisdictional wetlands. (5,781 acres; see 2002 RSEIS Appendix D, page D-9) However, the decreases in flooding will not impact jurisdictional status to these areas. Jurisdictional wetlands will remain jurisdictional wetlands due to factors other than backwater flooding such as high groundwater table, headwater flooding, and precipitation. Impacts due to the reduction of backwater flooding were assessed by the fish HEP model and the waterfowl WAM model. Impacts from a reduction of flooding were calculated on jurisdictional wetlands as well as prior converted cropland.

Bohlen Comment 31:

What is truly astonishing about these successive statements about the extent of wetland impacts due to the project is that the hydrologic analysis of the pre-project and post-project duration and extent of flooding has not changed at all. Neither has the map of land use within the project area. These steadily shrinking claims about the extent of wetland impacts are based solely on arbitrary changes in what lands the Corps chooses to enumerate. These changes, however, rest on factually and legally incorrect premises.

First, the claim that the project now impacts only 102 acres of vegetated wetlands, such as forested wetlands is based on the premise that the Corps need only consider vegetated wetlands directly filled during project construction. Even in the 2002 RSEIS, the Corps acknowledged that there were thousands of acres of forested and other vegetated wetlands on which flooding would be either eliminated or greatly reduced. The elimination or great reduction in backwater flooding is a major wetland impact and should be treated as such. In my testimony before the Missouri Clean Water Commission, I also explained how the 2002 RSEIS left out many more thousands of acres of wetlands that will also not experience backwater flooding – a significant

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hydrologic alteration – as a result of project construction. These are wetland impacts that must be accounted for under the § 404(b)(1) guidelines even if, as the Corps implausibly claims, these wetlands will remain just wet enough from local rainfall sources not to lose their jurisdictional status as wetlands.[14]

[14] The Corps has provided no substantial justification for its claim that none of these wetlands will lose their jurisdictional status. Indeed, that claim appears implausible, especially with respect to those forested areas now flooded most regularly by the Mississippi River whose backwater flooding will be eliminated.

Bohlen Response 31: See Response to Bohlen Comment 30 above.

The Corps does not claim that the project will impact "only 102 acres of vegetated wetlands" (See 2002 RSEIS Table 4-1 and 4-2 and Appendix D). The Corps has said that 102 acres of vegetated wetlands will be "directly impacted" by the project, that is, they

will be replaced by project structures (See 2002 RSEIS Table 4-1 and 4-2 and Appendix D). The Corps has consistently called "direct" impacts the loss of wetland status because of fill and channel enlargement. Indirect impacts are the reduction in hydrology (inundation from backwater). The Corps analyzed impact to wetlands (See Response to Bohlen Comment 39 below).

The statement in Footnote 14 that "[t]he Corps has provided no substantial justification for its claim that none of these wetlands will lose their jurisdictional status" is incorrect. Pages D-8 and D-9 of the 1999 DSEIS; pages D-5, D-6, and D-7 of the 2000 FSEIS; and pages D-6, D-8, and D-9 of the 2002 RSEIS succinctly provide a clear rationale for the conclusion that the non-cropland jurisdictional wetlands that will receive reduced inundation from backwater flooding will retain their jurisdictional status after project implementation. The thorough review to substantiate this conclusion was done by individuals very familiar with the project area. The ground-truthing procedures utilized to verify the existing wetland status of forested wetlands at elevation 290 feet NGVD were performed at a time in which the Mississippi River was not near an elevation that would inundate these lands. This provides further evidence that forested wetlands that experience reduced inundation from backwater flooding after implementation of the project will retain their jurisdictional status. The Water Quality Certification from the State of Missouri requires monitoring of jurisdictional wetlands below an elevation of 295 feet NGVD to verify this assertion and requires additional mitigation if additional jurisdictional wetlands are impacted.

Bohlen Comment 32:

> Second, the Corps has now abandoned its prior estimate that approximately 9700 acres affected by the project qualify as farmed wetlands. All of these acres will be at least partially drained by the project, and the Corps acknowledged in the 2002 RSEIS that 6713 of these acres may no longer be flooded long enough post-project to qualify as farmed wetlands. In fact, the analysis performed by the Corps showed that all of these 6,713 acres would no longer have backwater flooding sufficient to meet farmed wetland criteria, which require fifteen days of inundation during the growing season at least once every two years on average. The Corps has not altered its own analysis, but now inappropriately relies on an earlier NRCS estimate that 0.4% of the cropland in the project area is farmed wetland. The Corps rejected this same estimate in the 2002 RSEIS.

Bohlen Response 32: For an explanation of the 9,700 acres, 6,713 acres, and NRCS' 0.4%, see the Response to Bohlen Comment 37 below. In general, in earlier documents, the Corps relied on conservative estimates that overstate the number of potential farmed wetlands in the project area. These estimates were based solely on the inundation period. The Corps did not and has not done a jurisdictional wetland determination on any of these acres. NRCS has made its own estimate of the farmed wetlands in the area based on their current mapping conventions and the HGM provided by the Corps. Although the Corps accepts NRCS' analysis for purposes of the Food Security Act, mitigation for the

project has been based on the Corps' numbers, not NRCS' numbers. The commenter's concerns in this regard are misplaced.

Regarding the New Madrid Floodway flood control features, there are no acres that are 'drained' by this project. Draining in the sense of agricultural drainage means to install measures to remove water faster or more efficiently to allow for agricultural production or to intensify production. Several mitigation approaches proposed in this RSEIS 2 would actually serve to reduce drainage from wetland mitigation tracts (Sections 2.6.2.2., 2.6.2.4, 5.2.2.1, 5.2.2.2, 5.2.3.2, for example). Rather than 'drain' the area, the project will reduce backwater flooding.

Bohlen Comment 33:

In response to a Corps request, NRCS last fall "evaluated the St. Johns Bayou/New Madrid Floodway project for its effect upon wetland conservation provisions of the Food Security Act."[15] The agency did not develop a new estimate of the area of farmed wetland within the project area, but stated only, "Our sampling shows the original wetland inventory to be adequate for delineating farmed wetlands (FW) for planning purposes in the project area." The Corps justifies their return to the previously rejected estimate of the area of farmed wetland on that basis.

The letter from NRCS notwithstanding, there are significant problems with NRCS's original estimate of farmed wetlands within the project area, as acknowledged in the 2002 RSEIS. It is worth quoting from the 2002 RSEIS.

> The Bootheel region of southeast Missouri was one of the first areas to be mapped in accordance with the 1985 Food Security Act (Farm Bill). The 1989 mapping conventions were developed with a multi-agency team of U.S. Fish and Wildlife Service, Missouri Department of Conservation, and the NRCS. All determinations in the Bootheel were made off-site using four years of slides (1984-1989). Two sets (spring and summer) of slides were available, and NRCS chose to use the summer set of slides. These years also represent drought years, but that was not considered in making the determinations (pers. Comm., Pat Graham/NRCS).[16]

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[14] The Corps has provided no substantial justification for its claim that none of these wetlands will lose their jurisdictional status. Indeed, that claim appears implausible, especially with respect to those forested areas now flooded most regularly by the Mississippi River whose backwater flooding will be eliminated.

[15] Letter from Roger Hansen, State Conservationist, to Larry Sharpe, October 5 2005. and attached NRCS report.

[16] 2002 RSEIS Appendix D, Page D-4 and D-5

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Bohlen Response 33: The Corps did not "reject" NRCS' estimate of farmed wetlands in the project area. To ensure that the project was fully mitigated, the Corps chose to rely on its own conservative estimate of potential farmed wetlands. The Corps is relying on NRCS' analysis for purposes of the Food Security Act. However, compensatory mitigation is based on compensating for unavoidable significant impacts to fish and wildlife resources. This includes impacts attributed to reduced backwater flooding whether the area is a jurisdictional wetland, permanent waterbody, farmed wetland, or prior converted cropland. Please see Response to Bohlen Comment 37 below.

Bohlen Comment 34:

The RSEIS also points out that NRCS Food Security Act wetland determination rules have changed significantly since this estimate was first produced. In rejecting this estimate of Farmed Wetlands, the 2002 RSEIS states "The Corps did not want to underestimate wetland impacts by analyzing only impacts to a small portion of the land (0.4 percent) that was currently classified as farmed wetlands (FW)."

Thus the Corps, in abandoning its previous analysis has abandoned it in favor of a wetland determination

(1) that it previously rejected as an underestimate of farmed wetlands in the project area
(2) that was based on outdated mapping convention; and
(3) that was based on summer aerial photographs (after the period of spring flooding) taken in drought years.

For obvious reasons, such an estimate is likely to significantly underestimate the extent of farmed wetlands.

Bohlen Response 34: The Corps has not abandoned its previous analysis concerning wetland impact analyses. Wetland information with regard to farmed wetlands has been revised to reflect current information provided by NRCS (RSEIS 2 Section 4.4.3.1). As previously stated and in addition to direct impacts from project construction, mitigation is based on impacts from the reduction of backwater flooding (See Response to Bohlen Comment 37). Impacts were quantified on all areas regardless of jurisdictional status of the area and mitigation has been proposed accordingly.

Bohlen Comment 35:

> Reliance on this estimate for purposes of mitigation planning, which is the main context here, is inappropriate for several reasons. First, the Corp's method for estimating the extent of farmed wetland was based on hydrologic data, which is far more reliable than the indirect evidence derived from aerial photography used in generating the NRCS estimate for reasons discussed below. Second, the Corps cannot simply defer to the NRCS because the Corps and NRCS last October dissolved their Memorandum of Agreement whereby the Corps accepted NRCS wetland delineations. For determination of jurisdictional wetlands, the Corps' own wetland analysis must control. Thus the NRCS estimate, even if it were acceptable for NRCS purposes, cannot be accepted by the Corps over the Corps' own analysis for Corps purposes, including compliance with NEPA, the Water Resources Development Acts, , Section 404 of the Clean Water Act and Executive Order 11990.
>
> By regulatory definition, a farmed wetland is an area in agricultural use that has hydric soils and has a 50% probability of being inundated for at least fifteen consecutive days during the growing season. The determination of whether specific lands constitute farmed wetland is thus a matter of fact, and can in principal be determined unambiguously by site-specific determination of (1) whether the area is in agricultural production, (2) soil characteristics and (3) whether or not the area is inundated for the requisite days in most years. As a matter of practice, however, indirect methods must generally be utilized to estimate whether specific lands qualify. This is because in most contexts, evidence of the duration and frequency of flooding is lacking. Almost always, long-term hydrologic records that permit estimation of the long term probability of flooding are unavailable. A variety of indirect methods have been developed to substitute for this lack of information.

Bohlen Response 35: The Corps appreciates the commenter's confidence in the Corps' method for estimating the extent of farmed wetlands in the project area. The Corps continues to rely on this estimate to determine compensatory mitigation. However, NRCS makes certified farmed wetland determinations. In the 2002 RSEIS, NRCS expressed some concern about the potential effects that new mapping conventions might have on their estimate. NRCS has taken a fresh look at the area, employing their new mapping conventions and they have clearly stated that they estimate that only 0.4% or about 520 acres are potentially farmed wetlands within the project area (See Response to Bohlen Comment 37 below). The jurisdictional status is relevant for determining whether the proposed mitigation is adequate for purposes of the Food Security Act, as confirmed by NRCS. Based on the Corps' HGM and its own reanalysis, NRCS has determined that the Corps' mitigation is adequate for that purpose and the Corps relies on that determination. See the Response to Bohlen Comment 43 below.

Bohlen Comment 36:

In the present situation, however, excellent information on the frequency and duration of flooding exists. 32 years of data on Mississippi River stage can be used with great reliability to determine the duration and extent of flooding in the project area. Extensive hydrologic modeling has been carried out based on this 32 year period of record to support project design. The economic and environmental analyses for the project rely on this data. Thus the Corps has data that can be used to directly and simply determine what lands will be inundated for a period of 15 days during the growing season in most years.[17] It was precisely such an analysis that was used to produce the estimate in the 2002 RSEIS that 9700 acres of farmed wetlands occur within the project area. The original Corps analysis is significantly more robust in terms of determining the extent of areas meeting the hydrologic criteria of farmed wetlands than is the method used by NRCS. (The inherent limitations and particular weaknesses of the NRCS analysis as applied to this project are discussed further below.)

[17] This form of analysis may leave out wetlands in higher elevations flooded solely by local rainfall. It may therefore underestimate farmed wetlands, but it will not overestimate farmed wetlands.

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Bohlen Response 36: The Corps agrees that the 2002 RSEIS, in particular Tables 4-1 and 4-2, indicates 9,700 acres of cropland within 'wetland' tables. Since the comment apparently reflects confusion regarding the data presented of the tables, perhaps these cropped areas could have been presented more clearly as a mixture of farmed wetlands and prior converted cropland. However, Response to Bohlen Comment 37 below and Section 4.2.1.2 of the RSEIS 2 explain the goal of the hydrologic analysis with respect to farmed wetlands. The 2002 RSEIS stated that this was to avoid underestimating the actual farmed wetland acres affected by the project (2002 RSEIS Appendix D, page D-5, second paragraph). However, mitigation in the RSEIS 2 is still based on the Corps' hydrologic analysis.

Regarding wetlands that are flooded only by local rainfall, these potential wetlands will not be impacted by the project, which only reduces backwater flooding. Therefore, whether these wetlands are included or not does not affect the analysis.

Bohlen Comment 37:

> Not only is the approach taken by the original Corps analysis to determining hydrologic characteristics the "gold standard" for determining wetland hydrology but it is also established as the first method for doing so in the 1987 Corps Wetland Delineation manual, which is still in effect. Under that manual, areas that meet hydrologic criteria according to this kind of analysis are deemed to have wetland hydrology. In this case, there is also no dispute that all the areas identified in this way also have hydric (i.e., wetland) soils – and that is confirmed by the NRCS analysis. The Corps admission that 9700 acres are flooded long enough to meet the farmed wetland criterion is therefore conclusive.

Bohlen Response 37: The characterization of the Corps' inundation analysis is appreciated, and the Corps agrees and has consistently stated that the forested areas in question have sufficient hydrology from backwater flooding to meet the Corps' 1987 Wetland Delineation Manual hydrologic criteria. However, the Corps neither performed any ground-truthing of cropland to verify hydrology, nor determined whether any areas also meet the hydric soils criteria to be classified as wetlands, farmed or otherwise. Rather, the Corps assumed that areas estimated to have the necessary hydrology were wetlands and calculated impacts and maximized mitigation accordingly. Based on the hydrology, the Corps estimated that up to 9,700 acres of potential farmed wetlands existed in the project area. This estimate is "conclusive" of nothing more than that, and certainly is not a basis for saying that 9,700 acres of farmed wetlands are located in the project area.

The hydrological inundation analysis was based on Mississippi River stages, contours of the land, and other source of hydrology (2002 RSEIS Appendix C). The comment that there is "no dispute" that all the areas have hydric soils overstates the situation. The Corps did not evaluate whether these acres had hydric soils and the NRCS relied on its mapping conventions. In the absence of empirical data, the absence of dispute on the matter cannot be assumed. However, whether these lands have hydric soils or not is not an issue because the Corps assumed for the purpose of analysis that if the hydrology was there, the other wetland criteria were present as well (2002 RSEIS, Page D-2, Assumption 3). Therefore, the Corps' analysis was conservative.

NRCS is the agency charged with responsibility for jurisdictional determination of farmed wetlands.

The "admission" that 9,700 acres have the hydrology to be classified as farmed wetlands, and to complete that thought, that 6,713 of those acres would lose that hydrology due to reduced backwater inundation, was a conservative approach to develop an estimate of maximum potential farmed wetland impacts (See 2002 RSEIS Tables 4-1 and 4-2). It was not a jurisdictional wetland determination of farmed wetlands. Therefore the Corps' "admission" cannot be "conclusive" on this point. Based on the NRCS' estimate of project area farmed wetlands using current mapping conventions, a substantial portion of

those 6,713 acres are likely prior converted cropland and not farmed wetland (See NRCS letter of October 5, 2005, RSEIS 2 Appendix G).

Additionally, the NRCS has completed one certified determination within the project area (RSEIS 2 Appendix F, Attachment 4). This particular area would have been classified as potential farmed wetlands by the Corps' inundation analysis. However, the results of the certified determination concluded that the area is prior converted cropland (See Bohlen Response 44 below).

The Corps has consistently favored the environmental resources in all of its analyses for this project. The Corps continues to base mitigation for wetlands on its inundation analysis, so the jurisdictional characterization of the acres in question is irrelevant. In other words, the Corps recognizes that it is most likely proposing mitigation for hydrological impacts on a substantial number of prior converted croplands.

Bohlen Comment 38:

B. The HGM analysis is similarly flawed.

Although the 2005 DSEIS truly justifies the proposed mitigation by the use of models focused on individual aquatic functions, the RSEIS2 now includes a separate kind of analysis to evaluate impacts on wetlands per se. This analysis is a modified form of the Hydrogeomorphic Method or HGM. Like any HGM-based functional assessment, it is based on a "Regional Guidebook", in this case, Klimas at al. 2004, A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Forested Wetlands in the Delta Region of Arkansas, Lower Mississippi River Alluvial Valley.

I applaud the decision by the Corps to use this well documented method for determining wetland functions to evaluate project impacts and consider mitigation alternatives. Although the project area lies outside the reference domain of the Regional Guidebook, and thus it cannot be demonstrated based on reference wetlands that the method is valid, I must defer to local experts with respect to whether application of the regional guidebook to the project area is reasonable. There is much to be commended in this effort to use an HGM analysis to evaluate wetland mitigation requirements. Unfortunately, its use here to argue that wetland impacts of the project would be fully mitigated is flawed for four reasons.

Bohlen Response 38: The Corps' wetland analysis is set out in the RSEIS 2 Section 4.2.1. As explained in detail there, the Corps made an estimate of the agricultural lands which would experience reduced inundation and, for planning purposes, assumed that this entire area consisted of wetlands. The NRCS said that the Corps' estimate of 6,713 acres of impacts to farm land was good for planning purposes (2002 RSEIS Tables 4-1

and 4-2). The NRCS' own estimate of the farmed wetlands in the project area using their own mapping conventions was 0.4% (or 520 acres based on the Corps GIS data).

When the Corps withdrew the ROD and reconsidered project impacts, the NRCS was asked to provide additional information on wetland impacts and the sufficiency of the Corps' proposed mitigation. In order to make a statement regarding the sufficiency of mitigation, the NRCS asked that the Corps conduct an HGM analysis to determine the impacts of the project on the various wetland functions provided by farmed wetlands. This is the method of analysis preferred by NRCS. The Corps complied and in addition, used HGM on the area of direct impacts (under the footprint of the project). The results of the HGM analysis and NRCS' reevaluation using current mapping conventions confirmed the NRCS' previous estimates of the farmed wetlands in the project area, the functions they perform, and the adequacy of the Corps' mitigation. This request is explained in Section 4.4.3.1 (4th paragraph), and also related text in Sections 4.2.1.2 and 4.2.1.3 of this RSEIS 2. The HGM Guidebook to the Delta Region of Arkansas is applicable for use in the St. Johns Basin and New Madrid Floodway project area (See RSEIS 2 Appendix D, Assumption 1).

This and other comments suggest that the Corps is relying on the NRCS' estimate to calculate mitigation. This is not the case. The Corps has used NRCS' estimate of area wetlands to determine a baseline for required wetland mitigation. However, the Corps is actually proposing a higher number of acres of mitigation than would be suggested using only NRCS' estimate (RSEIS 2 Section 5.2).

Bohlen Comment 39:

The biggest problem by far is not a flaw with the HGM analysis per se but lies in the limited acreage of wetlands to which it was applied. The HGM analysis was applied to only a tiny subset of the wetlands that will be altered by the proposed project, and thus dramatically understates the cumulative wetland impacts. The Corp's HGM analysis assumes that the only wetland impacts are on 622 acres of wetlands (102 acres of direct impacts and 520 acres of indirect effects to farmed wetlands (following the NRCS estimate of farmed wetland area in the project area). However, it has been well documented that hydrology of many times as many acres of wetland will be significantly altered.[18] In previous testimony, I have argued that the actual area of wetlands that will experience reductions in flooding and other alterations of hydrology is likely to be substantially higher. The Corps has chosen not to evaluate the functional losses associated with these hydrologic changes, although (1) basic principals of wetland ecology hold that they will be substantial, and (2) the very HGM model used in the RSEIS2 indicates that reduction in flooding has a major impact on wetland functions.

The Arkansas Regional Guidebook for the HGM used by the Corps in the RSEIS2 includes assessment models for 7 wetlands function categories. Hydrologic variables are an explicit component of six of the seven and frequency of flooding – explicitly "overbank or backwater flooding from a stream"[19] – is a component of four: Detain Floodwater, Export Organic Carbon, Remove Elements and Compounds, and Provide Habitat for Fish and Wildlife.[20] For three of these four functions (fish and wildlife habitat is the exception), the FCI score (the estimate of relative wetland function in HGM) is essentially proportional to the frequency of flooding[21], Sites that are flooded only once every five years are estimated to provide only one quarter of these functions compared to sites flooded on at least every two years. The HGM model makes it quite plain: significantly reduced backwater flooding from the Mississippi on forested wetlands throughout the project area will significantly reduce wetland function.

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18 The 2002 RSEIS identified 13,205 acres of jurisdictional wetlands within the project area that would experience "reduced inundation" under project alternative 3-1.A. 2002 RSEIS, Appendix D, page D-9. (No estimate was stated for project alternative 3-1.B., which would be mostly reduced). This estimate was based not merely on an improperly limited estimate of wetland acres, but also on an improper definition of "reduced inundation." It referred only to areas that would not be flooded long enough to meet jurisdictional wetland criteria. Other wetland acres would still have reduced inundation but would not cross that particular threshold.

19 Regional Guidebook, page 121.

20 Changes in frequency of flooding can also be anticipated to lead to gradual changes in remnant forested wetlands throughout the project area, as has been observed in and around Big Oak Tree State Park.

21 Strictly speaking, the FCI score is proportional to the frequency of flooding subindex, V_{FREQ}.

Bohlen Comment 39 (continued):

The Corps chooses not to evaluate these wetland impacts at all on forested wetlands, apparently on the basis of their claim that none of the forested wetlands in the project area will be converted from jurisdictional to non-jurisdictional status. While I disagree with that premise, even if it turned out to be true, significant wetland functions will be lost even on wetlands that retain their jurisdictional status. Under Section 404 of the Clean Water Act and the Section 404(b)(1) guidelines, impacts to wetlands may occur not merely from their direct filling or complete elimination but also from other consequences of project construction and such impacts are generally considered in determining compensation requirements. The partial HGM analysis presented in the RSEIS2 ignores these impacts on vegetated wetlands, and relies on a flawed estimate of the extent of farmed wetlands. The analysis is therefore wrong and seriously understates the extent of wetland functional losses associated with the project.

If the HGM analysis were applied to the true extent of wetland impacts on thousands of acres of wetlands, it would almost certainly show that proposed mitigation fails to compensate for wetland impacts. The HGM analysis shows that more than one acre of reforestation is required to make up for each acre of wetland impact on both farmed and vegetated wetlands. A realistic accounting of wetland impacts will therefore show that tens of thousands of acres of reforestation are required to compensate for the projects full wetland impacts.

Bohlen Response 39: Although the 404(b)(1) guidelines do not require an HGM analysis, the Corps did perform an analysis of impacts of the project on wetlands (2002 RSEIS Appendix F). The comment is correct in that the HGM analysis was not applied to the entire project area. The Corps chose to utilize a different methodology in analyzing functional losses of the wetlands. In conducting its 404(b)(1) analysis, the Corps began by quantifying potential wetland areas that would be impacted. The 300-foot NGVD contour was chosen as the maximum practical extent of flooding due to backwater events (which correlates to in excess of a 70-year flood in the St. Johns Basin and excess of a 30-year flood in the New Madrid basin). The number of acres within the 300-foot contour was calculated by using GIS topographic data coupled with an inundation analysis (WETSORT). WETSORT provided the elevation at which water was expected to be present for 12 consecutive days in 50% of the years (for non-agricultural lands)[4] or 15 consecutive days in 50% of the years (for agricultural lands).[5] See 2002 RSEIS Appendix C, page C-5 for a description of the WETSORT process. These elevations were applied to the GIS data resulting in the number of acres in various land cover types meeting the hydrologic inundation criteria (forest, scrub/shrub marsh, herbaceous vegetation, cropland, pasture, sandbars, urban, and open water) (See 2002 RSEIS Section 4.3.1).

[4] This meets the inundation criterion for jurisdictional wetlands under the 1987 Corps of Engineers Wetland Delineation Manual.

[5] This meets the inundation criterion for farmed wetlands under the Swampbuster provisions of the Food Security Act. However, this does not take into account that most of these acres are designated as prior converted croplands.

The Corps, USFW, and MDC ("HEP team") agreed upon the techniques to analyze the functional characteristics of the impacted lands. This team selected aquatic and terrestrial HEP and WAM to evaluate impacts to forested wetlands. Scrub/Shrub/ Marsh habitats were evaluated using the terrestrial and aquatic HEP models. Cropland, pasture, and herbaceous habitats were evaluated using the shorebird and aquatic HEP and WAM. Open water was evaluated using the aquatic HEP. All habitat models were developed by the USFWS. The HEP team jointly selected and agreed on sample sites and the impacts of each alternative (2002 RSEIS Appendix D, page D-13).

Furthermore, in response to the concern that there were other wetland functions that were not fully evaluated (particularly with respect to water quality issues), the Corps commissioned WES to study nutrient cycling, groundwater recharge, floodwater storage, sediment retention/export and nutrient and sediment input of the project on Big Oak Tree State Park (2002 RSEIS Appendix D, page D-14). The results of this study can be found in the 2002 RSEIS at Appendix I.

The Corps' analysis was completely adequate for the Corps' purposes. However, the Corps asked NRCS to confirm its prior estimate of the farmed wetlands in the project area and to advise whether the project's impacts to those wetlands were adequately mitigated. To perform the requested analysis, the NRCS in 2005 requested an HGM assessment be conducted on farmed wetlands to determine if compensatory mitigation was adequate. The Corps performed the HGM and furnished the results to NRCS. NRCS confirmed its previous estimate of the number of acres of farmed wetlands and stated that the Corps' mitigation was "more than adequate." (NRCS letter, dated October 5, 2005, see RSEIS 2 Appendix G).

Neither the Clean Water Act nor the Swampbuster provisions of the Food Security Act regulate prior converted cropland. However, the Corps' mitigation proposal is based upon project impacts to resources and not the jurisdictional status of those resources.

Bohlen Comment 40:

The second major problem with the HGM analysis is that a proper HGM analysis cannot be made until the Corps identifies specific mitigation sites. HGM analyses generally, and HGM analysis under the Arkansas Delta Regional Guidebook in particular ordinarily rest on detailed site-specific analysis incorporating substantial field work. This can be seen clearly when one examines HGM Regional Guidebooks and is clearly evident when one participates in field training on HGM methods. The Arkansas Regional Guidebook includes twenty separate assessment variables, many of which cannot be determined based on map data or remotely sensed information alone. But no field work was carried out in this case. Furthermore, the express intent of the HGM protocols is that they be applied on a site-specific basis.[22] And application of the method on a site specific basis – at least with regard to mitigation sites – is not possible until such time as mitigation sites have been specified. It would be more appropriate to say, therefore, not that an HGM analysis was carried out, but that an analysis was carried out to estimate what the results of an HGM analysis might look like if one were actually carried out. This distinction is far from trivial. It is a fundamental premise of the HGM method that wetland functions vary site to site based on site characteristics, a position consistent with both principals of wetland ecology and the findings of the National Academy of Sciences report on wetland mitigation. On the whole the HGM approach to wetland functional assessment thus reinforces the comments I have consistently made

[22] The first sentence of the introduction of the Arkansas Regional guidebook is the following: "The Hydrogeomorphic (HGM) Approach is a method for developing functional indices and the protocols used to apply these indices to the assessment of wetland functions at a site-specific scale."

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that a proper mitigation analysis requires a detailed mitigation plan with site-specific information.

Bohlen Response 40: See Response to Bohlen Comment 39 above. The Corps did not perform an HGM analysis of the entire project area, is not required to do so, and does not propose to do so. The Commenter is suggesting that the Corps is required to provide a detailed mitigation plan for this RSEIS 2. This is not required (RSEIS 2 Sections 4.5.2, 4.5.3, 4.5.4, and 6.3). See also 2002 RSEIS Appendix M, pages M-11 – 12 and Responses to Bohlen Comments 49, 50, 51, 54, and 55.

Bohlen Comment 41:

> The third problem is that, in the absence of site-specific information on mitigation sites, the HGM analysis was forced to rely in analysis of "generic" impact and mitigation sites. While the analysis makes a assumptions that are for the most part well crafted, ther is one critical exception. The appendix nowhere describes what hydrologic conditions – and in particular what frequency of flooding –were assumed to apply to sites of wetland impact and to mitigation sites. It appears to assume that mitigation sites will be regularly flooded to provide maximum wetland functions.Yet we know (1) that frequency of flooding has a significant effect on wetland functions, and (2) that the potential mitigation sites that have been identified in the New Madrid basin include areas that are infrequently or never flooded by backwater. The key assumption therefore appears to be counterfactual.

Bohlen Response 41: The HGM report the Corps provided to NRCS specifies that both the impact site and the mitigation site are assumed to be frequently-flooded, riverine backwater settings; it does not describe the specific flood frequency used in the assessment (RSEIS 2 Appendix D, page 207, assumption (b)). In fact, however, a 2-year flood zone was assigned to both impact and mitigation sites. As indicated in the 2002 RSEIS, potential wetland mitigation land will be pursued within the post-project 2-year flood zone (See RSEIS 2 Section 2.2 and 2002 RSEIS Section 5.3.2, 11th paragraph). The 2-year frequency designation produces the maximum functional effectiveness for the frequency variable in all models in which frequency is a component. Refer to Response to Bohlen Comment 39 above regarding the higher functionality within the 2-year floodplain as cited in the Arkansas Regional Guidebook.

Bohlen Comment 42:

> Finally, the HGM model (at least as applied in this, "generic" form) assigned no habitat value to farmed wetlands. Yet, in this case, there is no dispute that farmed wetlands have substantial habitat value, as reflected in the Corps HEP analyses For this reason, the HGM cannot address impacts on lost fish and other habitat functions of the wetlands. Loss of habitat values are indisputably a form of impact to wetland, and must be compensated. In the present case we know that the HGM analysis is structurally unable to represent these functional losses, and thus we cannot rely on the HGM analysis alone to be certain that all significant wetland functions are effectively mitigated. The HGM analysis cannot stand alone as a complete assessment of wetland impacts. The , merits of the Corps' overall wetlands impact analysis thus continues to depend on the merits of the fish and other HEP models and the adequacy of the mitigation proposed based on those models

Bohlen Response 42: Concur. The Corps' analysis recognizes the habitat value of farmed wetlands without qualifying it as "substantial."

Bohlen Comment 43:

C. The NRCS wetland analysis for Swampbuster purposes is also flawed.

I have reviewed the NRCS report and underlying maps used to reassess wetlands in the project area in October of 2005. It confirms that the NRCS analysis of wetlands is flawed for Swampbuster purposes as well.

The definition of a "farmed wetland" is identical for Swampbuster and Clean Water Act purposes. The definition, as stated above, requires that wetlands have hydric soils and be flooded for a period of at least 15 days during the growing season. Since there is no question that potential farmed wetlands in the project area have hydric, i.e., wetland, soils, the only question is whether particular parcels are inundated for 15 consecutive days at least every other year on average during the growing season. That is known as the test of wetland hydrology.

Bohlen Response 43: Please see the preceding Responses to Bohlen Comments 37 (as to the commenter's "no question" the soils are hydric), 41, 42, 44 and Environmental Defense Response 11. Additionally, refer to RSEIS 2 Section 5.2.

The NRCS and the Corps have not made certified farmed wetland determinations for this project. The NRCS performed a review using current mapping conventions to verify the previous estimate of farmed wetlands in the project area was still reasonable (NRCS May 29, 1998). This was conducted to ensure that the flood damage reduction project and the proposed compensatory mitigation would not result in Swampbuster violations.

Bohlen Comment 44:

Note that this standard is a numerical one that hinges on hydrologic conditions. In the current situation, the Corp's hydrologic modeling for project planning has

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examined hydrologic conditions – at least with respect to backwater flooding – with unusual precision based on the most reliable form of evidence of site hydrology that is virtually ever available. We thus know, to a degree unusual in wetlands-related work, exactly what lands meet the hydrologic criteria for being designated farmed wetland. The indirect methods employed by the NRCS in their recent partial re-evaluation of the extent of farmed wetland in the basin is far less reliable for determining hydrologic condition than is direct hydrologic modeling.

Disregarding the Corps' direct evidence of wetland hydrology, the NRCS applied an indirect form of evidence for wetland hydrology or the lack of it. On a sampling of sites, it has used aerial photographs taken of crops in years that reflect dry and wet years based on local rainfall. Based on those aerial photographs, it looked for signs of crop stress, delayed planting, and other indications of excessive wetness. While this may comply with NRCS's standard approach to wetland determination, the method is a much less reliable way to determine site hydrology than the evidence gathered by the Corps. The NRCS hydrologic indicators are indirect and the analysis is based on data from only a handful of years, while the Corp's original method was based on direct estimates of flooding based on a 32 year record. No wetland scientist could credibly prefer the NRCS analysis in this case to the direct data provided by the Corps.

Bohlen Response 44: The Corps' hydrologic model estimated that construction of the flood damage reduction project would decrease inundation on a total of 1,296 acres and 5,417 acres of agricultural lands that could meet the 15-day hydrologic criterion for farmed wetlands within the St. Johns Bayou Basin and the New Madrid Floodway, respectively. This model was utilized for planning purposes and was not intended to make certified wetland determinations. This model does not equate to on-site verification. Additionally, the model did not account for other wetland features such as the presence or absence of hydrophytic vegetation, or hydric soil indicators (*i.e.,* histosol, histic epipedon, sulfic odor, aquic moisture regime, reducing conditions, gleyed or low chroma colors, concretions, high organic content in surface layer in sandy soils, organic streaking in sandy soils, listed on local hydric soils list, listed on National hydric soils list, and other soil factors). Put simply, on the basis of elevation alone, the Corps' model set the outer boundaries of the acreage that could be considered to meet the jurisdictional definition of "wetlands" based on backwater inundation. This included the assumption that 100% of the agricultural areas that meet the 15-day hydrologic criterion had hydric soils.

NRCS confirmed that the Corps identified the maximum area that could experience flooding for 15 days (289.0 and 288.3 NGVD in the St. Johns Basin and the New Madrid Floodway, respectively) and could therefore potentially be farmed wetlands from backwater effects only. NRCS then used aerial photographs, Farm Service Agency compliance slides and other tools to determine whether particular areas within the Corps' maximum area actually would be farmed wetlands (i.e., actually were flooded and had hydric soil). Farm Service Agency compliance slides were selected that represented wet, normal, and dry precipitation years. Farmed wetland signatures (*e.g.,* drowned crop, standing water) were interpreted from the compliance slides. NRCS has identified areas within the Corps' backwater flooding zone that are not farmed wetlands, because — 1) they contain non-hydric soils, 2) they have been previously manipulated, or 3) they lack other characteristics of farmed wetlands, such as stressed vegetation, that were not observed during an on-site determination. The NRCS estimated that 0.4% of the entire project area actually would be considered to be farmed wetlands.

The NRCS has stated that the most reliable method to make farmed wetland determinations is to conduct an acre by acre analysis with current mapping conventions to obtain exact data (NRCS letter, October 5, 2005). The Corps agrees with this statement and most wetland scientists would agree as well. However, the Corps did not make jurisdictional determinations for the purposes of calculating damages or mitigation, since jurisdictional status was not critical information for these purposes. The Corps has utilized its hydrologic data to estimate the extent of flood damages and determine unavoidable impacts to significant fish and wildlife resources.

Using the Corps 15-day crop season flood area shape files and the hydric interpretation files for the New Madrid and Mississippi County SSURGO soils files, NRCS determined the percentage of the 15-day flood area that is all hydric and the areas that contain non-hydric soils. Of the St. Johns Basin 15-day flood cropland, 4% contains non-hydric soils. The 15-day flooded cropland in the New Madrid Floodway has non-hydric soils in 8% of the area. This reaffirms that the Corps estimate is the maximum area of potential farmed wetlands using only one of the additional NRCS criteria described above.

Pursuant to its statutory responsibilities, the Corps is aware that NRCS has made three certified determinations within the project vicinity. Two determinations were made outside of the project area in the vicinity of Wilson City and north of New Madrid adjacent to Interstate 55. The remaining determination was made adjacent to the Ten Mile Pond Conservation Area (RSEIS 2 Appendix F, Attachment 2). Based on Corps' GIS data, elevations in this area are approximately 285 - 288 feet NGVD. This area was classified as potential farmed wetlands by the Corps' hydrologic model. However, the results of the NRCS certification indicate that the majority of this area adjacent to Ten Mile Pond is prior converted cropland.

Bohlen Comment 45:

The NRCS standard approach to wetland determinations appears largely irrelevant in the present context. The NRCS used photographs from a small number of years, including "wet years" to identify wetlands. Following standard NRCS practice, "wet years" were identified by local climate data. However flooding in the project area is not dominated by precipitation, but by backwater flooding. The dominant cause of river flooding is not local rainfall, but precipitation in the Ohio River and upper Mississippi River valleys. Thus selection of aerial photographs on which to base wetland determinations does not take into consideration the primary source of flooding in the project area and is technically unjustified.

Bohlen Response 45: NRCS' standard approach is not irrelevant to the purposes for which it was used. The Corps asked NRCS to verify their prior estimate of the number of farmed wetlands as determined under Swampbuster in the project area and to state whether the Corps' proposed mitigation was adequate to avoid the possibility of Swampbuster violations. Each of these questions is committed to the NRCS' expertise by statute, and NRCS properly used its standard approach to answer these questions.

The NRCS' estimate took into account precipitation, backwater flooding, hydric soils, aerial photography, and Farm Service compliance slides. The Corps' estimate included hydrologic inundation only and represents the maximum number of acres that could meet the inundation criterion.

Bohlen Comment 46:

The hydrologic characteristics of river floodplain wetlands makes it difficult for the NRCS to distinguish farmed wetlands from uplands using its standard method. The project area, like many large river floodplains, receives an extended, strongly seasonal period of inundation, often followed by rapid drop in water level. This fact means that areas that are inundated for the requisite 15 days can generally be successfully planted with crops (such as soybeans, which mature rapidly) a few days after floodwaters have receded. Under these circumstances, signs of crop stress due to wetness are unlikely to be observed, because the dominant period of wetness occurs before planting in almost all years. Similarly, when planting is delayed, it will be delayed a similar amount throughout extensive areas of floodplain, making visual evidence of such a delay difficult to observe.

The likely flaws with the NRCS method were directly confirmed by the NRCS in its report to the Corps on wetlands identified. This report stated that the NRCS method failed to identify any wetlands created by backwater flooding. The report says on page 2:

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Bohlen Comment 46 (continued):

> 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. Johns Bayou (no headwater flooding was observed). Most wetland signatures were due to inundation or moisture due to precipitation & local flooding events. (emphasis supplied)

Since the NRCS analysis was unable to detect areas of backwater flooding in an area where it is known to be significant, it must provide a very poor estimate of areas inundated by backwater flooding. Indeed, the analysis probably provides a better estimate of areas that will retain wetland characteristics after project completion than it does of the total area of lands inundated by floodwater at least 15 days today.

Wetland scientists acknowledge a hierarchy of proof of hydrology. The Corps' evidence, based on 32 years of hydrologic records and extensive modeling is as direct evidence of the duration and frequency of flooding as it is possible to get without years of on-site monitoring. The NRCS method is far less reliable in general, and is especially so in the context of a large river floodplain. There is no scientific basis for disregarding the Corps' hydrologic data.

Bohlen Response 46: Wetland scientists acknowledge that there are three variables in determining wetlands (hydrology, vegetation, and soils). All three variables make up the scientific basis in determining what is and what is not classified a jurisdictional wetland (See 1987 Corps Wetland Delineation Manual).

NRCS' standard analysis utilizes many different variables to estimate farmed wetlands from prior converted cropland or uplands (See Bohlen Response 44).

The Corps requested NRCS to determine if the proposed mitigation was adequate for Swampbuster provisions, not to make certified determinations on the amount of farmed wetlands in the project area.

Bohlen Comment 47:

> The Corps has used the same hydrologic analysis to estimate flood problems, the extent of flood protection benefits, economic and environmental costs and mitigation. In particular, the Corp's hydrologic analysis underlies estimates of the economic benefits of reduced inundation to farmland that may result from delayed planting or crop stress. If the NRCS analysis were correct (that effects of flooding on crops occur on almost no lands in the project area), it would logically follow that the Corps' analysis of project economic benefits must be wrong. And if the NRCS were correct that areas are seldom flooded with the frequency and duration reported by the Corps, then all the environmental analyses, including the mitigation analyses, must be wrong as well. But neither agency has challenged these underlying Corps analyses.. It is therefore not only technically invalid but logically inconsistent to reject the Corps' direct hydrologic evidence and the estimate of the extent of farmed wetlands that stems from it.

Bohlen Response 47: The Corps concurs that its hydrologic analysis was used to estimate flood problems, extent of flood protection benefits, economic and environmental costs and mitigation. Agricultural economic benefits are derived from the reduction in the duration and frequency of flooding. Flooding occurs on project area lands regardless of their jurisdictional status as prior converted cropland, farmed wetlands, or other lands. Reducing that flooding produces economic benefits, also without regard to jurisdictional status. The Corps' hydrologic analysis did not determine the jurisdictional status of farmland tracts. Rather, on-site delineations of wetlands on particular fields are necessary to determine jurisdictional status.

The Corps has consistently utilized its hydrologic model to determine significant unavoidable impacts to fish and wildlife resources from the flood damage reduction project. All unavoidable impacts (direct from channel enlargement and fill and indirect from the reduction of backwater flooding) were quantified based on the hydrologic model and appropriate habitat model, not by the jurisdictional status of a particular tract of land.

The Corps requested NRCS to determine if the proposed mitigation was adequate for Swampbuster provisions. NRCS requested a functional assessment on the proposed farmland. Additionally, NRCS provided estimates on the acres of farmed wetlands that have the potential to be impacted by the project. NRCS' analyses indicated that 0.4% of the project area (520 acres) is farmed wetlands (See RSEIS 2 Section 4.5.1). Based on the functional assessment, impacts to farmed wetlands could be mitigated at a ratio of 1.53 acres of mitigation for every acre of impact (RSEIS 2 Section 5.2). Therefore, impacts to farmed wetland would be fully mitigated by reforesting 796 acres of cropland using the NRCS estimate.

However, the Corps is not utilizing NRCS' estimate on farmed wetlands in the area and the results of the HGM analysis to determine appropriate mitigation. The Corps is proposing to compensate for impacts associated with a reduction of flooding on

farmland regardless of jurisdictional status at a ratio 1 acre of reforestation to every acre of impact. Therefore, impacts to farmland will be compensated by reforesting 6,713 acres of farmland (RSEIS 2 Section 5.2). Additionally, the Corps is proposing to monitor all mitigation sites to ensure that the sites are functioning as designed (RSEIS 2, Section 6.5).

NRCS concluded that the Corps of Engineers' projections of the affected wetlands and resulting mitigation are more than adequate for NRCS wetland conservation provisions of the Food Security Act (see RSEIS 2, Section 4.3.1.1, and Appendix G). The Corps' remains confident of NRCS' conclusion.

Bohlen Comment 48:

V. THE PROPOSED MITIGATION REMAINS INCONSISTENT IN BASIC WAYS WITH MITIGATION REQUIRED BY THE CLEAN WATER ACT

In a variety of ways, the proposed new mitigation continues to be inconsistent with mitigation required of private parties under the Clean Water Act. I covered these issues in my previous testimony, and the basic issues have not changed. In fact, the current RSEIS2 moves farther away from acceptable mitigation practice.

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Failure to identify specific mitigation site with specific mitigation plan: Recent EPA and Corps guidance has reaffirmed the critical requirement that a relatively detailed mitigation plan be available before the granting of a permit under Section 404 of the Clean Water Act for permits that require mitigation.[23] This guidance was issued in part in response to a National Academy of Sciences study,[24] and a mitigation action plan developed by the two agencies.[25] Recent conversations with officials at EPA responsible for developing wetlands mitigation policy confirm that a detailed site-specific information is required as a matter of standard practice for virtually all private mitigation.

Bohlen Comment 48 (continued):

[23] USACE, EPA, NRCS, FWS, and NOAA (1995). Federal guidance for the establishment, use, and operation of mitigation banks. Federal register November 28, 1995 (Volume 60, Number 228), pp 58605-58614.

USACE New England District Regulatory Division. 2002. Checklist for review of mitigation plan, and Introduction: Performance Guidelines and Supplementary Information on the checklist for review of mitigation plan. U.S. Army Corps of Engineers New England District Regulatory Branch. Revised 4/1/2002.

U.S. Army Corps of Engineers. (2001). Guidance for the establishment and maintenance of compensatory mitigation projects under the Corps regulatory program pursuant to Section 404(a) of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. Regulatory Guidance Letter 01-1. October 31 2001.

U.S. Army Corps of Engineers. (2002). Guidance on compensatory mitigation projects for aquatic resource impacts under the Corps regulatory program pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. Regulatory Guidance Letter 02-2. December 24, 2002. Avalable at http://www.usace.army.mil/civilworks/cecwo/reg/flexible.htm.

[24] National Research Council. 2001. Compensating for Wetland Losses

[25] EPA and USACE. 2002. Mitigation Action Plan. Available at http://www.mitigationactionplan.gov/.

Bohlen Response 48: See Responses to Zedler Comments 4, 15, and 16. See also RSEIS 2 Section 4.4.3.1 and 33 C.F.R 335.2. As stated in RSEIS 2 Section 4.5.2, Federal Civil Works Projects compensate for unavoidable impacts to fish and wildlife resources, but do not follow the requirements applicable to private applicants under the Regulatory 404 Program. The mitigation proposed for the project exceeds what is normally required for 404 applicants. Specifically, the Corps is proposing to mitigate for damages to prior converted cropland. The 404 Program would generally not require any mitigation for impacts to these areas.

The citations in the comment refer to regulatory guidance. This Civil Works project has complied with Federal Laws in the development of mitigation and the referenced guidance has been used during development of compensatory mitigation measures (see Zedler Responses 4, 15, and 16).

Furthermore, the WQ certification requires that the project will not be operated until all mitigation lands have been acquired and all detailed site-specific mitigation plans approved by MDNR demonstrating that all significant unavoidable impacts to fish and wildlife resources have been compensated to the extent justified. This is a more than reasonable safeguard to ensure that all significant impacts are compensated while still meeting the Federal water resource planning objective 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 and Federal Law concerning compensation of unavoidable impacts to significant fish and wildlife resources.

Bohlen Comment 49:

> There are two reasons for this requirement. First, without evaluation of a specific site and specific plans for carrying out mitigation on that site, there is no way to evaluate the likely functions that the mitigation site will provide or the likelihood of mitigation success. Both are strongly influenced by site-specific factors. I discussed the strong effect that location may have on wetland functions briefly in the context of the HGM analysis. The point, however, is more general. Wetland functions are generated by site-specific processes, and it is impossible to determine what functions will be provided by mitigation without knowing where the mitigation will be carried out or the likelihood of success. That determines no only what kinds of acres are acceptable for mitigation but the mitigation ratios.

Bohlen Response 49: See Response to Bohlen Comment 48 and the references therein. The Corps concurs that site-specific areas are necessary to determine precise gains in wetland functions as well as benefits to fish and wildlife resources. As we have said before, WRDA 86 requires that mitigation sites be purchased from willing sellers. Willing sellers cannot be identified until a ROD is signed that decides to recommend a project for construction and funds are appropriated. NEPA does not require site-specific detailed mitigation plans. However, conservative estimates regarding likely gains in function and habitat have been made throughout the RSEIS 2. Therefore, based upon reasonable scientific assumptions applicable to the study area, there is a high likelihood that mitigation as discussed in the RSEIS 2 will provide more than the necessary habitat value required to compensate for project. The law requires that mitigation be provided concurrently with construction. The Water Quality Certification requires that mitigation lands be acquired and detailed mitigation plans be approved before the project elements are operated. Additionally, mitigation may be adjusted as a result of monitoring efforts and adaptive management to ensure that mitigation sites are functioning as designed and producing the desired habitat outputs. Mitigation will ultimately be accomplished when impacted habitat values are replaced, not when a certain quantity of acres is procured.

Bohlen Comment 50:

> Second, allowing a project to be approved without a clear mitigation plan, complete with identified mitigation sites, increases the risk that adequate mitigation will never be constructed or constructed in a manner that provides less than the required environmental benefits. One of the most striking conclusions of the NAS report on wetlands mitigation was that failure of permittees to construct required mitigation correctly or at all was a major cause of mitigation "failure". The reason for this is clear: most project sponsors facing a mitigation obligation – and in this I would argue, the Corps is no exception – perceive mitigation primarily as something that increases the cost of projects. Strong financial incentives tend to encourage project sponsors to look for ways to reduce their mitigation obligations. While most permittees no longer chose to ignore their mitigation obligations entirely, the incentives to find ways to cut corners on mitigation (both during the permitting process and during mitigation construction) are strong. Again, in this I would argue the Corps is no exception.

Bohlen Response 50: See Responses to Bohlen Comments 48 and 49 above and the references therein. The project cannot be operated until all land is acquired and site-specific mitigation plans approved by MDNR, as required (See Responses to Bohlen Comments 53 and 55 below).

Bohlen Comment 51:

Modern mitigation policy uses a number of tools to help manage the risk of mitigation failure that stems from these economic forces. These include the following:

- Requiring detailed information – often at the level of site-specific design drawings – on proposed mitigation sites
- Clarification of legal responsibilities for project success, clear specification of performance standards on which success will be measured, and explicit planning for corrective action should problems arise
- Long term project monitoring, including requirements for filing of as-built project drawings and regular reports to detect developing problems before they become difficult to correct
- Use of mitigation bonding, escrow accounts and other financial guarantees to provide less problematic avenues for enforcement compared to civil or criminal litigation.
- Reliance on advance mitigation, especially via mitigation banks (which necessarily requires identification of mitigation sites before project construction) or

These strategies help manage the risks that stem from the financial incentives operating on project sponsors in a number of ways. First, they ensure that when permits are issued, private parties know exactly what their mitigation obligations are going to be, so that they can determine whether the project remains cost-effective. They also give regulatory agencies maximum certainty of what mitigation will be constructed. Through clarity of the description of required mitigation actions they produce a legal setting in which failure to meet mitigation obligations can be clearly documented, simplifying enforcement actions. And by establishment of various financial incentives for proper completion of mitigation, they significantly reduce the incentive for private parties to cut corners on mitigation.

Bohlen Response 51: See the Responses to Bohlen Comments 48 - 50, above. This is not a private project and the rules that apply to private projects do not apply in the same fashion to this Federal project (See RSEIS 2 Sections 4.4.3.1 and 4.5.2). The first 2 bullets above address requirements that will be addressed in the detailed mitigation plans (See RSEIS 2 Section 6.3). These detailed plans are also required by the Water Quality Certification (RSEIS 2 Appendix G). Mitigation monitoring is addressed in RSEIS 2 Section 6.5 and is also required by the Water Quality Certification. Long term management is discussed in RSEIS 2 Section 6.6. Project monitoring is discussed in RSEIS 2 Section 7. The full faith and credit of the United States of America provides the financial assurance that the mitigation will be provided. WRDA 86 requires that mitigation be provided concurrently with construction, not in advance. The concerns applicable to private applicants do not apply to federal civil works projects.

Bohlen Comment 52:

The new mitigation proposals in the RSEIS2 not only fail to provide specific, detailed mitigation plans, they move in the opposite direction. While the primary mitigation features are becoming more clearly defined (with the notable exception that the RSEIS2 still does not provide site-specific data on which to assess the proposals) the so-called "additional mitigation" is so vague as to be almost meaningless.

Bohlen Response 52: The RSEIS 2 presents mitigation in sufficient detail to demonstrate that mitigation is achievable and that the project remains economically justified. Site-specific mitigation, including acquisition of sites, planning, implementation, and long term monitoring, will be coordinated with the interagency mitigation team. See Responses to Bohlen Comments 48 - 51 above.

Bohlen Comment 53:

As was true of the mitigation proposed in the 2002 RSEIS, a significant proportion of the proposed mitigation in the primary mitigation features is via

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reforestation. Yet the document offers few specifics with respect to where reforestation will occur except with regards to plantings around Big Oak tree State Park, and even there the document presents only general description of the area and omits any site-specific analysis. Thus a majority of the proposed reforestation continues to be unspecified with respect to location. It thus is still impossible to review it in terms of its adequacy to compensate for the loss of environmental services the project will entail.

Bohlen Response 53: See Responses to Bohlen 48 - 52 above.

Bohlen Comment 54:

With respect to the Additional Mitigation described in the RSEIS2 , the Corps relies on descriptions of potential actions for additional mitigation, but does not commit to initiating any of the proposed options. Among the vague options included under the "additional mitigation" category are the following:

- **Additional Reforestation.** Reforestation is likely to be one of the most successful approaches to mitigation certain project impacts, so consideration of additional reforestation is appropriate. However the RSEIS2 discusses no specific locations, so there is no way to determine what the benefits will be. Significantly, the Corps also offers no commitment with respect to for exactly how much reforestation – if any – will occur.
- **Increase Flood Durations on Reforested Areas.** No specific locations are specified so both environmental benefits and costs (which are likely to be substantial) are unknown. Moreover, creation of artificial impoundments is environmentally problematic and can cause more environmental harm than good.[26] The necessary balance can only be struck with specific projects in mind. Again, the Corps makes no commitments to using this restoration approach, so we do not know if this is a major or minor component of how they propose to fulfill the remainder of their mitigation obligation. Heavy reliance on artificially maintained hydrologic conditions should raise a red flag with respect to the efficacy, sustainability, and long-term costs of mitigation.
- **Creation/Restoration/ Enhancement of Large Waterbodies;** Although this option is discussed in terms of Riley lake, the Corps does not commit to taking action at Riley Lake, but uses it as a case study of potential projects. In addition to conceptual problems with Riley Lake mitigation discussed above, SCI Engineering has raised a host of site-specific issues. These are the kinds of issues that would have to be addressed at any other site, whose availability and suitability for restoration remain highly speculative.
- **Restoration of Small Waterbodies.** No specific projects are discussed, so it is impossible to evaluate the benefits that might be achieved in this way. A concentrated effort to identify small-scale restoration opportunities

[26] Because these areas have manipulated hydrology, they also provide an ideal situation in which to take actions that create numerical increases in scores in habitat models without necessarily providing the environmental benefits the models might lead you to expect.

Bohlen Comment 54 (continued):

> throughout the project area would be an excellent idea. It is surprising that after years of project planning, the Corps was unable to provide even a list of candidate projects.
>
> In short, each of these proposals is little more than an offer to look for additional mitigation options. Their inclusion here underscores the fact that the Corps has been unable or unwilling to identify adequate mitigation even to meet their own assessment of mitigation needs.

Bohlen Response 54: See Responses to Bohlen Comments 3, and 48 - 54 above. One goal of the RSEIS 2 is to demonstrate that a variety of mitigation techniques can be used to compensate for unavoidable impacts to fish and wildlife resources. Precise gains in habitat values will be calculated during the development of site-specific detailed mitigation plans. The formulation of these plans as well as calculation of benefits will be based upon the information in the RSEIS 2. The RSEIS 2 demonstrates the overall mitigation strategy. However, monitoring mitigation sites will ultimately determine when mitigation is complete.

The interagency mitigation team, including the Corps and sponsor, has identified numerous areas for potential mitigation. The Corps has currently acquired 1,657 acres of areas for mitigation purposes. The Corps was in the process of formulating detailed mitigation plans for these sites prior to the withdrawal of the ROD. For instance, an opportunity was identified by MDC staff on one particular tract of land purchased for mitigation that could involve restoration of a small waterbody. Plugging a drainage ditch adjacent to Ten Mile Pond Ditch has the potential to restore a meander scar of the historical channel. This restoration will provide added benefits to all resource categories than simply reforesting the area. Opportunities such as this will be examined throughout mitigation formulation. This is a primary reason why the Corps maintains that mitigation must retain flexibility.

Mitigation planners are analyzing the possibility to retain water for longer durations on mitigation tracts to provide additional habitat for fish and waterfowl. This can be accomplished by the construction of perimeter levees and water control devices (RSEIS 2 Section 5.4.3.2). Through adaptive management, these areas will be monitored to provide maximum gains to all resource categories. In the event that these areas are not functioning as designed, the water control devices and perimeters levees will be removed.

Additionally, coordination with MDNR staff revealed that potential mitigation lands located south of Big Oak Tree State Park were historically canebrakes. The Corps and MDNR staff will pursue this option if the lands are acquired.

Bohlen Comment 55:

Although the Corps presents four mitigation "scenarios," they do not select any one as a preferred alternative. In fact, they do not promise to follow any of them. A huge range of possible mitigation options are described in the RSEIS2. Locations for many of the proposed actions remain unspecified, and the Cops effectively reserves the option to swap mitigation among proposed actions. To a significant extent this document lays out a menu of choices, some of which may not be feasible, others of which may do more environmental harm than good, and leaves selection among these alternatives to the future. Avoiding these kinds of vague promises in private-sector mitigation is a major focus of recent mitigation guidance, and a core recommendation of the NAS report.

Bohlen Response 55: See Responses to Bohlen Comments 48 - 55 above. The RSEIS 2 sets out that the Record of Decision will prescribe the recommended mitigation plan (RSEIS 2 Section 1.4.7). Nevertheless, flexibility will remain a critical concept in the development of compensatory mitigation. Flexibility and adaptive management will allow the Corps to adjust mitigation based upon expected needs of the mitigated resource as well as the needs of the general public. As previously stated in Bohlen Response 48 above, the WQ certification states the following:

"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."

Therefore, the project will not be operated until all unavoidable impacts to significant fish and wildlife resources are compensated to the extent justified. This is a reasonable safeguard to ensure successful mitigation.

Bohlen Comment 56:

While the Corps is not a private party, in this project it faces the same incentives to keep mitigation costs down as do private parties, because the project only barely manages to meets the cost-benefit requirements of the WRDA. The various drafts of the EIS, including the RSEIS2, make clear that a favorable benefit-cost analysis, and in fact, a higher benefit-cost analysis than other alternatives, is central to the Corps' justification for its selection of a project alternative. But even as presented by the Corps, the four mitigation "scenarios" lead to an overall project that passes the benefit-cost test by extraordinarily slim margins of between 1.01 to 1 to 1.04 to 1.[27] The New Madrid levee closures fail to pass economic muster for two of the four mitigation scenarios (Scenarios A and C), and even the remaining two mitigation scenarios achieve only a paltry cost-benefit ration of 1.01 or 1.02 to 1.[28]

[27] RSEIS 2, page 46 and 47 and table 2.9 on page 50. and tables 5.13 through 5.16, pages 125 through 128.
[28] Tables 5.13 through 5.16, pages 125 through 128.

Bohlen Response 56: See Responses to Bohlen Comments 3 and 6 above and Response to Environmental Defense Comments 2 - 3.

Bohlen Comment 57:

> Given the uncertainty in mitigation plans, and the high significance of mitigation costs to the overall economic analysis of what is clearly a project that only marginally meets the cost-benefit requirement, the Corps cannot now be confident that any mitigation scenario will allow the project to pass economic muster. Such a call requires far more detail in mitigation planning.[29]

[29] The RSEIS2 claims that the Corps will monitor project impacts and act to address mitigation shortcomings, but this statement does not remedy the lack of specificity in a detailed mitigation plan. It does nothing to demonstrate that mitigation can offset project impacts or that it can do so at a cost that makes the project economical. Furthermore, requiring additional mitigation after the fact would be even more difficult than requiring a detailed mitigation plan after project impacts have already occurred. But more fundamentally, there is nothing clear to monitor for. The fisheries models, for example, make no

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biological predictions of fish communities to be found through monitoring. The HSI scores reflect relative habitat quality, and while habitat quality is an important heuristic tool for qualitative analysis of environmental impacts, it is not directly measurable. Habitat quality is not the same as the abundance of fish within different habitats, nor is it equal to the relative importance of habitats as sources of food or for quantitative production of larval or young of the year fishes. Habitat quality (and thus HSI models) can combine features of all of these as well as other factors. Significantly, this means that it is impossible, after the fact, to determine whether particular mitigation efforts have provided the "habitat value" they were designed to produce. In the present case, as the fisheries HEP model makes no specific quantitative predictions, no set of measurements can demonstrate that mitigation goals were achieved, except in the trivial sense that mitigation that numerically satisfies the HEP model was or was not constructed.

Bohlen Response 57: While the Benefit to Cost ratios that are presented in RSEIS 2 Section 5.8 are close to unity (slightly higher than 1 to 1.0), the mitigation credits have been conservatively calculated and presented. For example, in RSEIS 2 Table 2.7, wherever a 'TBD' designation was provided in the Draft RSEIS 2, there would be some habitat improvement. However, these particular techniques and corresponding benefits to individual resource categories were considered sufficiently uncertain that no mitigation credit for them was taken. During long term monitoring, the Corps intends to verify habitat units provided by these techniques to the respective resource categories. There are many other areas where the analyses are conservative, such as with the post-project hydrologic inundation durations, the value of the hydrologic restoration project for Big Oak Tree Park to fishes, and the wetland impacts (which includes substantial prior converted cropland acreage). The additive effect of these conservative analyses gives confidence that the implementation of the project would be beneficial to the Nations' economy.

Additionally, the Corps is working with the interagency mitigation team in the development of monitoring protocols. Monitoring will occur on each site-specific

mitigation area and will be developed during the formulation of the detailed site-specific mitigation plan (See RSEIS 2 Section 6.5). A monitoring plan will also be developed to monitor the St. Johns Bayou Basin and the New Madrid Floodway to ensure that predictions made in previous NEPA documents and clarifications made in this RSEIS 2 are accurate (See RSEIS 2 Section 7.0). Monitoring is a critical component of the Corps' plan and is clearly outlined in the water quality certification. The monitoring plan will be developed with the interagency mitigation team and must be approved by MDNR prior to any ecological impacts.

Bohlen Comment 58:

> Under these circumstances, the Corps is undoubtedly facing strong internal and external pressures to reduce mitigation costs in order to keep the cost-benefit numbers of the project as a whole favorable.. In this it is no different than most private entities looking for mitigation. I would argue that the behavior of the Corps to date strongly supports the idea that these pressures are intense, and there is no reason to believe that they will abate. Indeed, I believe that a primary motivation behind the continually shrinking estimates of wetland impacts in successive EIS documents and the promotion in this most recent RSEIS2 of relatively inexpensive but technically unjustified mitigation approaches has been to minimize the costs of mitigation even at the expense of not fully compensating for environmental impacts of the project.

Bohlen Response 58: The Corps has the responsibility to safeguard the public's resources entrusted to it. This duty applies to all aspects of project analysis, design, and construction. See Responses to Bohlen Comments 3 and 6 above and Response to Environmental Defense Comments 2 and 3. The Corps has conducted several reviews of this project. Each such review has involved a closer and more detailed examination of the analyses and assumptions of previous documents. It is this careful review that accounts for both reductions and expansions in previous estimates of aspects of the project.

Bohlen Comment 59:

> Under these circumstances vague mitigation plans, a lack of specificity in what actions will be undertaken, and reliance on loose descriptions of mitigation goals provides a fine recipe for future conflict and inadequate mitigation. If the project is approved and goes ahead prior to specification of a detailed mitigation plan, the Corps will have only a general notion of the eventual costs of mitigation. If mitigation costs exceed estimates for any reason, the Corps would be faced with only two unacceptable options. One would be to minimize mitigation costs and perform inadequate mitigation. The other would be to exceed the mitigation budget and build an uneconomical project that is a net economic loss to the nation.

Bohlen Response 59: The RSEIS 2 demonstrates that mitigation is attainable and that the project is economically justified. The RSEIS 2 is based on conservative estimates

regarding gains to habitat from implementing mitigation measures and detailed cost estimates for the mitigation techniques. The cost estimates allowed for several contingencies. The RSEIS 2 also demonstrates that mitigation measures will be monitored to ensure that all unavoidable impacts to significant fish and wildlife resources are compensated. Please see Responses to Bohlen Comments 49, 56, and 57 above.

Bohlen Comment 60:

> The 2005 DSEIS provides policy rationales for not selecting a detailed mitigation plan with detailed sites, but none of these rationales (whether or not legal) distinguish the Corps from private parties. The Corps points out that it does not have condemnation power and therefore wishes to remain flexible. But private parties also typically lack condemnation power. Yet private parties regularly must identify mitigation sites on private lands and they must do so before a section 404 permit will be issued. The Corps wishes to avoid the expense of selecting a specific mitigation site until after the permit is issued. So, undoubtedly, would private parties.

Bohlen Response 60: Please refer to Sections 4.4.3.1. and 4.5.2 of the RSEIS 2.

Bohlen Comment 61:

> I see only two truly distinguishing features between this project and the normal project requiring environmental mitigation. One is that the project's impacts are exceptionally large. Under established practice, a larger project is subject to more vigorous scrutiny by the Corps and EPA. A second distinction is that the Corps here serves as both regulator and project proponent. But that too calls for more rigor up front because once the project is approved, and especially once it has been constructed, the Corps will face strong incentives to determine that mitigation is acceptable, even if it is substandard.
>
> Since the existing mitigation plan promises very little, the Corps will have considerable leeway in deciding what mitigation is constructed. Since there are few clear tests to be applied to determine whether the mitigation constructed actually addresses resource concerns, interpretations will have a significant effect on what is eventually constructed. And importantly, the Corps faces very limited possibility of legal challenge or other enforcement even if less mitigation is constructed than initially promised, mitigation proves less successful than anticipated, fails to replace lost wetland an habitat functions, is significantly delayed in its construction, or is otherwise substandard.[30]

Bohlen Comment 61 (continued):

[30] The Corps states that they will not operate the project until all mitigation has been deemed adequate and approved by MDNR. But at best this is no different from other situations in which permit regulators could in theory stop projects from operating after the fact. The failures of this approach explain why it is no longer relied upon. Institutional strategies to reduce risk of default such as mitigation bonds, escrow accounts and mitigation banks are increasingly the norm In this case, moreover, MDNR is limited to enforcing the terms of its water quality certification. And in this case, it is obvious there would be even more pressure on MDNR to approve whatever mitigation is on offer quickly rather than allowing farmers' fields be flooded. Given the lack of specificity over what mitigation will be constructed and given the vagueness of the mitigation requirements in the RSEIS2, MDNR will have little leverage once the project is constructed in case of disagreements with the Corps and thus will have a very hard time imposing much quality control.

Bohlen Response 61: See Responses to Bohlen Comments 48, 49, 51, and 55 and RSEIS 2 Sections 4.4.3.1. and 4.5.2. This project has undergone very rigorous scrutiny from various state and Federal regulatory and wildlife agencies; local, state, and Federal government, elected officials; Federally recognized Indian Tribes; non-governmental organizations; academia; and the general public, as well as state and Federal court. This scrutiny has resulted in a project that provides for National Economic Development consistent with the goals for protecting the Nation's environment. All unavoidable impacts to significant fish and wildlife resources will be mitigated to the extent justified. Furthermore, there will be a net benefit to overall habitat for most resource categories (wetlands, terrestrial wildlife, and waterfowl habitat) within the project area.

Bohlen Comment 62:

Failure to Discount for Temporal Losses: Recent Corps and EPA guidance documents have continued to insist temporal losses be offset with greater mitigation. In other words, if mitigation sites are not going to be fully functional at the time of project impacts, more mitigation is required. Offsetting these temporal losses requires some kind of discounting for time. The mitigation proposed in the RSEIS2 continues to violate this principle as there is no effort taken to discount future wetland functions even though much of the mitigation remains dependent on mature trees that will come into effect only over time.

What has been done, both in the fisheries analysis and in the HGM analysis, is to estimate an annual average level of function over the 50 year planning horizon for the project (the writers call this an annualized value or average annual habitat units).[31] This

Bohlen Comment 62 (continued):

acknowledges that mitigation sites will not provide full functions immediately, but it is not discounting. Discounting addresses the fact that benefits received many years from now are not as valuable as benefits received today. A dollar in hand today is worth somewhat more than a dollar that will be delivered next year. The difference in value depends on the discount rate. But in one year's time, I'll still prefer a dollar in hand to a dollar I would not get until two years from now, so I can apply the same logic again (and again).[32] While the logic is most familiar in a financial context, it applies equally to environmental goods and services.[33] A good fishing trip today is worth more than a good fishing trip 20 years from now. Nevertheless the Corps continues to treat fish habitat value and wetland values that come into being 20 or more years from now as having the same value as fish habitat available immediately. But their net present value is lower. The Corps' analysis thus fails to account completely for the loss of wetland and fisheries functions and understates the mitigation required to fully compensate for present-day environmental impacts.

quality control.

[31] Incidentally, the equation depicting the calculation of a Cumulative HU on page 24 is incorrect. First, it includes a summation sign that does not specify an index of summation. Moreover, the expression inside the summation is a complete formula for calculating cumulative habitat units within one habitat type. Presumably, the summation sign refers to summation across all habitat types. If so, that should be made explicit, otherwise it may lead to serious calculation errors. Second, the expression inside the summation sign is strictly correct only for a specific model of the long-term development of habitat values, one in which values develop linearly from the moment of project implementation until *the end of the planning horizon* (50 years in this case). This is inconsistent with the model presented in the text, which postulates that fast-growing species would develop 100% of function in 10 years, while slow-growing ones would

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deliver full function in 20 years. I have not yet been able to confirm whether the calculations resulting in numbers in the text were carried out correctly, but if they were, they did not use this formula.

[32] Mathematically, this relationship can be expressed in its simplest (discrete time) form as follows. Given an asset that has a value of X dollars, and an annual discount rate of r, the present value of that asset if delivered in n years is $\frac{X}{(1+r)^n}$.

[33] This logic was developed in detail in King, D. M., C.C. Bohlen and K. Adler. 1994. Watershed Management and Wetlands Mitigation: A Framework for Determining Compensation Ratios. EPA Office of Policy, Planning and Evaluation, Washington DC. A spreadsheet that allows calculation of time-discounted mitigation requirements is available on the HGM website, at http://el.erdc.usace.army.mil/wetlands/datanal.html.

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Bohlen Response 62: Temporal losses were calculated based on standard methodologies that are commonly used in HEP (USFWS 1980) and HGM analyses (Klimas, *et al.*, 2004). See RSEIS 2 Section 2.3.2 and Appendix C.

The math question in footnote 31 is noted. The math was performed correctly, but there is a typographical error in the document. An appropriate correction will be made in the final RSEIS 2.

Bohlen Comment 63:

> Failure to focus on natural hydrology and landscape position: Finally, the Corps' proposed mitigation relies heavily on artificial manipulation of small areas of wetlands to produce habitat benefits. This approach is fraught with risk. Hydrology is the driving force that shapes wetland ecosystems, and success at generating wetland functions by manipulating water is mixed. All too often, hydrologic manipulation leads to unanticipated changes in wetland structure or function. Even when such manipulations are deemed successful, they may result in increases in one function (say production of waterfowl), but at the expense of others (say access for floodplain fishes). Recent Corps and EPA guidance, reflecting the findings of the NAS report, generally discourage reliance on mitigation that relies primarily on artificially maintained hydrology to provide nominal mitigation benefits.

Bohlen Response 63: See RSEIS 2 Section 4.3.2.4, and Responses to Zedler Comments 10 and 14, Sparks Comment 4, and Environmental Defense Comments 6 and 9. Risk is exactly what the Corps is trying to reduce. By pooling water during the rearing season, the risk of premature dewatering and elevated mortality of fish is reduced. The Corps has documented the high rearing value of permanent waterbodies, and there is every reason to expect that larval fish survival will be enhanced in spawning and rearing pools. See RSEIS 2 Section 4.3.2.4 and Response to Sparks Comment 4.

Most of the project impacts and mitigation features, including the spawning and rearing pool, are located in what are currently leveled soybean fields. These fields do have some habitat value. However, the Corps maintains that bottomland hardwood habitat, restoration of hydrology to Big Oak Tree State Park, moist soil management areas, 64 miles of buffer strips, wildlife corridors, 387 acres of modified borrow pits, spawning and rearing pools, and restored floodplain lakes provide much greater ecological functions than that provided by frequently flooded soybean fields.

Table 1. Lands Flooded in New Madrid Basin at elevations corresponding to different flood return intervals.

		Acres Flooded in Different Land Categories[1,2]						
	Flood Elevation (ft. NVGD)	Cropland	Fallow	BLH	Large Waterbody	Small Waterbody	Total Flooded Acres	Total ADFAs[3]
Two Year Flood (Flood at least 50% of years)	293.00	27,205	2,134	4,863	614	592	35,408	8895
Three year Flood (Flood at least 33% of years)[4]	295.60	41,093	3,087	5,860	646	636	51,322	
Four Year Flood (Flood at least 25% of years)[4]	295.85	42,305	3,174	5,945	647	640	52,711	
Five Year Flood (Flood at least 20% of Years)	296.00	43,032	3,226	5,996	648	643	53,545	10,027

Note 1: Calculations are based on electronic files containing the data set forth in Appendix C of the 2002 RSEIS, provided to Environmental Defense in response to a FOIA request. Calculations used the method for assessing return intervals set forth in the RSEIS2 on page 64.

Note 2: Land use and cover type data has been provided to us only at integer elevations. Hydrologic data and the elevations associated with different flood return intervals are known more precisely. The values presented here use linear interpolation to estimate areas in each land cover flooded at non-integer elevations.

Note 3: ADFAs are calculated solely for land below the designated elevations for April 1st to May 15th. Results are expressed based on land use data at the nearest integer elevation.

Note 4: ADFAs are not reported for the three and four year flood elevations because the nearest integer elevation for the three, four and five year flood elevations is 296 feet, and the results of this calculation would be identical. This is an artifact of the way the calculations are carried out, and does not imply that actual ADFAs for these elevations would be identical.

Bohlen Response 64: See Response to Bohlen Comment 29.

Bohlen Comment 65:

Table 2. Lands Flooded in St. Johns Basin at elevations corresponding to different flood return intervals.

		Acres Flooded in Different Land Categories[1,2]						
	Flood Elevation (ft. NVGD)	Cropland	Fallow	BLH	Large Waterbody	Small Waterbody	Total Flooded Acres	ADFA
Two Year Flood (Flood at least 50% of years)	292.50	9,853	951	2,877	166	546	14,392	4105
Three year Flood (Flood at least 33% of years)[4]	292.70	10,289	967	2,904	167	548	14,875	
Four Year Flood (Flood at least 25% of years)[4]	293.30	11,680	1,037	2,989	179	556	16,440	
Five Year Flood (Flood at least 20% of Years)	293.56	12,319	1,076	3,026	188	560	17,169	4,241

Note 1: Calculations are based on electronic files containing the data set forth in Appendix C of the 2002 RSEIS, provided to Environmental Defense in response to a FOIA request. Calculations used the method for assessing return intervals set forth in the RSEIS2 on page 64.

Note 2: Land use and cover type data has been provided to us only at integer elevations. Hydrologic data and the elevations associated with different flood return intervals are known more precisely. The values presented here use linear interpolation to estimate areas in each land cover flooded at non-integer elevations.

Note 3: ADFAs are calculated solely for land below the designated elevations for April 1st to May 15th. Results are expressed based on land use data at the nearest integer elevation.

Note4: ADFAs are not reported for the three and four year flood elevations because the nearest integer elevation for the two, three and four year flood elevations is 293 feet, so the results of this calculation would be identical. This is an artifact of the way the calculations are carried out, and does not imply that actual ADFAs for these elevations would be identical.

Bohlen Response 65: See Response to Bohlen Comment 29.

Bohlen Comment 66:

National Academy Report

Parameter	# Studies	# States	Range of Values	Mean	Median
1. % Required mitigation actually attempted	8	7	28 to 100	76	70
2. % Regulatory compliance					
a. % area gain (loss)	8	5	(92) to 44	(17)	(32.5)
b. % permits issued	19	6	0 to 100	58	53
3. % Ratio required and ratios met (post construction)	9	4	17 to 90	61	62
4. % Functional equivalency of completed mitigation	9	4	0 to 67	21	18

From Table 6.16 in NRC 2001

Bohlen Response 66: Table noted. However, there is no text explaining the purpose of this table that was copied from the NRC (2001).

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Dr. Christopher Woltemade Comment 1:

REPORT REGARDING THE WATER QUALITY ANALYSIS OF THE REVISED DRAFT ENVIRONMENTAL IMPACT STATEMENT (DECEMBER 2005) FOR THE ST. JOHNS BAYOU/NEW MADRID FLOODWAY PROJECT

Dr. Christopher Woltemade
(January 2006)

I am a hydrologist working as a Professor at Shippensburg University of Pennsylvania at and have previously provided a report and have testified about the water quality assessment for the St. Johns Bayou/New Madrid Floodway project of the U.S. Army Corps of Engineers. I have reviewed the December 9, 2005 Draft Supplemental Environmental Impact Statement for the project. This DSEIS continues to use the same basic spreadsheet "model." Nothing in the new draft has changed my previous views regarding the project, but I offer this additional assessment of some new claims in this draft.

Woltemade Response 1: Comment noted.

Woltemade Comment 2:

I. Basic Summary of Project Impacts

The purpose and effect of the project is to restrict backwater flooding that now occurs regularly in the project area on tens of thousands of acres to a 2,500-acre sump area. When flooding occurs on these acres, it generally does so for a week or more, which is enough time for them to remove large quantities of pollutants, including nitrogen. The primary factors that determine the extent of nutrient removal are the extent and duration of flooding. Because the project so dramatically reduces the extent of flooded acres that will remove this nitrogen, it will unquestionably dramatically reduce the amount of nitrogen-removal.

Woltemade Response 2: The comment suggests that large quantities of nitrogen are removed during periods of backwater flooding. The majority of the land currently available to backwater flooding in the project area has been leveled, drained, and used for agriculture (primarily soybean production) for many years. Agricultural lands have been demonstrated to be sources of nutrients to rivers and lakes (*e.g.*, Beaulac and Reckhow, 1982, from Ashby, *et al.*, 2000) due in large part to fertilizer application. The relationship between agricultural lands acting as a source of nitrogen rather than a sink has been demonstrated by several major studies that concluded that rivers that drain a higher percentage of agricultural lands have higher concentrations of nitrogen than rivers that drain a higher percentage of forested areas (Mitsch, *et al*. 1999.) The Corps disagrees with the suggestion that the project will "unquestionably dramatically reduce

the amount of nitrogen removal" based upon the discussions of the processes and site characteristics in the following paragraphs.

To address potential impacts of various project alternatives on water quality, a model was developed using a mass balance approach in a spreadsheet format (Ashby, *et al.*, 2000). The model is consistent with a basic understanding of nitrogen cycling and how nitrogen is introduced into riverine ecosystems. Generally, nitrogen is introduced into watersheds by a variety of mechanisms (*e.g.*, backwater/headwater flooding, rain carrying atmospheric nitrogen, applications of nitrogen fertilizer to agricultural lands, nitrogen in sewage sludge from municipal wastes, and other processes (collectively called the "nitrogen input")). Furthermore, nitrogen is exported from water sheds through several processes including to following:

- denitrification and volatilization - where bacteria converts nitrate in the soil to gaseous nitrogen which is released to the air,
- runoff - where water carries dissolved and particulate forms of nitrogen compounds to surface water bodies,
- leaching - where nitrates enters groundwater,
- and physical removal during harvesting.

Runoff and leaching pose the biggest concern to water quality as nitrogen is very mobile and easily moves with water in the soil and in runoff. In the Mississippi drainage basin alone, agricultural activities are a major source of the nutrients that enter the Mississippi River (National Science and Technology Council Committee on Environment and Natural Resources 2000). Therefore, any measures that slow or prevent runoff or increase filtering efficiency of lands adjacent to surface water bodies (*e.g.*, runoff ditches, streams, and rivers) should result in less nitrogen entering the river system.

As previously described in Ashby, *et al.* (2000), (See 2002 RSEIS Appendix I for a modified version of this report) the project area is both a source and sink for nitrogen, depending on land use and hydrologic conditions. During periods of rainfall and subsequent runoff in the project area (*i.e.*, the St Johns Bayou and New Madrid Floodway), the combination of sources and sinks (*e.g.*, water quality processes) was considered to result in a net nitrogen export (*e.g.*, more nitrogen from the project ends up in the Mississippi River than is removed by the project area). This was attributed to the fact that most of the land in the project area is cropland which is a considerable source of nitrogen during runoff events, likely from fertilizer applied to agricultural fields. The Mississippi River itself is also a source of nitrogen (from upstream watersheds) that is available to the project area during periods of backwater flooding.

An interagency team comprised of scientists from the Corps, MDNR, USFWS, and EPA was formed to review the water quality analysis methods, as described in Ashby, *et al.,* 2000 and Appendix I of the 2002 RSEIS. This team agreed that wetlands (cypress/tupelo, scrub/shrub marsh, marsh, bottomland hardwood, riparian, sandbars, open water, and rivers) removed nitrogen from floodwaters. The team also agreed that

while upland and agricultural areas may process some nitrogen, the overall effect of flooding such areas was an increase of nitrogen to the floodwaters (Ashby, *et al.*, 2000). Overall, impacts to the water quality of the Mississippi River is not expected to be discernible, due to the large volume of water in the Mississippi River in comparison with the floodwater volume of the project area (2002 RSEIS Appendix I, page I-iv). Impacts to nitrogen loads to Mississippi River water from various scenarios considered were all calculated to be less than 0.1 percent of the total estimated Mississippi River nitrogen load of 1.6 million metric tons in a year (RSEIS 2 Section 4.2.2.2.). It is reasonable to assume that additional mitigation would likely provide a slight improvement in water quality over current conditions (RSEIS 2 Section 5.3.3.)

In summary, the assumptions of the model are:

- Some nitrogen from Mississippi River water is removed during backwater flooding (Ashby, *et al.*, 2000, page 7)
- Nitrogen removal efficiency varies with land cover, with primary removal occurring in various types of wetlands (Ashby, *et al.*, 2000, Tables 4 and 5)
- 10% of particulate materials (including phosphorus, nitrogen, carbon, sediment) are removed due to sedimentation (Ashby, *et al.*, 2000, page 7 and Appendix C)
- Water inundation would occur from November through January and later, which is sufficient time for water quality processes to occur (Ashby, *et al.*, 2000, page 4)
- Water quality processing is calculated using the extent of flooding by acres by land cover type (wetlands, cropland, BLH, pasture, etc – See Ashby, *et al.*, 2000, Tables 4 and 5) by flood frequency event (corresponding to a certain acreage for the various land cover types – See Ashby, *et al*., 2000 Appendix C)

Model assumptions were accepted by an interagency team. The interagency team also agreed on the approach of the analysis which was to use net change (*i.e.*, whether the land cover type resulted in a decrease (net removal) or increase (net export) of nitrogen) to evaluate several project alternatives.

Woltemade Comment 3:

> II. Results of Corps Model
>
> To assess the impacts of the project on nitrogen removal, the Corps developed an extremely simplistic model. I testified before the Clean Water Commission about the fundamental flaws in that model, and there is no indication that the model has been changed or corrected for the 2005 DSEIS. Among other problems, as discussed below, the model leaves out the primary mechanism by which farmed wetlands remove nitrogen and therefore greatly underestimates the likely nitrogen removal on flooded crop fields. Regardless, the Corps's own model shows that absent mitigation, the project would dramatically reduce the amount of nitrogen removed by the project area, which in turn means that all extra nitrogen would remain in the Mississippi River.

Woltemade Response 3: To the extent that the comment suggests the model leaves out the primary mechanism by which farmed wetlands remove nitrogen (*i.e.*, denitrification), Ochs and Milburn (2003) reported denitrification rates of approximately 0.001 and 0.002 kilograms per hectare per 90 days of flooding. These studies were conducted on flooded and non-flooded cotton and soybean fields. These reported denitrification rate values are extremely low. The values do not differ markedly for selected flooding conditions or by crop type (soybean and cotton). With regard to nitrogen removal within the model (Ashby, *et al.*, 2000, Appendix C), the model provides for 10% nitrogen removal from floodwaters on agricultural lands and was accepted by the interagency team. Nitrogen export coefficients rates utilized in Ashby, *et al.*, 2000 of 1.875 kg/ha to 15 kg/ha (Ashby, *et al.*, 2000, pages 8 and 9), when multiplied by a 10% nitrogen removal factor, would result in a removal rate of 0.1875 kg/ha and 1.5 kg/ha (Ashby *et al*., 2000 page 8). The model therefore does not likely under estimate the nitrogen removal on flooded crop fields.

Ochs and Milburn's peer-reviewed 2003 publication occurred after the report prepared by Ashby, *et al*., (2000) but was presented at the water quality certification hearings in January 2004.

With regard to "nitrogen [that] would remain in the Mississippi River," the annual load of nitrogen transported by the Mississippi River to the Gulf of Mexico is estimated at 1.6 million metric tons (National Science and Technology Council Committee on Environment and Natural Resources, 2000). The amount of nitrogen that enters the project area during a 5 day winter flooding event at a discharge of 800 thousand cubic feet per second was estimated to be 11,745 metric tons (Ashby, *et al*., 2000, page 12). This value is less than 0.1% of the estimated annual total Mississippi River nitrogen load of 1.6 million metric tons (RSEIS 2 Section 4.2.2.2.). Even if the project area provided 100% removal, (which is highly unlikely since the majority of the project area is agricultural land) the amount that enters the project area is indiscernible in terms reducing the amount of nitrogen carried to the Gulf of Mexico.

Regarding the absence of mitigation referred to in this comment, evaluations that include mitigation are discussed in Woltemade Responses 5, 6, and 7 below.

Woltemade Comment 4:

> In particular, in an average sized flood today (represented by scenario 5 in the model, which the Corps viewed as approximately a 2-year flood), 21,610 kg N would be removed. By contrast, in an average sized flood under the proposed
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>
> project, only 3,977 kilograms would be removed. As a result, the project area would remove 82% less nitrogen.[1]
>
> This is the only valid measure of project impacts as assessed by the model. Any nitrogen not removed by the project area remains in the Mississippi River and therefore remains available to contribute to the very serious hypoxia problem in the Gulf of Mexico.
>
> Prior drafts of the EIS made no effort to evaluate the offsetting effects of mitigation. The reason is straightforward. These effects cannot be properly estimated without knowing their location, flood frequency and their source of water.

Woltemade Response 4: The reported value of nitrogen estimated to be removed during an average flood (3,977 kilograms - Ashby, *et al*., 2000 Table 14 Scenario 3 with both basins) was based on flooding to an elevation of 282 ft. This value should not be interpreted to represent net nitrogen removed by the project area. The scenarios were selected for Ashby's analysis and are based on alternatives set out in the 1999 DSEIS (See Ashby, *et al*., 2000, page 4). Therefore the commenter's comparison between scenario 5 and scenario 3 does not represent with and without project conditions described in the RSEIS 2. Consequently, the statement that the project area would remove 82% less nitrogen is not applicable for evaluating project impacts. A more valid comparison is provided in Response to Woltemade Comment 7.

The Corps concurs with the statement that "any nitrogen not removed by the project area remains in the Mississippi River" with the caveat that additional nitrogen removal likely occurs in other areas as the water travels downstream and additional nitrogen enters the river downstream as well. However, as previously stated, the amount of nitrogen removed by the project area is indiscernible in relation to the hypoxia problem in the Gulf of Mexico.

The effects of mitigation on nitrogen removal are discussed in Responses to Woltemade Comments 5, 6, and 7.

Woltemade Comment 5:

> However, as I have previously testified, even if we assume that mitigation lands will be ideally flooded and located to remove nitrogen, the mitigation proposed in 2002 would almost certainly not offset these impacts. Reforesting 8,375 acres of already flooded cropland, if in ideal locations, could modestly increase nitrogen removal because forested lands will remove modestly more nitrogen than flooded cropland. But the increase cannot possibly be enough to offset the lost nitrogen removal on tens of thousands of acres that are no longer regularly flooded. The mitigation now proposed by the 2005 DSEIS does not affect this judgment. Not only does the total acreage of mitigation sites remain roughly the same, but the new draft makes clear that many of these acres are to be located above the sump areas that will still be allowed to experience backwater flooding. They may experience some local flooding infrequently, as claimed, but they will not help filter Mississippi River water, which is the primary source of water and nitrogen that are not removed by the project.

Woltemade Response 5: Literature cited in Ashby, *et al*., (2000) and results from Ochs and Milburn (2003) do not support the reviewer's contention that forested lands will remove modestly more nitrogen than flooded cropland. In fact, bottomland hardwood restoration (as proposed in the mitigation) will result in greater net nitrogen removal when compared to flooded crop fields (Ashby, *et al*., 2000 Tables 4 and 5). Additionally, nitrogen export would be reduced by taking cropland out of production through reforestation which will directly lead to less fertilizer application. See Woltemade Response 7 for a more detailed explanation of removal efficiencies for each landcover type.

With regard to the "lost" nitrogen removal on "tens of thousands of acres" of agricultural land that are no longer "regularly" flooded, this removal is not a very high amount. For example, using a nitrogen removal rate of 0.002 kg/ha (for a 90 day period of flooding), as reported in Ochs and Milburn 2003 for flooded cropland, would result in 8.1 kg of nitrogen removed per 10,000 acres. However, using values reported in Ashby, *et al.*, (2000), nitrogen currently being contributed to the Mississippi River by the project area ranges between 7,588 to 60,703 kg per 10,000 acres of upland agricultural areas.[6] Based on this comparison, upland agricultural areas likely export more nitrogen to the Mississippi River from runoff than they remove from flood waters.

Removal of cropland from production and reforesting (proposed as mitigation in the RSEIS 2) will reduce nitrogen available to the Gulf of Mexico by: (1) reducing fertilizer applications (no crop, no fertilizer), (2) improving nitrogen removal from runoff in the project area (actually, mitigation will improve/add nutrient and sediment removal from the project area during runoff throughout the year and not just during Mississippi River backwater inundation), and (3) improving removal of nitrogen from Mississippi River during periods of backwater flooding on the mitigation sites when flooded. The Corps' mitigation proposal is also consistent with reports calling for restoration of croplands to

[6] Ashby reports values of nitrogen removed of 1.875 to 15 kg/ha.

wetlands in the Mississippi River Basin in order to reduce nitrogen flow into the Gulf of Mexico (National Science and Technology Council Committee on Environment and Natural Resources, 2000).

Compensatory mitigation acres will be located within the 2-year floodplain and will be subjected to runoff flooding from the project area. Some of these acres which are located in the fish spawning and rearing pool will also be subjected to annual backwater flooding. The mitigation acres within the fish spawning and rearing pool will provide filtering of Mississippi River water during annual backwater flooding and filtering of headwater runoff the rest of the year. The remaining mitigation tracts will provide filtering of runoff throughout the entire year. All mitigation types (*e.g.*, reforestation with BLH, buffer strips along streams and ditches, moist soil management units, Big Oak Tree Park hydrologic restoration) will take cropland out of production and will result in improved nitrogen removal efficiency in the project area. This is in accordance with recommendation by National Science and Technology Council Committee on Environment and Natural Resources (2000).

Woltemade Comment 6:

III. New Corps Analysis

The water quality analysis in the 2002 DSEIS never attempted to estimate the nitrogen benefits of proposed mitigation, and Dr. Ashby, the primary author of that study, acknowledged in a deposition that I have read that such an analysis could not be done until specific mitigation sites were selected. Despite this acknowledgment, the 2005 DSEIS asserts that there has been new analysis of the benefits of mitigation, and claims that it shows that when mitigation is included, the project will result in a reduction in nitrogen loading to the Mississippi River. Subsequently, Environmental Defense requested and received the spreadsheets for these calculations, which I have reviewed.

[1] The pages of the water quality analysis setting forth these estimates are attached. My understanding is the version of the analysis that was printed in the June, 2002 EIS left off the calculations for the St. Johns basin. The calculations in text are for both basins.

2

Unfortunately, the actual Corps analysis shows nothing of the kind because it is not based on a comparison of the area without the project and the area with the project. In effect, the Corps analysis assumes that the project does not really exist.

Woltemade Response 6: The Water Quality Analysis for the 2000 FSEIS (Ashby, *et al*, 2000) included impacts from project flood control operation and did not include expected

benefits from compensatory mitigation. During the referenced deposition on November 14, 2003, Dr. Ashby was asked and answered several questions regarding mitigation. At the time of the deposition, the type and locations of mitigation were not developed and Dr. Ashby acknowledged that he did not know the characteristics of the mitigation sites at that time. This extract from the deposition is provided as an example:

> **Page 59, line 7. Mr. Searchinger: Is it fair to say that you don't know if the mitigation sites will have the same characteristics that would provide optimal wetland retention benefits, is that true?**
> **A: I don't know that at this time.**

Dr. Ashby agreed that water quality benefits were dependent upon specific characteristics of mitigation sites. He also agreed that location of the sites will have an influence on the water quality benefits. The following extracts are provided as examples:

> **Page 36, line 6, Q: Okay, Now the water quality benefits of the mitigation site, of the mitigation of the project, is it fair to say that the amount of benefit will depend on the specific characteristics of the mitigation sites?**
> **A: Yes.**
> **Q: So the location actually chosen will have influence on the water quality benefits?**
> **A: Yes.**

Although the remaining mitigation sites (in excess of the 1,657 acres obtained in 2004 - See RSEIS 2 Section 1.2) have yet to be identified, the characteristics of areas appropriate for consideration as mitigation sites have been identified and quantified, allowing further analysis that is included in section 5.2.3 of the RSEIS 2.

The new analysis includes the effects of compensatory mitigation using a flooding scheme from previous analyses that approximates a hydrologic scenario with the project in place (flooding to the various pool elevations - See RSEIS Section 2.6.2.5). Since mitigation lands will be located in the post-project 2-year floodplain, it is consistent with the impact analysis to consider the benefits of these mitigation areas in calculating the post-project mitigation benefits.

The new analysis presented in the RSEIS 2 Table 5.3 includes compensatory mitigation using a flooding scheme from previous analyses that approximates a hydrologic scenario with the project in place. Estimated nitrogen loads exported from the New Madrid Floodway to the Mississippi River for various flow scenarios and project formulations are reported in the second column of Table 5.3. In Table 5.3, the estimated nitrogen load from the basic mitigation scenario (*i.e.*, with project) was 58.3 metric tons and was comparable to the estimated nitrogen load of 120 metric tons from the moderate high flow load (*i.e.*, 290 feet elevation - 2-year flood) for without project conditions. A more complete assessment is provided in Woltemade Response 7.

Woltemade Comment 7:

> In reality, the major effect of the project is that fewer acres flood in the same flood event. That is the whole purpose of the project. For example, under existing conditions, 17,315 acres flood in the New Madrid Floodway when a flood reaches 290 feet. If the project were in operation, flooding would be blocked beyond 284 feet, so only 1,727 acres would flood – a 90% reduction. Any proper analysis has to compare the different number of acres that flood. But the Corps analysis assumes that the same number of acres flooded. (It does this technically by assuming that nitrogen release and removal would occur on the same acres with the project in effect as under current conditions.) According to the Corps's analysis, the only difference is that now, thousands of these same acres have been reforested, which remove more nitrogen according to the Corps' assumptions. By this hypothetical scenario, nitrogen runoff has obviously decreased, but it is not the scenario of the actual project. The mitigation analysis therefore has no bearing on the actual affects of the project with mitigation.

Woltemade Response 7: See Woltemade Responses 5 and 6. The numbers used in the comment are approximately correct with these exceptions: (1) approximately 2,000 acres will flood at elevation 284.4 feet NGVD, the proposed spawning and rearing pool elevation, during the April 1 - May 15 timeframe, (2) 6,400 acres will be flooded for winter waterfowl, and (3) while 17,315 acres exist in the New Madrid Floodway at elevation 290 feet NGVD, 12,775 acres are agricultural. However, actual post project hydrologic conditions will vary depending on actual gate operations and wet precipitation years so some additional retention of runoff and backwaters may occur.

Regarding the Corps assumptions with respect to more nitrogen removal through reforestation, please refer to Woltemade Responses 2 and 5.

The comment states the mitigation analysis has no direct bearing on the actual effects of the project with mitigation. In fact, the mitigation analysis for water quality includes a comparison of nitrogen removal efficiencies at an elevation of 290 feet NGVD between existing conditions and with mitigation associated with restored acreage. As described below, this has a direct bearing on actual effects of the project with mitigation since amounts of nitrogen removed with and without mitigation are compared. Furthermore, loss of nitrogen removal attributed to reduced flooding is also addressed in the following discussion.

While the project will result in a decrease in nitrogen removed from Mississippi River water since backwater flooding will be reduced but as previous described, this is a very small amount (*i.e.*, 8.1 kg/ha, see Woltemade Response 5, Second paragraph), especially when compared to estimates of nitrogen exported or removed from the project area as illustrated below:

- The New Madrid Floodway currently removes an estimated 10.3 kg of nitrogen from Mississippi River floodwaters on 12,775 agricultural acres

(corresponding to elevation 290 NGVD or the 2 year flood event) using Ochs and Milburn's (2003) 0.002 kg/ha denitrification rate,[2]

- The New Madrid Floodway currently exports an estimated 120,880 kg of nitrogen to the Mississippi River at elevation 290 NGVD (Ashby, *et al*., 2000 Table C1 Scenario 5),
- With basic mitigation in place, it is estimated that the New Madrid Floodway would export 58,322 kg nitrogen to the Mississippi River (RSEIS 2 Table 5.3, last row in table),
- Increased nitrogen removal efficiencies due to mitigation in the project area would remove 62,558 kg (120,880-58,322) of nitrogen,
- Therefore, the removal efficiency per acre is increased to slightly more than 50% and,
- This clearly compensates for the loss of 10.3 kg of nitrogen removal associated with Mississippi River flooding filtration by the agricultural lands.

[7] 12,775 acres * 0.4046873 hectares/acre * .002 kg/hectare = 10.3 kg

Woltemade Comment 8:

IV. Other Flawed Standard of Measurement

At various times, the Corps has also suggested that the project will improve water quality, even without mitigation, using another measure. This measure is so-called nitrogen removal efficiency. But common sense shows that this measure is not environmentally relevant. .

In this context, efficiency means how much nitrogen is removed per acre flooded. The project would improve nitrogen removal efficiency because even though dramatically fewer acres are flooded, the few acres that remain flooded include relatively more forested lands. Efficiency is improved in the same way that closing 9 older sewage treatment plants while preserving one new treatment plant will increase the average efficiency of each operating treatment plant. But it also now means that the sewage that previously entered and was at least somewhat treated by the nine older plants now flows into the river completely untreated. From an environmental standpoint, the question is whether more or less nitrogen is in the Mississippi River with or without the project and, as I discuss above, the project would increase the amount of nitrogen in the river even according to the Corps' own analysis.

3

Woltemade Response 8: See Woltemade Response 7 above. The ability of various land uses to remove nitrogen (or the relative efficiencies of those land uses) is extremely environmentally relevant. If this were not so, there would be no scientific basis for recommending wetland and riparian restoration to achieve water quality improvements. The National Science and Technology Council Committee on Environment and Natural Resources (2000) recommended conversion of cropland to forested wetlands to help ameliorate the Gulf of Mexico hypoxia problem. Even the comment includes a reference to "more effective nitrate removal" from Spieles and Mitch (1998) as cited in Woltemade (2000) indicating that nitrogen removal efficiency is environmentally relevant.

The example provided in the comment fails to accurately describe the current situation. The floodway currently provides very little "treatment" of Mississippi River water, and actually contributes to the nitrogen load of the Mississippi River since it is predominantly agricultural land (Woltemade Responses 2 and 7). The project's mitigation features, since it increases nitrogen removal efficiencies, will reduce the amount of nitrogen entering the Mississippi River from the project area (Woltemade Response 2). With the

implementation of compensatory mitigation features, the contribution of the nitrogen load to the Mississippi River from the project area will be reduced by an estimated 50% (Woltemade Response 7).

Regardless, considering both its value as a filter for the Mississippi River and the floodway and also as a net nitrogen contributor, the project area still has an indiscernible effect on the total nitrogen load carried by the Mississippi River (Woltemade Response 3).

Woltemade Comment 9:

V. Fundamental Flaws with Corps Analysis

Although I have previously described a variety of flaws with the Corps analysis, I wish to further highlight two. One is the improper treatment of flooded agricultural fields, which function as farmed wetlands. Wetlands remove nitrogen in two possible ways. One possible way is through sedimentation. As water moves through the wetland, sediment falls out and some nitrogen is attached to the sediment. This is a modest process. By far the primary source of nitrogen removal is a biochemical process through which the nitrogen in water is converted to harmless nitrogen gas, which is released into the atmosphere (which is already mostly nitrogen gas). At times, Dr. Ashby has claimed that the model incorporates nitrogen removal for farmed wetlands. In fact, he has acknowledged, that it only factors in the removal of nitrogen through sedimentation, which is modest (10%).

This has a major effect on the model because it assumes that flooded agricultural fields remove little nitrogen, while flooded forest lands remove large quantities of nitrogen. But denitrification occurs primarily because of the bacteria in flooded soils, and they will exist in flooded forests as well as flooded agricultural land if flooded for several days. I am aware of no scientific disagreement about this fact. The result is that the Corps model both underestimates nitrogen removal in the project area under existing conditions, and has the potential to greatly overestimate the value of a mitigation plan that is based largely on reforestation.

Woltemade Response 9: As previously pointed out (Woltemade Responses 2 and 5), there is published information that flooded agricultural fields provide much less nitrogen removal by conversion to nitrogen gas (denitrification) than fully functioning wetlands. A possible explanation why follows. Denitrification is accomplished primarily by the activity of bacteria. As the comment notes, there is no disagreement about this fact. However, the denitrifying bacteria require organic matter, which typically accumulates in great concentrations in wetlands (Mitsch and Gosselink, 1986) as cited in Reddy and D'Angelo (1994). It is likely that organic matter in post crop season agricultural fields is much lower than in established wetlands since much of the organic matter is removed in

the harvesting processes. The microbial community structure in bottomland hardwoods can also be quite different from the microbial community in agricultural fields since they are subjected to very different types of hydrology that affect microbial community structure.

Woltemade Comment 10:

> Another flaw with the model is that it is not really a hydrologic model at all. It leaves out nearly all of the factors that need to be considered in even a simple hydrologic model to estimate changes in nitrogen loss. It leaves out length of inundation- how long water remains in the wetlands. It leaves out water routing pathways. It calculates the effects of only single flooding events, not the effects of reduced flooding from multiple flooding events over the course of a year. These are fundamental qualities to any hydrologic model. The model used was not peer-reviewed, and for these reasons, I doubt it could pass even lenient peer review.

Woltemade Response 10: The model is not presented as, or intended to be used as a hydrologic model. The model uses hydrologic information relevant to the project and evaluates changes in multiple water quality constituents, including nitrogen with various project and hydrologic scenarios.

The comment makes three criticisms of the model used.

The first is that the model leaves out length of inundation. This is not correct. The model assumes a 60 day inundation period which is considered to be adequate for material processing (Ashby, *et al*., 2000). In fact this time period exceeds the recommended periods cited in Woltemade (2000) of several days to two weeks. This is discussed in Woltemade Response 2.

The second criticism is that the model leaves out water routing pathways. This is correct since the model is based on mass balances and accounts for change in mass of a material (*e.g.,* nitrogen) by land cover type. The Corps acknowledges that additional processing of materials is occurring and would be accounted for with more rigorous hydrologic models that account for water routing pathways. However the intent of the model was to provide a mechanism for evaluating project alternatives. Using removal efficiencies based on a mass balance approach as a function of land use and different flooding regimes for alternative evaluations was considered acceptable by the interagency team.

The third criticism is that the model calculates the effects of only single flooding events and not the effects of multiple flooding events over the course of the year. Based on accepted runoff coefficients reported in Ashby, *et al*., (2000, pp. 7 - 8), the effects of multiple flooding impacts can be assessed. For example, using model results reported in

Ashby, *et al*., (2000 Table C1 and Table 5.3 RSEIS 2), the net yield of nitrogen was estimated for several flooding events as follows:

- 120,088 kg during flooding to an elevation of 290 feet NGVD in the New Madrid Floodway (Scenario 5),
- 58, 321 kg for the same flooding scenario (*i.e.*, a moderate high flow approximating a 2-year flood event) with mitigation accounted for (Table 5.3),
- 14,246 kg during flooding at an elevation of 285 feet NGVD (Scenario 2).

Thus, it follows that a 2 year flood event (with mitigation) would have to occur approximately 2 times per year to provide a nitrogen export value equal to existing conditions (58,321 * 2 = 116,642). Furthermore, the estimated yield of nitrogen at elevation 285 feet NGVD is the equivalent of approximately 1/4 of the estimated nitrogen exported during a flood event at 290 feet NGVD, suggesting that as many as 8 flood events (of less magnitudes of the 2-year flood) would have to occur to equal the export of nitrogen associated with existing conditions. Using the estimate of nitrogen export with mitigation (58,321 kg), the project area could process approximately 4 flood events associated with the 285 foot elevation.

Finally, the model calculates mass by multiplying concentrations by volume, adjusting for material processing with input values (*e.g.*, removal rates for wetland land covers and export coefficients for upland land covers), and adjusting for acres flooded under various flooding scenarios. This is accomplished with mathematical equations in a commercially available software package. Input values used in the calculations were cited from peer-reviewed literature and were accepted by an interagency team prior to application of the model.

References:

Ashby, S.L., Ruiz, C.E., and Deliman, P. 2000. Supplemental Water Quality Analysis – St. Johns Bayou and New Madrid Floodway, ERDC/EL SR-00-7, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Beaulac, M.N. and Reckhow, K.H. 1982. An examination of land use – Nutrient export relationships, Water Resources Bulletin, 18(6):1013-1024.

Mitsch, W.J. and J.G. Gosslink. 1986. Wetlands. Van Nostrand Reinhold, New York, 539 pp.

Mitsch, W.J., Day, J.W., Gilliam, J.W., Groffman, P.M., Hey, D.L., Randall, G.W., and N. Wang. 1999. Reducing Nutrient Loads, Especially Nitrate-Nitrogen, to Surface Water, Ground Water, and the Gulf of Mexico: Topic 5 Report for the Integrated Assessment on Hypoxia in the Gulf of Mexico. NOAA Coastal Ocean Program Decision Analysis Series No. 19. NOAA Coastal Ocean Program, Silver Spring, MD. 111 pp.

National Science and Technology Council Committee on Environment and Natural Resources. 2000. An integrated assessment of hypoxia in the Northern Gulf of Mexico.

Ochs, C.A. and S.A.Milburn. 2003. Effects of simulated wintertime flooding to control erosion on selected chemical and microbial properties of agricultural soils in the Mississippi delta, J. Mississippi Academy of Sciences, 48:2, 102-114.

Reddy, K.R. and E.M. D'Angelo. 1994. Soil processes regulating water quality in wetlands, Global Wetlands: Old World and New, W. Mitsch, ed. Elsevier Science, pp 309-325.

Spieles, D.J. and W.J. Mitsch. 1998. The effects of season and hydrologic and chemical loading on nitrate retention in constructed wetlands: a comparison of low and high nutrient rivierine systems. Pp 105-117. In W.J. Mitsch and V. Bouchard (eds.). Olentangy River Wetland Research Park at The Ohio State University Annual Report 1997.

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ATTACHMENT 1

Riley Lake and Eagle's Nest Area Wetlands Reserve Program (WRP) Site Visit

Riley Lake and Eagle's Nest Area Wetlands Reserve Program (WRP) Site Visit
St. Johns – New Madrid Floodway Project
New Madrid County, Missouri

Introduction

Environmental Defense (ED) has raised concerns about the validity of acreages of bottomland hardwood and farmland numbers used in the DRAFT Revised Supplemental Environmental Impact Statement 2 (DRSEIS 2). Furthermore, ED has made a claim in their comments on the DRSEIS 2 that a potential mitigation feature of flooding the sump area would kill existing trees within the WRP sites.

The purpose of this field survey was to document the vegetation in the vicinity of Riley Lake (Figure 1Figure 1. Riley Lake Area with 288' NGVD and less contour.) and to document the vegetation on the WRP lands (Figure 2). Riley Lake is located in the Donaldson Point area located in the batture to the south of the proposed levee closure location. The WRP lands in the Eagle's Nest area are located in the New Madrid Floodway sump.

Methods

After obtaining verbal permission from area landowner's via the local levee board attorney, Lynn Bock, Kevin Pigott proceeded to the project area on 02 February 2006. Various locations were visited with latitude, longitude, dominant vegetation, and other supplemental information being collected on site.

Results

Riley Lake

The SCI report submitted by ED is misleading. The "significant amounts of the area assumed to be farmland actually exist as densely-planted cottonwood trees" are primarily located outside the proposed footprint for Riley Lake and are indeed at elevations greater than or equal to 290' NGVD. This elevation is greater than the maximum suggested as an option in the DRSEIS 2. As indicated in Figure 1, the cottonwood tree plantations are the majority of the vegetation appearing in the red area to the east of the Riley Lake footprint and immediately south of Missouri Department of Conservation land. The existing vegetation within the Riley Lake footprint is primarily established Black Willow trees (Figures 3 and 4). It is noted that the imagery used in figures 1 and 2 are US Department of Agricultural National Agriculture Imagery Program (NAIP) near infrared imagery and are dated 14 August 2005. Phone calls to SCI for locations of the cottonwood plantations within the Riley Lake project area described in their report were not returned and the field investigator was unable to determine the location of the described cottonwood plantations. No dense stands of cottonwoods were observed within the proposed Riley Lake footprint within the limited field time.

WRP Land

Of the approximate 800 acres of WRP land in the Eagle's Nest area, almost all land is within the 285' NGVD contour (Figure 2) and could potentially be influenced by a proposed mitigation option. However, the WRP tracts are comprised of "cells" delineated by perimeter levees and water control structures. All of the land appeared to be managed for waterfowl with roughly half of the land being used to grow a food source for waterfowl (Figures 5 – 9). Approximately half of the WRP tracts have young Black Willows growing in them. According to US Forest Service data for the Lower Mississippi Valley and Missouri River Divisions, Black Willows are very flood tolerant, able to survive deep, prolonged flooding during the growing season (Whitlow and Harris, 1979 cited in http://na.fs.fed.us/spfo/pubs/n_resource/flood/table.htm). Water is currently being held on these WRP tracts with no apparent damage to the growing trees or other vegetation.

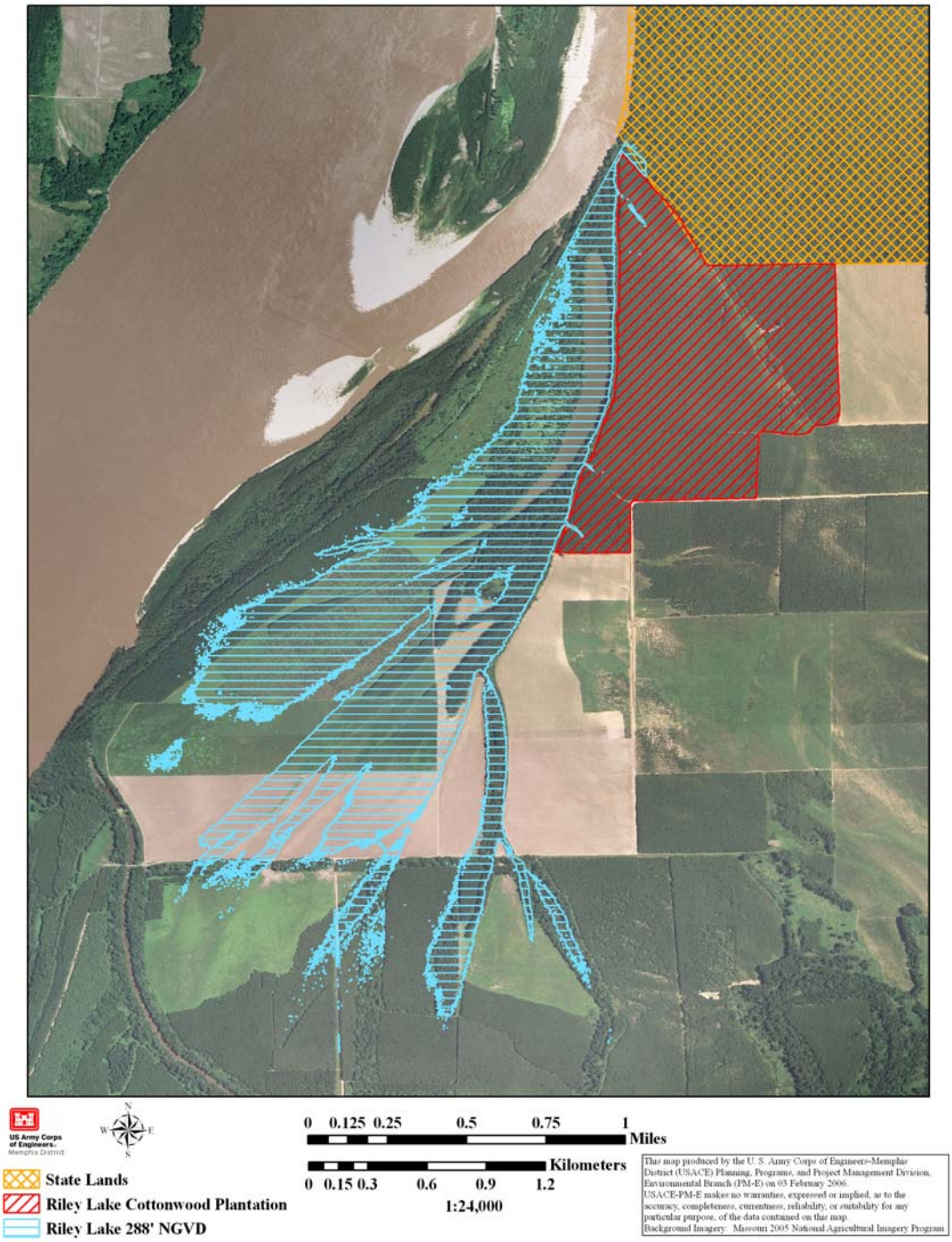


Figure 1. Riley Lake Area with 288' NGVD and less contour.

Figure 2. WRP land and 285' NGVD and less contour.

Figure 3. Existing vegetation adjacent to Riley Lake.

Figure 4. Existing vegetation adjacent to Riley Lake.

Figure 5. Flooded East Bayou WRP land looking South.

Figure 6. Flooded East Bayou WRP land looking Southwest.

Figure 7. East Bayou WRP land looking North.

Figure 8. Typical WRP water control structure (Eagle's Nest Farm WRP).

Figure 9. Waterfowl food source in Eagle's Nest Farm WRP land looking North.

References Cited

Whitlow, T.H. and R. W. Harris. 1979. Flood Tolerance in Plants: A State-of-the-Art Review. National Technical Information Service, U.S. Department of Commerce. August: 1-161.

ATTACHMENT 2

Change in Frequency Elevation in New Madrid Floodway

CHANGE IN FREQUENCY ELEVATION IN NEW MADRID FLOODWAY

A change in the frequency analysis for existing conditions in the New Madrid Floodway necessitates a revision to the 2-year frequency elevation as presented in the draft St. Johns - New Madrid SEIS. The following paragraphs describe the process.

In developing the criteria to quantify the fisheries impacts for each of the conditions, a necessary standard was the limit of valuable habitat. It was subsequently agreed that the 2-year frequency elevation would be the upper limit of potential impacts for the study. Therefore, only acreage below the 2-year frequency elevation was considered in the analysis.

To determine the 2-year elevation, the physical and rainfall-runoff characteristics of the New Madrid Floodway were utilized for the authorized and avoid and minimize conditions. The process entailed using actual rainfall for the period 1943-1974 and simulating the basin response at the outlet by routing daily runoff through the proposed structures. Daily runoff was developed using unit hydrograph procedures and sump storage routings reflecting corresponding Mississippi River stages. The frequency analysis was based on the resulting peak storage calculated in the sump for each year in the period-of-record analysis. Therefore, the physical and rainfall-runoff characteristics for the New Madrid Floodway were utilized to determine the interior frequency elevation. A similar method was applied to determine the existing conditions for the New Madrid Floodway, which assumed that interior storage in the Floodway was the dominant factor in determining the frequency relationship. As a result of using this procedure, a 2-year frequency elevation of 292.9 was determined for existing conditions.

During the review process of the draft SEIS, a quality control internal review was conducted by others in the agency. A result of the review was that the procedure used to develop the 2-year frequency elevation for existing conditions in the New Madrid Floodway was incorrect. It was also determined that the correct procedures were followed in developing the authorized and avoid and minimize frequency elevations, since the physical characteristics of the New Madrid Floodway and the basin response to rainfall-runoff processes are dependent upon the physical characteristics of the New Madrid Floodway. (It is important to understand that the authorized and avoid and minimize alternatives differ from existing conditions in the Floodway in that the basin is isolated from the direct influence of the Mississippi River by closure of the 1500-foot gap at the lower end of the Floodway). However, application of the basin characteristics of the New Madrid Floodway to determine a frequency elevation for existing conditions was not proper. This is true because virtually every annual peak elevation in the New Madrid Floodway under existing conditions is determined solely by flows in the Mississippi River and is independent of the Floodway area. Applying the physical characteristics of the Floodway, which is only a minor tributary (183 square miles) of the Mississippi River, to determine the frequency response is incorrect. It was determined that the frequency value for existing conditions at New Madrid is properly based on an analysis of peak flows and stage-discharge relationships along the Mississippi River system, which has a drainage area of approximately 920,000 square miles at New Madrid.

A comprehensive frequency analysis of the Lower Mississippi River was previously conducted. The analysis was based on an analysis of annual peak flows at all stations along the river that maintain continuous discharge records. A flow of 1,000,000 cfs is reflective of the 2-year frequency flow along the reach of the Mississippi River which includes New Madrid.

To determine the current 2-year elevation of the Mississippi River at New Madrid, a

synthetic rating curve at New Madrid was developed for the period 1993-1997 based on computed flows at Hickman, Kentucky and corresponding stages at New Madrid. The Hickman station is the key station for determining the flows in this reach of the Lower Mississippi River. For the established 2-year frequency flow of 1,000,000 cfs, the corresponding stage at New Madrid has been computed as 290 and is shown on Plate 1. This elevation is the appropriate 2-year frequency elevation for existing conditions in the New Madrid Floodway. The fisheries analysis has been updated to reflect this value. Plate 2 depicts the 2-year frequency elevations for the fisheries analysis for the three conditions evaluated for the New Madrid Floodway.

The revision in the 2-year frequency elevation for the New Madrid Floodway affects only the environmental impacts associated with the existing conditions fisheries analysis in the Floodway. All other analyses and results contained in the Hydraulic Appendix for the draft SEIS remain acceptable, since the analyses are not contingent upon the revised 2-year frequency elevation.

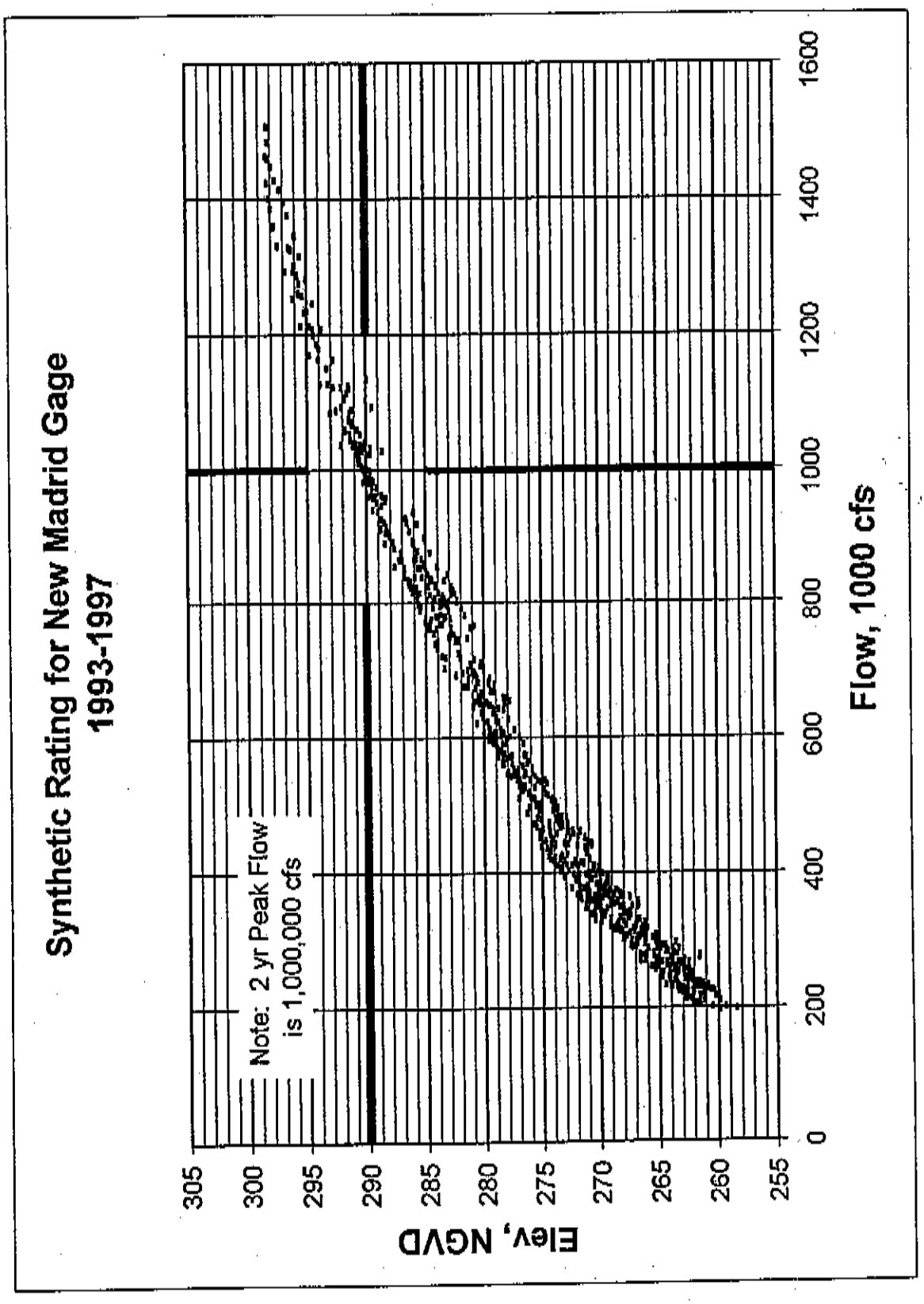
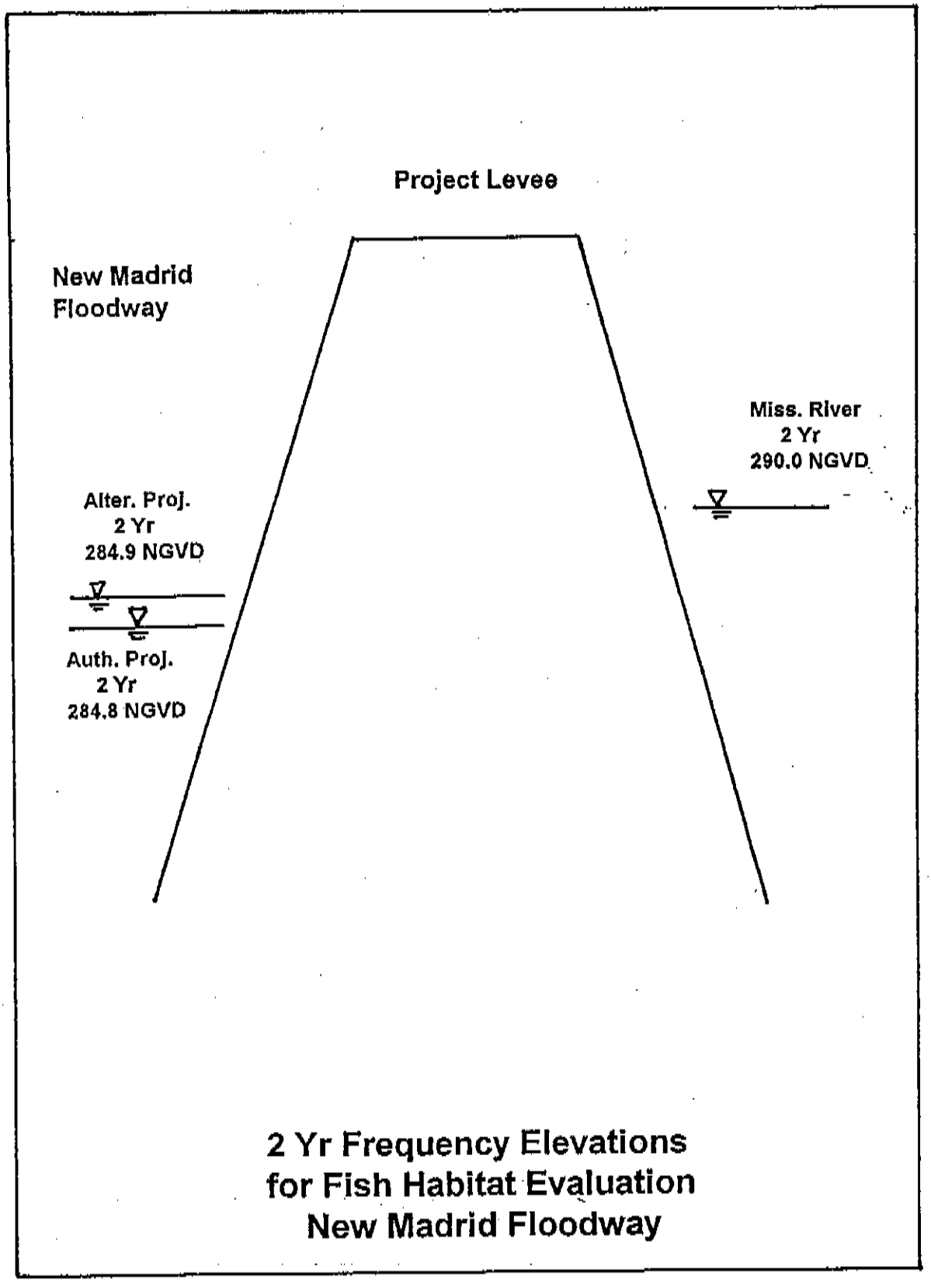

Synthetic Rating for New Madrid Gage
1993-1997
Note: 2 yr Peak Flow
is 1,000,000 cfs
Elev, NGVD
305
300
295
290
285
280
275
270
265
260
255
0
200
400
600
800
1000
1200
1400
1600
Flow, 1000 cfs

Plate 1



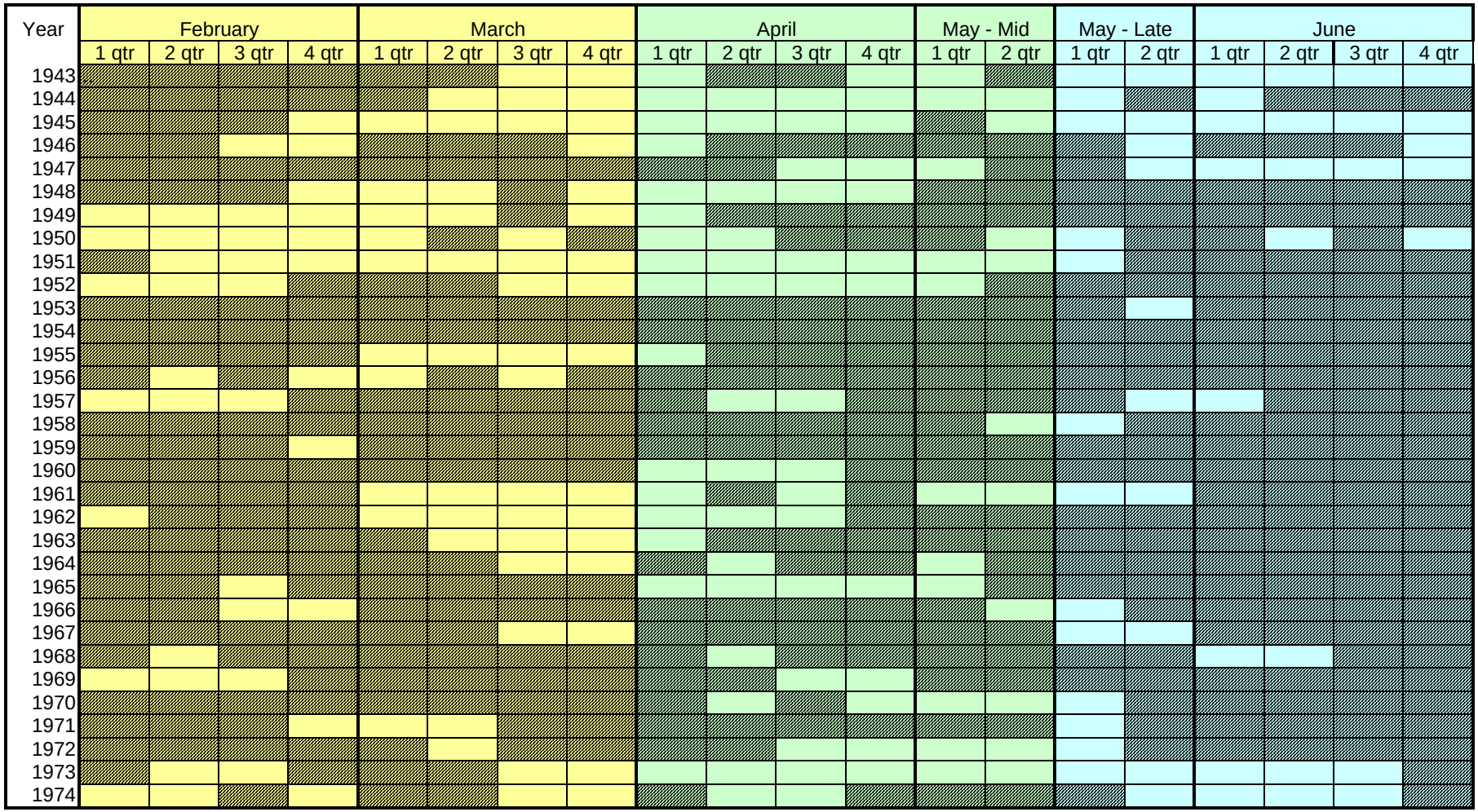
2 Yr Frequency Elevations for Fish Habitat Evaluation New Madrid Floodway

Plate 2

ATTACHMENT 3

Periods When the New Madrid Culverts are Likely to be Open

Periods When New Madrid Culverts Are Likely to be Open*



Early Season Fish Spawning & Rearing
Mid-Season Fish Spawning & Rearing
Late Season Fish Spawning & Rearing

Early Season Open Gates**
Mid Season Open Gates**
Late Season Open Gates**

* Likely to be open means the stage for at least three daysout of each shaded monthly quarter is below the start pump elevation
** This does not exclude the gates being open during the early season prior to crop planting

ATTACHMENT 4

NRCS Certified Wetland Determination

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
480 W Jackson Trail
Jackson, Missouri 63755
Phone 573.243.1467
Fax 573.243.3808

Subject: ECS-Wetland Determination/Delineation

Date: November 21, 2005

To: Robyn Sitzes, Resource Conservationist
NRCS, Charleston

File Code: 190-13-14

Enclosed is the documentation for your county's **Request for Certified Wetland Determination / Delineation** on this tract.

This Certified Wetland Determination is valid for the Food Security Act only. A copy of this Certified Wetland Determination is being sent to the COE for the Clean Water Act. Prior to any manipulations or conversions in this area approval must be obtained from the COE.

Please contact me if you have any questions.

Donnie Holbrook

Donnie Holbrook
Soil Scientist - Wetland Team

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

An Equal Opportunity Provider and Employer

United States Department of Agriculture

NRCS
Natural Resources Conservation Service
480 West Jackson Trail
Jackson, Missouri 63755
Phone: 573.243.1467

November 21, 2005

Dick Mochow
US Army Corps of Engineers
Regulatory Functions Branch
167 North Main
B 202
Memphis, TN

Dear Mr. Mochow:

Enclosed is the Certified Wetland Determination for the 2454, 2455, 2456, 2436 & 2437 tracts in Mississippi County, Missouri. The Ten Mile Pond Conservation Area.

If you require additional information or if you have any comments or questions, please call.

Donnie Holbrook
Wetland Team Soil Scientist

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

An Equal Opportunity Provider and Employer

Wetland Delineation Worksheet
MDC-Ten Mile Pond
Tract: 2454, 2455, 2456, 2436, 2437
County: Mississippi

1. Date of field visit: 11/3, 11/10/2005

2. Legal description: sec. 16, 21, T. 24 N., R.16 E.

3. Purpose of Request: MDC wants to build a small levee on crop fields to be able to flood the fields for wildlife use. The levee will be placed entirely on cropland and the fill for construction will be taken from the adjacent crop field.

4. Participants on the Delineation: Dick Mochow COE on 11/10/05, Rob Vinson MDC, Rod Doolen Wetland Biologist, Donnie Holbrook Wetland Soil Scientist on 11/3 and 11/10/05.

5. Pre-field review includes: Checked the local soil survey and FSA aerial photos and slides and U.S. Geological Topography maps and NWI maps (when available).

6. How many plots were taken: 1 (additional plots were taken for confirmation)

7. Method (please circle): ***routine*** ***transects*** ***other***_____

8. Description of the site: Project area was cropland on terraces and includes five tracts.

9. Description of each plot (location is depicted on the attached map) and/or other remarks: Plot 1 was selected to best represent the project area.

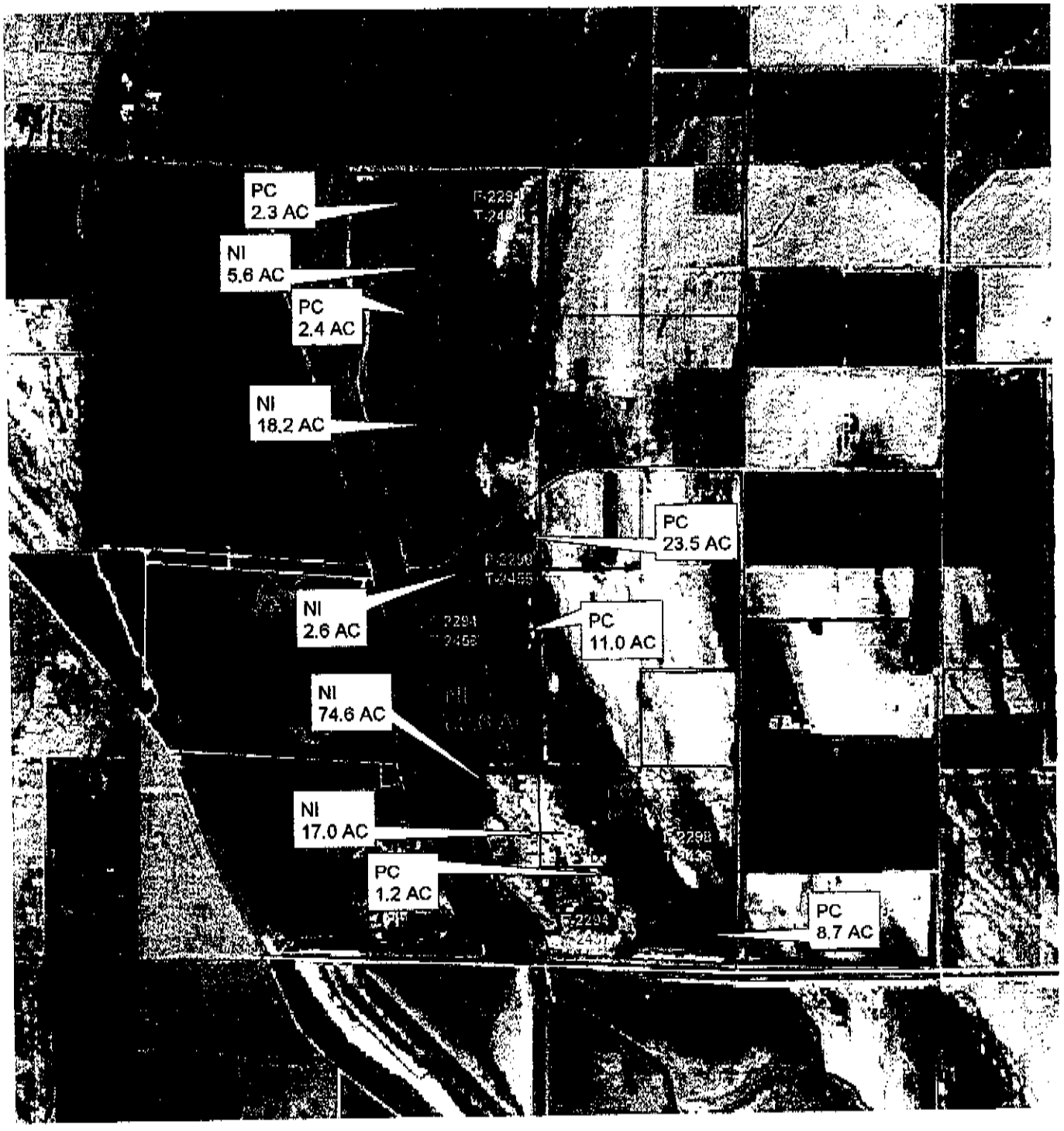
10. **Conclusion of Project Site**: All plots (approx. 274.2 acres) represent the levee construction running from north to south on five adjacent tracts. They **did not** have the required indicators for a wetland and for FSA purposes will be delineated as **Prior Converted Cropland (PC).** The areas below where the levee will be constructed were **Not Inventoried (NI).** All the remaining area was also **Not Inventoried (NI).**

Donnie Holbrook
Wetland Team Soil Scientist

See attached WetForms for additional information.

NOTE: *The acres on this delineation are estimated. The delineation line(s) on the attached photo is the approximate location of the wetland. Only wetlands flagged by NRCS and measured by FSA in the field are the official certified wetland determination. The wetland will only be flagged once by NRCS (as requested by landowner). The landowner is responsible to place permanent markers to mark the official wetland boundary.*

Certified Wetland Determination
MDC-Ten Mile Pond



0.5 0.25 0 0.5 1 Miles

N
W E
S

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: T-2454,2455,2456,2436,2437	**Project No:** Ten Mile	**Date:** 25-Nov-2005
Applicant/Owner: MDC-Ten Mile Pond Conservation Area		**County:** Mississippi
Investigators: Donnie Holbrook		**State:** Missouri
		Plot ID: 1

Do Normal Circumstances exist on the site?	(Yes) No	**Community ID:** cropland on terrace
Is the site significantly disturbed (Atypical Situation:)?	Yes (No)	**Transect ID:**
Is the area a potential Problem Area?	Yes (No)	**Field Location:**
(If needed, explain on the reverse side)		sec. 16,21, T. 24 N., R. 16 E.

VEGETATION (USFWS Region No. 3)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 0/0 = 0.00%

FAC Neutral: 0/0 = 0.00%
Numeric Index: 0/0 = 0.00

Remarks:
beans and corn stubble

HYDROLOGY

YES Recorded Data(Describe in Remarks):
- NO Stream, Lake or Tide Gauge
- NO Aerial Photographs
- YES Other

NO No Recorded Data

Field Observations

Depth of Surface Water:	N/A *(in.)*
Depth to Free Water in Pit:	N/A *(in.)*
Depth to Saturated Soil:	N/A *(in.)*

Wetland Hydrology Indicators

Primary Indicators
- NO Inundated
- NO Saturated in Upper 12 Inches
- NO Water Marks
- NO Drift Lines
- NO Sediment Deposits
- NO Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- NO Oxidized Root Channels in Upper 12 Inches
- NO Water-Stained Leaves
- YES Local Soil Survey Data
- NO FAC-Neutral Test
- NO Other (Explain in Remarks)

Remarks:
No wetness signatures for farmed wetland.

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

STATE OF MISSOURI
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.

Recycled Paper

Sincerely,

WATER PROTECTION PROGRAM

Refaat Mefrakis

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.

EXHIBIT

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

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

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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

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

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