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Addendum to Final Independent External Peer Review Report

St. Johns Bayou and New Madrid Floodway, Missouri Project Work Plan, Phase 2 Environmental, Economic, and Hydrologic and Hydraulic Review

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Flood Risk Management Planning Center of Expertise
Sacramento District

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SHORT-TERM ANALYSIS SERVICE (STAS)

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Addendum to Final Independent External Peer Review Report

St. Johns Bayou and New Madrid Floodway, Missouri
Project Work Plan, Phase 2
Environmental, Economic, and Hydrologic and Hydraulic Review

by

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The views, opinions, and/or findings contained in this report are those of the author and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.

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LIST OF ACRONYMS

AAHU	Average Annual Habitat Unit
ADFA	Average Daily Flooded Area
ATR	Agency Technical Review
BLH	Bottomland Hardwood Forest
CA	Conservation Area
CEA	Council of Economic Advisors
CE/ICA	Cost Effectiveness Incremental Cost Analysis
CECW	Corps of Engineers Directorate of Civil Works
CEQ	Council on Environmental Quality
cm	Centimeter
CNP	Current Normalized Price
COI	Conflict of Interest
CRP	Conservation Reserve Program
CWA	Clean Water Act
DEE	Daily Existence Energy
DTM	Digital Terrain Model
DrChecks	Design Review and Checking System
DSS	Data Storage System
DUD	Duck Use Days
EC	Engineering Circular
ECO-PCX	USACE Ecosystem Restoration Planning Center of Expertise
EIS	Environmental Impact Statement
EMAP	Environmental Monitoring and Assessment Program
ER	Engineering Report
EROS	Earth Resources Observation and Science Center (USGS)
ERDC	Engineer Research and Development Center
FCA	Flood Control Act
FCI	Functional Capacity Index
FCU	Functional Capacity Unit
FORTRAN	Formula Translation
FRM-PCX	Flood Risk Management Planning Center of Expertise
ft.	Foot/Feet
HEP	Habitat Evaluation Procedure
HGM	Hydrogeomorphic (or Hydrogeomorphic Method)
HSI	Habitat Suitability Index
HU	Habitat Unit
GIS	Geographic Information System
IEPR	Independent External Peer Review
in.	Inch
Lansat TM	Land Satellite Thermatic Mapper
LIDAR	Light Detection and Ranging
LMAV	Lower Mississippi Alluvial Valley

MAV	Mississippi Alluvial Valley
MDNR	Missouri Department of Natural Resources
MDOC	Missouri Department of Conservation
MRL	Mississippi River Levees
MoDOT	Missouri Department of Transportation
NRCS	Natural Resources Conservation Service
NEPA	National Environmental Policy Act
NED	National Economic Development
NGVD	National Geodetic Vertical Datum
NTP	Notice to Proceed
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
PCX	Planning Center of Expertise
PDT	Project Delivery Team
POP	Period of Performance
PMIP	Planning Models Improvement Program
RMR	Resting Metabolic Rate
SI	Suitability Index
SJNM	St. Johns Bayou and New Madrid Floodway
SOW	Statement of Work
STAS	Short Term Analysis Service
TMDL	Total Maximum Daily Load
TME	True Metabolizable Energy
UMAV	Upper Mississippi Alluvial Valley
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WAA	Wetland Assessment Area
WAM	Waterfowl Assessment Method
WET	Wetland Evaluation Technique
WRDA	Water Resources Development Act
WRP	Wetlands Reserve Program

1. INTRODUCTION

This addendum is a supplement to the *Final Independent External Peer Review Report, St. Johns Bayou and New Madrid Floodway, Missouri, Consolidated NEPA Document and Project Work Plan: Phase 2 Environmental, Economic, and Hydrologic and Hydraulic Review* (hereinafter referred to as the SJNM Final IEPR Report) submitted on April 28, 2010, by Battelle. The activities associated with this addendum to the SJNM Final IEPR Report were conducted under Contract No. W911NF-07-D-0001, Delivery Order: 09150, Delivery Order Number: 0666.

The addendum was prepared to document activities related to the independent external peer review (IEPR) comment/response process associated with the IEPR Final Panel Comments contained in the SJNM Final IEPR Report (Appendix A). The comment/response process is conducted after the Final IEPR Report is submitted to ensure that the IEPR Panel's (the Panel's) opinion and objectivity are not influenced by the U.S. Army Corps of Engineers (USACE). It is a critical part of the IEPR process because it allows the USACE Project Delivery Team (PDT) to understand the concerns of the Panel and also allows both the PDT and the Panel to discuss and agree to (if appropriate) actions to address the concerns. The comment/response process (the last step in the IEPR process following submission of the Final IEPR Report) usually involves a draft and final response from the PDT and a final response from the IEPR Panel. However, the PDT's draft Evaluator Responses included a list of detailed clarifying questions (instead of the typical Concur or Non-Concur responses), necessitating that the comment/response process be conducted over several iterations (defined as "rounds") for the IEPR Panel to respond to PDT questions. The results of the comment/response process are documented in this addendum report. For this IEPR, the comment/response process was coordinated by the Flood Risk Management Planning Center of Expertise (FRM-PCX) and Battelle. The comment/response process involved the Memphis District PDT responding to the IEPR Final Panel Comments (Evaluator Responses), and the IEPR Panel responding to the PDT Responses to the comments (BackCheck Responses). The details of this comment/response process are described in Section 2.

2. METHODS

The section provides a detailed description of the activities associated with each comment/response round conducted for this project. The schedule associated with these activities is shown in Table 1.

2.1. Round 1: Draft Comment/Response

Battelle posted 20 IEPR Final Panel Comments developed as part of the SJNM Final IEPR Report in USACE's Design Review and Checking System (DrChecks) on May 4, 2010. Table 1 shows the comment/response schedule, and Table 2 lists the Final Panel Comment statements (full IEPR Final Panel Comments, including the basis for comments, level of significance, and recommendations for resolution, are shown in Appendix A). Battelle received the draft Evaluator Questions/Responses from USACE on May 5, 2010. The draft Evaluator Questions/Responses consisted of a series of questions, clarifications, and responses to the IEPR Final Panel Comments. Following the receipt of the draft Evaluator Responses, Battelle instructed the Panel to prepare draft BackCheck Responses to the draft Evaluator Questions/Responses. Specifically, the lead panel member (i.e., author) for each IEPR Final Panel Comment was instructed to develop a draft BackCheck Response and circulate the response to the Panel for review. Once the draft BackCheck Responses were reviewed by the entire IEPR Panel, they were compiled and submitted to the FRM-PCX and PDT to facilitate discussion during the Draft Response teleconferences.

Due to the length of the questions and responses prepared by both USACE and the IEPR Panel, two Draft Response teleconferences were held on May 13, 2010, and May 17, 2010. Participants in these two teleconferences included the FRM-PCX, PDT, IEPR Panel, project sponsor, and review agencies to discuss the Panel's draft BackCheck Responses to the draft Evaluator Responses. At the close of the two teleconferences, 6 IEPR Final Panel Comments (Final Panel Comments 9, 10, 15, 16, 17, and 19) were resolved (i.e., USACE and the IEPR Panel both concurred with the Final Panel Comment and the questions/responses) and 14 IEPR Final Panel Comments required further discussion. The unresolved IEPR comments included the broad topic areas of Shorebirds, Hydrogeomorphic Method (HGM)/Wetland Mitigation, Fisheries, and Economics (Table 3) (full Draft Responses are shown in Appendix B).

2.2. Round 2: Final Preliminary Evaluator Response and Focus Groups

At the close of the two Draft Response teleconferences, USACE prepared a May 21, 2010, Final Preliminary Evaluator Response memorandum describing the unresolved issues relating to 10 of the 14 unresolved IEPR Final Panel Comments and providing further comment and clarification on primary areas of concern (Appendix C). Based on this memorandum, Battelle formed individual Focus Groups, each consisting of two to three subject matter experts from the IEPR Panel, to facilitate further discussion on the four topic areas. It was determined that the IEPR panel members with subject matter expertise on those topics would attend their respective Focus Group meetings and report the findings back to the IEPR Panel.

- Focus Group A (Shorebirds): IEPR Final Panel Comment 1 (Note: IEPR Final Panel Comment 2 is considered a subtopic of this Focus Group topic)
- Focus Group B (HGM/Wetland Mitigation): IEPR Final Panel Comments 7, 8, and 18 (Note: IEPR Final Panel Comment 6 is considered a subtopic of this Focus Group topic)
- Focus Group C (Fisheries): IEPR Final Panel Comments 3, 4, and 5
- Focus Group D (Economics): IEPR Final Panel Comments 11, 12, and 13

As noted above, IEPR Final Panel Comment 6 was determined to be a subtopic of IEPR Final Panel Comment 7 (Focus Group B: HGM/Wetland Mitigation) and was removed from further discussion as a separate comment. In addition, IEPR Final Panel Comment 2 was determined to be a subtopic of IEPR Final Panel Comment 1 (Focus Group A: Shorebirds) and was removed from further discussion as a separate comment. A portion of IEPR Final Panel Comment 14 (Subtopic: Cumulative Effects) and a portion of IEPR Final Panel Comment 20 (Subtopics: Gate and Pump Operation/Alternatives) were not resolved; however, the remaining concerns were considered minor and tabled until the Final Response process.

Battelle convened a teleconference on May 24, 2010, with the IEPR Panel to discuss the expertise necessary to respond to the four topic areas and to develop a Focus Group meeting schedule. The four Focus Group teleconferences were held with the PDT counterparts to the IEPR Panel subject matter experts. The PDT also invited the project sponsor and review agencies to participate in each Focus Group discussion.

The Focus Groups meetings were held over a two-week period starting May 28, 2010, and ending June 9, 2010. Subsequent to the close of the last Focus Group discussion, USACE determined that there was sufficient information for development of its final Evaluator Responses. This action concluded the activities associated with the draft comment/response process. The results of the Focus Group teleconferences are shown in Table 4.

2.3. Round 3: Final Comment/Response

The goal of the final round in the comment/response process was for the PDT and the IEPR Panel to reach "concurrence" on the 12 IEPR Final Panel Comments discussed in the Focus Group meetings. Battelle received the USACE final Evaluator Responses on July 14, 2010. The period of performance (POP) for the St. Johns Bayou Project Work Plan IEPR expired on July 31, 2010. Following the receipt of the final Evaluator Responses on July 14, 2010, no activities were conducted until Battelle received a contract modification revising the scope of work and extending the POP (authorization was received on August 17, 2010).

Once the panel members were under subcontract, a kick-off meeting was held on August 25, 2010, to provide the IEPR Panel with the July 14, 2010, USACE final Evaluator Responses and to discuss the overall Final Response schedule. The IEPR Panel was instructed to review the final USACE Evaluator Responses and prepare final BackCheck Responses. The lead panel member for each IEPR Final Panel Comment was instructed to develop a "draft" of the final BackCheck Response and circulate the draft Final Response to the Panel for review. A second Final Response teleconference was held with the IEPR Panel on August 31, 2010, to determine the panel members' preliminary review of their final BackCheck Responses. Battelle moderated

a third Final Response teleconference on September 15, 2010, for the panel members to review the compiled final BackCheck Responses. Once the final BackCheck Responses were reviewed by the entire IEPR Panel, Battelle submitted them to the FRM-PCX.

The PDT and the FRM-PCX requested a Final Response teleconference with the IEPR Panel to discuss a subset of the final BackChecks Responses − specifically, those responses indicating that the IEPR Panel did not concur with the USACE final Evaluator Response. This Final Response teleconference was held on September 8, 2010, with the FRM-PCX, PDT, IEPR Panel, and review agencies in attendance. At the close of this Final Response teleconference, 19 of the 20 IEPR Final Panel Comments were determined to be resolved as "Concur with Comment"(15) or "Concur" (4), with one IEPR Final Panel Comment unresolved. A second Final Response teleconference was held on September 15, 2010, to discuss the concerns relating to the unresolved IEPR Final Panel Comment 1 (Topic: Shorebirds).

At the close of this Final Response teleconference, the PDT and the IEPR Panel reached partial concurrence on the response to this remaining IEPR Final Panel Comment (Table 5) (full Final Responses are shown in Appendix D). The final BackCheck Responses were entered into DrChecks on November 4, 2010. A pdf printout of DrChecks and the addendum to the SJNM Final IEPR Report was submitted to USACE on November 5, 2010.

Table 1. SJNM IEPR: Project Work Plan Comment/Response Schedule

Activity	Due Date
Battelle submits Final IEPR Report	April 28, 2010
Draft Question/Comment/Response: Round 1	
Battelle inputs IEPR Final Panel Comments into DrChecks	May 4, 2010
USACE provides draft Evaluator Questions/Responses to Battelle	May 5, 2010
Draft Response Teleconferences between Battelle, IEPR Panel, and USACE to clarify questions and concerns on draft Evaluator Questions/Responses and draft BackCheck Responses	May 13, 2010, and May 17, 2010
Final Preliminary Evaluator Question/Response and Focus Groups: Round 2	
USACE prepares Final Preliminary Draft Evaluator Questions/Response memorandum in response to IEPR Panel concerns raised during May 13 and May 17 Draft Response teleconferences	May 21, 2010
Teleconference between Battelle and IEPR Panel to assign Focus Group (i.e., subject matter expert topic) responsibilities	May 24, 2010
Focus Group A(Shorebirds) Teleconference between Battelle, IEPR Panel, and USACE:	May 28, 2010
Focus Group B (HGM/Wetland Mitigation) Teleconference between Battelle, IEPR Panel, and USACE	June 4, 2010
Focus Group C (Fisheries) Teleconference between Battelle, IEPR Panel, and USACE	June 8, 2010
Focus Group D (Economics) Teleconference between Battelle, IEPR Panel, and USACE	June 9, 2010
USACE inputs final Evaluator Responses into DrChecks	July 14, 2010
St. Johns Bayou Project Work Plan IEPR: POP expires	July 31, 2010
Final Comment/Response: Round 3	
Contract modification received on St. Johns Bayou Project Work Plan IEPR	August 17, 2010
Teleconference between Battelle and IEPR Panel: Kick-Off for St. Johns Bayou Project Work Plan IEPR revised scope	August 25, 2010
Teleconference between Battelle and IEPR Panel to discuss BackCheck Responses to final Evaluator Responses	August 31, 2010
Final Response Teleconference between Battelle, IEPR Panel, and USACE to discuss the final Evaluator Responses and clarify questions	September 8, 2010
Final Response Teleconference between Battelle, IEPR Panel, and USACE to discuss the final Evaluator Response regarding the IEPR Panel Response on Final Panel Comment 1:Shorebirds	September 15, 2010
IEPR Panel submits final BackCheck Responses to final USACE Evaluator Responses in DrChecks	September 22 - October 5, 2010
Battelle enters final BackCheck Responses into DrChecks	November 4, 2010
Battelle submits Addendum to Final IEPR Report	November 5, 2010
Battelle submits pdf printout of DrChecks project file to USACE	November 5, 2010

Table 2. Final Panel Comments Identified by the SJNM IEPR Panel for the Final IEPR Report: Project Work Plan, Phase 2

IEPR Final Panel Comment	Significance – High
1	There are significant gaps regarding the application of the Shorebird Model, and the major concerns raised in the Phase 1 IEPR of the Consolidated NEPA Document have not been addressed.
2	The Project Work Plan does not respond to the concerns raised during the Phase 1 IEPR regarding the method to analyze the project's impact on shorebird habitat.
3	Information is not provided to support the importance of flood pulses (different from 2-year frequencies) in wetland ecosystems and for wetland-dependent organisms.
4	A more complete discussion of fish access in St. Johns Bayou and New Madrid Floodway is needed, and the potential quantification of losses and potential mitigation due to access restrictions must be addressed.
5	The fisheries methodology is not adequate to quantify actual spawning and rearing habitat based on Habitat Suitability Index (HSI) values.
6	The Waterfowl Assessment Method (WAM) appears to be appropriate; however, the parameter estimates for the model are based on fall migratory and wintering ducks and do not appear to consider spring migrants.
7	It is unclear if the application of the Hydrogeomorphic (HGM) approach to evaluate project impacts and develop proposed mitigation will yield scientifically credible results.
8	There is an insufficient level of detail in the Project Work Plan to evaluate the validity of the proposed compensatory mitigation plan.
9	The adaptive management plan requires a detailed analysis of the ongoing mitigation management costs and a clear funding source adequate to support those activities.
10	The methodology to determine the extent of the wetlands in the project area requires further detail to determine if it is valid.
11	The assessment of economic impacts of the proposed project may not be valid because the method used to document the future with and without project conditions, does not consider trends in real prices and costs.
12	The use of two discount rates for the same analysis is confusing and is not warranted in any conventional economic analysis.
13	The farming survey may not be credible unless a large enough sample size is used, producing a smaller statistical error for the analysis and avoiding many possible sources of bias.
14	The cumulative impact approach lacks specific information on how the conceptual matrix will be used to evaluate the incremental impacts of the proposed project or address the unique aspects of the study area.
15	More precise contour data (i.e., greater than a 1-foot contour interval) are required to estimate wetland availability and mitigation for waterfowl and shorebirds.

Table 2. Final Panel Comments Identified by the SJNM IEPR Panel for the Final IEPR Report: Project Work Plan, Phase 2, continued

IEPR Final Panel Comment	Significance – Medium
16	The list of significant resources is not complete because it does not include a discussion of the quality of the wetland resource, which is dependent upon the dynamic nature of the ecosystem's function and its connection to the river.
17	The water quality analysis in the Project Work Plan does not address water quality conditions in any of the study area water bodies and does not compare nutrient loads to the Mississippi River with and without project conditions.
18	The validities of several assumptions for the future without project alternatives are questionable.
19	The potential impact of global climate change on the proposed project and the conceptual mitigation plan should be acknowledged.
Significance – Low	
20	The gate closure and pump operation management alternatives proposed for St. Johns Bayou and New Madrid Floodway require further clarification.

Table 3. Draft Comment/Response[a] - Round 1: IEPR Final Panel Comment Status

IEPR Final Panel Comment	Draft Evaluator Response/Questions (Q)	Status at End of Round 1[b]	Path to Resolution/Remarks
1	17 questions (Q1a - Q1q)	**Unresolved**	**Focus Group A**
2	3 questions (Q2a - Q2c)	Unresolved subtopic: Additional comments noted during meeting	Subtopic of Final Panel Comment 1
3	2 questions (Q3a, Q3b)	Resolved: Q3b **Unresolved: Q3a**	**Focus Group C**
4	3 questions Q4a - Q4c	Resolved: Q4b **Unresolved: Q4a, Q4c**	**Focus Group C**
5	7 questions Q5a - Q5g	**Unresolved**	**Focus Group C**
6	6 questions Q6a - Q6f	Unresolved subtopic	Subtopic of Final Panel Comment 7
7	5 questions Q7a - Q7e	Resolved/No comment: Q7d, Q7e **Unresolved: Q7a – Q7c**	**Focus Group B**
8	4 questions Q8a - Q8d	Resolved/No comment: 8c **Unresolved: Q8a, Q8b, Q8d**	**Focus Group B**
9	2 questions Q9a, Q9b	Resolved/Comments noted	None required
10	Response only - no questions	Resolved/Comment noted	None required
11	1 question Q11	**Unresolved**	**Focus Group D**
12	1 question Q12	**Unresolved**	**Focus Group D**
13	1 question Q13	**Unresolved**	**Focus Group D**
14	Questions/Responses Q14a - Q14e	Resolved/Comments noted: Q14a, Q14e Unresolved: Q14b, Q14c, Q14d	Focus Group not required to resolve Q14b, Q14c, Q14d

Table 3. Draft Comment/Response - Round 1: IEPR Final Panel Comment Status, continued

IEPR Final Panel Comment	Draft Evaluator Response/Questions (Q)	Status at End of Round 1[a]	Path to Resolution/Remarks
15	Response only - no questions	Resolved/Comments noted	None required
16	6 questions/responses Q16a - Q16f	Resolved/Comments noted	None required
17	2 questions/responses Q17a, Q17b	Resolved/Comments noted	None required
18	3 questions/responses Q18a - Q18c	**Unresolved**	**Focus Group B**
19	Response only - no questions	No response required/Comment noted	None required
20	1 question Q20	Resolved/Comments noted	None required

[a.] Full draft Evaluator Responses and draft Panel BackChecks are shown in Appendix B.
[b.] Color-coded cells indicate unresolved questions sent to Focus Group.

Key:
= Focus Group A (Shorebirds)
= Focus Group B (HGM/Wetland Mitigation)
= Focus Group C (Fisheries)
= Focus Group D (Economics)

Table 4. Final Preliminary Comment/Response and Focus Group - Round 2: IEPR Final Panel Comment Status

IEPR Final Panel Comment	Final Preliminary Evaluator Question/Response[a] and Focus Groups			
	Status at End of Round 2		Focus Group Discussion	Potential Revisions to Response
	Resolved	Unresolved		
1	--	all	**A: Shorebirds**	**x**
2	--	N/A Subtopic of Final Panel Comment 1	N/A	N/A
3	Q3b	Q3a/R3-2	**C: Fisheries**	**x**
4	Q4b	Q4a, Q4c/R4-1, 4-2	**C: Fisheries**	**x**
5	--	x	**C: Fisheries**	**x**
6	--	N/A Subtopic of Final Panel Comment 7	N/A	N/A
7	Q7d, Q7e	Q7a – Q7c	**B: HGM/Wetland Mitigation**	**x**
8	RQ8c	Q8a, Q8b,Q8d R8-1, R8-2	**B: HGM/Wetland Mitigation**	**x**
9	all	--	N/A	N/A
10	all	--	N/A	N/A
11	--	x	**D: Economics**	**x**
12	--	x	**D: Economics**	**x**
13	--	x	**D: Economics**	**x**
14	Q14a, Q14e	--		N/A
15	all	--	N/A	N/A
16	all	--	N/A	N/A
17	all	--	N/A	N/A
18	--	x	**B: HGM/Wetland Mitigation**	**x**
19	No response required	--	N/A	N/A
20	all	--	N/A	N/A

[a]Full final Preliminary Evaluator Comment/Responses are shown in Appendix C.

Key:
= Focus Group A (Shorebirds)
= Focus Group B (HGM/Wetland Mitigation)
= Focus Group C (Fisheries)
= Focus Group D (Economics)

Table 5. Final Comment/Response[a] - Round 3: IEPR Final Panel Comment Status

IEPR Final Panel Comment	Final Comment/Response Status at End of Round 3			
	Final Evaluator Response	Final BackCheck Response		
		Resolved		Unresolved
		Concur	Concur with Comment	
1	Comment/Response Q1a - Q1q	Q1m - Q1q [b]		Q1a-Q1k
2	Recommendation 1-3 revised response		x	
3	Questions / Recommendation Q3a, Q3b/R3-1, R3-2		x	
4	Recommendations 1 and 2 revised response		x	
5	Recommendations 1 and 2 revised response		x	
6	Recommendation revised response		x	
7	Recommendation revised response		x	
8	Recommendation revised response		x	
9	Recommendation revised response		x	
10	Recommendation revised response	x		
11	Recommendation revised response		x	
12	Recommendation revised response		x	
13	Recommendation revised response		x	
14	Recommendation revised response		x	
15	Recommendation revised response	x		
16	Recommendation revised response		x	
17	Recommendation revised response		x	
18	Recommendation revised response		x	
19	Recommendation revised response	x		
20	Recommendation revised response	x		

[a.] Full final Evaluator Responses and final Panel BackChecks are shown in Appendix D.
[b.] An additional teleconference was held on Final Panel Comment 1, resulting in a split of "concur" and "unresolved" responses to the Q1a – Q1q.

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Appendix A
IEPR Final Panel Comments

on the

St. Johns Bayou and New Madrid Floodway, Missouri
Final IEPR Report: Project Work Plan, Phase 2
Environmental, Economic, and Hydrologic and Hydraulic Review

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Comment 1:
There are significant gaps regarding the application of the Shorebird Model, and the major concerns raised in the Phase 1 IEPR of the Consolidated NEPA Document have not been addressed.
Basis for Comment:
The Phase 1 IEPR of the Consolidated NEPA Document (Phase 1 IEPR) raised significant concerns regarding the application of the Habitat Model of Mitigating Shorebirds in the Upper Mississippi Alluvial Valley (Shorebird Model). The Project Work Plan does not include adequate detail to address how the analyses of impacts on shorebird habitat will be carried out, and therefore does not respond to the concerns raised in the Phase 1 IEPR Final Panel Comments. The future NEPA document will require the development of new techniques for estimating impacts on shorebird habitat that are not currently specified or described. Neither the Phase 1 IEPR nor the Shorebird Model Certification Review were able to address these issues, because the information supplied to the IEPR Panel was inadequate to base a review of the application of the Shorebird Model. Major issues raised in the IEPR that are not addressed in the Project Work Plan include the following: • The use of total sparsely vegetated area that is flooded and then exposed, rather than average or median area is recommended, because all sparsely vegetated and flooded areas become suitable habitat when exposed by receding flood waters. The Project Work Plan does not incorporate the key recommendation from the Phase 1 IEPR, that the <u>total</u> flooded area should be used to calculate shorebird habitat, rather than average habitat available by month. There are large differences between the amount of area where flooding is proposed to be reduced by the project, and the relatively much smaller area where shorebird habitat was calculated to be lost. This concern will not be addressed by the application of mean flood elevations as proposed in the Project Work Plan. As discussed in the mid-review conference call with USACE, the IEPR panel, and Battelle (March 17, 2010), the total sparsely vegetated area which is flooded and then exposed should be estimated and used as the input for the Shorebird Model. • The actual habitat value of moist soil units for shorebirds will be substantially less than calculated because the same units are being managed for waterfowl as well. The Project Work Plan does not include a response to this issue, which will require calculating reduced values for both species groups if the same area is to provide habitat for shorebird and waterfowl simultaneously. • 3. The long-term maintenance of the moist soil units will require extensive management in perpetuity. The Project Work Plan does not indicate that a permanent management plan will be included in the future NEPA document.
Significance – High:
The major concerns raised in the Phase 1 IEPR must be addressed prior to developing a detailed proposal to mitigate for shorebird habitat impacts.

Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Develop methods for calculating the total area of sparsely vegetated habitat that floods and is then exposed; these methods should be subjected to peer review. 2. Reduce the value of moist soil units for both shorebirds and waterfowl to reflect the difficulties of managing the same area for both species groups. 3. Develop a permanent management plan to ensure that the dynamic nature of the area to be impacted, and the high level of function that results, is replaced in perpetuity once natural function is lost.

Comment 2:

The Project Work Plan does not respond to the concerns raised during the Phase 1 IEPR regarding the method to analyze the project's impact on shorebird habitat.

Basis for Comment:

The Shorebird Model is a simple Habitat Suitability Index (HSI) model that discounts various habitat types by their relative value for migrating shorebirds, and employs commonly used approaches. The correct application of the Shorebird Model is critical because the acreage values used as inputs have the largest effect of any variable on the output of the model. Although the application of the model has not been adequately reviewed by the IEPR panel, the panel believes that the methods used in the future NEPA document were seriously flawed. Insufficient information was provided to the panel to review the model application, as detailed in the Phase 1 IEPR. The application of the model was specifically excluded from the Shorebird Model Certification Review (Battelle, 2010), which focused only on the technical quality and usability of the model and not on its application. Presumably, a new analysis and a new application of the model, potentially with modifications, is proposed, but this is not specified clearly in the Project Work Plan. A detailed review of the calculations of shallowly flooded areas used as inputs for the Shorebird Model, and the application of the shorebird Habitat Evaluation Procedures (HEP) models to those input values, still needs to be completed to determine if the methodology follows standard scientific procedures. It would be prudent to include this review during the early stages of the development of the future NEPA document, rather than after the future NEPA document is completed.

In addition, the Project Work Plan does not respond to several of the major concerns raised in the Shorebird Model Certification Review, because the Project Work Plan was written before the Model Certification Review had been completed. As a result, the Project Work Plan does not explain how these concerns will be addressed in the future NEPA document. Major issues that were not addressed include the following:

1. The use of more detailed elevation data to determine impact area. The Project Work Plan states that more detailed data are not available, but does not provide a plan for overcoming this limitation. During the mid-review conference call with USACE, the IEPR panel, and Battelle (March 17, 2010), the IEPR panel discussed the possibility of using total flooded area as an approach to resolving this issue. The total area flooded to any depth but subsequently exposed, plus the addition of the one-foot contour above the maximum flood extent, will likely include all water depths and all mudflats accessible to shorebirds.
2. The use of other variables known to be important for determining shorebird habitat value, including percent cover, proximity to other wetlands, and the amounts of mudflat habitat.
3. A description of how the HSI values were developed, and a justification for the values chosen.

- A description of how the Shorebird Model was developed, how it should be interpreted, the assumptions made, and the limitations of the model.

• Testing and validation of the Shorebird Model.
Significance – High:
The impacts of the proposed project on shorebird habitat cannot be determined without a thorough review of the methods to be applied in estimating those impacts.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Conduct a review of the application of the shorebird model; such a review did not occur either during the Phase 1 IEPR or during the Shorebird Model Certification Review. 2. Clearly outline the methods for carrying out the analysis of impacts on shorebird habitat before they are applied during the development of the future NEPA document. 3. Address all of the concerns raised in the Phase 1 IEPR and the Shorebird Model Certification Review.

Literature Cited:

Battelle Memorial Institute. 2010. Model Certification Review of the Habitat Model for Migratory Shorebirds in the Upper Mississippi Alluvial Valley Prepared for Department of the Army U.S. Army Corps of Engineers Ecosystem Restoration Planning Center of Expertise, Rock Island District, Battelle, Columbus, OH

Comment 3:
Information is not provided to support the importance of flood pulses (different from 2-year frequencies) in wetland ecosystems and for wetland-dependent organisms.
Basis for Comment:
Bottomland hardwood forests and backwater swamps are characteristic wetland ecosystems of the St. Johns Bayou and New Madrid Floodway. These ecosystems are adapted to, and nourished by, the flood-pulsing Mississippi and Ohio Rivers. Floodplain ecosystems depend on a pulsing hydrology of various amplitudes and frequencies (Junk et al., 1989; Odum et al., 1995), and when their hydrology is not altered they are generally most productive (Conner and Day, 1976; Mitsch and Ewel, 1979; Megonigal et al., 1997). Any changes in that pulsing can lead to suboptimal conditions. The Project Work Plan does not present adequate information regarding the impact of flooding frequency on ecosystem or community function, except for the assumption that 2-year frequency flood events will be used to determine the impacts on fish and shorebirds. Floodplain ecosystems and their biological communities are formed not only by annual and 2-year frequency floods, but also by dramatic floods of longer recurrence interval such as 25-year and 100-year flood events. Fluvial processes such as sediment deposition and erosion are often dramatic during these less frequent flood events. Fish and wildlife are influenced by these rare events, which generate new habitats, different hydrology, and major inputs of nutrients and sediments. The Consolidated NEPA Document and the Project Work Plan mostly ignore recurrence intervals above two years for fish. Pulsing hydrology is also an important consideration for shorebirds because of rare but important hydrologic processes such as development of new mudflats, yet only 2-year floods are described for their habitat as well.
Significance – High:
Changing either the frequency or amplitude of flooding on the project site has great implications on how well the impacts can be mitigated on site and on the ability of the site biota, especially fish and shorebirds, to adapt to that change in flooding.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Understand and recognize the importance of flood pulses to the remaining natural ecosystems on the site. 2. Consider impacts of these important seasonal pulses by evaluating the effects of floods with other than a 2-year recurrence interval.

Literature cited:

Conner, W. H., and J. W. Day, Jr. 1976. Productivity and composition of a bald cypress-water tupelo site and a bottomland hardwood site in a Louisiana swamp. *American Journal of Botany* 63:1354–1364.

Junk, W. J., P. B. Bayley, and R. E. Sparks. 1989. The flood pulse concept in river-floodplain systems. *In* D. P. Dodge, ed. *Proceedings of the International Large River*

Symposium. Special Issue of the Journal of Canadian Fisheries and Aquatic Sciences 106: 11–127.

Megonigal, J. P., W. H. Conner, S. Kroeger, and R. R. Sharitz. 1997. Aboveground production in Southeastern floodplain forests: A test of the subsidy-stress hypothesis. *Ecology* 78: 370–384.

Mitsch, W. J., and K. C. Ewel. 1979. Comparative biomass and growth of cypress in Florida wetlands. *American Midland Naturalist* 101:417–426.

Odum, W. E., E. P. Odum, and Odum, H.T. 1995. Nature's pulsing paradigm. *Estuaries* 18: 547–555.

Comment 4:
A more complete discussion of fish access in St. Johns Bayou and New Madrid Floodway is needed, and the potential quantification of losses and potential mitigation due to access restrictions must be addressed.
Basis for Comment:
Mississippi River fish access to spawning and rearing habitat is a critical component of this project. An evaluation of fish access, comparing the open New Madrid Floodway with the existing culvert access of the St. Johns Floodway, would quantify any access restriction due to the culverts. The fish access studies outlined in the Project Work Plan will provide data needed to assess fish movement into and out of the St. Johns Floodway in relation to river stage and water temperature. However, the Project Work Plan does not include a comparison between the gated St. John's Floodway and the currently open New Madrid Floodway. This information would allow a comparison of the scenarios needed to evaluate access restriction due to the culverts. In addition, monitoring fish access in the floodways during and after project construction and under varying gate operations is not mentioned in the Project Work Plan. Finally, the Project Work Plan does not identify a methodology that may be used to quantify the impact of restricted access on fish rearing and spawning or mitigation for the potential loss due to restricted access by the culverts or gate operations.
Significance – High:
River connectivity to the floodways allowing fish access for spawning and rearing is a significant ecological feature of floodplain river ecosystems and any potential impact should be quantified for the proposed project.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Expand current fish access studies in the St. Johns Floodway to include the New Madrid Floodway. This would allow a comparison of fish access between a culvert access floodway and an open access floodway. Noted fish access restrictions due to the proposed culverts or gates should be subject to a detailed compensation plan as part of the overall mitigation program. 2. Use existing gate operations to conduct a study to quantify fish access restrictions for each spawning period, including stage and water temperatures. Any impact or loss should then be compensated in the mitigation plan. If fish access is restricted, then nearby batcher land mitigation should be considered to offset spawning and rearing loss attributed to access loss.

Comment 5:
The fisheries methodology is not adequate to quantify actual spawning and rearing habitat based on Habitat Suitability Index (HSI) values.
Basis for Comment:
HSI values used for each of five spawning and rearing habitats represent a community-level perspective. However, the HSI values have not been empirically developed or evaluated within habitats of either floodway. Although the relative ranking of HSI values among habitats is supported in the Project Work Plan, quantitative HSI differences need to be determined since these differences will influence mitigation choices. In turn, mitigation choices may increase HSI values due to habitat classification changes and adaptive management scenarios. For example, changing from fallow habitat (HSI = 0.5) to bottomland hardwood (HSI = 1.0) suggests a doubling of habitat suitability for spawning and rearing for all periods. This is not supported in the Project Work Plan. This comment was also included in the Model Certification Review for Enviro Fish (Battelle, 2010). The Project Work Plan indicates that HSI values may change due to holding water during the entire spawning and rearing period even though the habitat complexity does not change. The Delphi Process will be employed to determine a new HSI value for these scenarios. Even without an HSI change, the habitat units (HUs) may increase appropriately if the number of days of suitable habitat within the spawning and rearing period increases due to holding water and increasing the average daily flooded acres (ADFAs) within the spawning and rearing periods.
Significance – High:
The HSI values are critical in calculating existing and lost HUs for project alternatives, as well as for evaluating mitigation alternatives.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Evaluate and compare existing spawning and rearing habitat types within the St. Johns and New Madrid floodways that will allow the development of quantitative HSI values for each habitat during each of the three spawning/rearing periods. 2. Evaluate any positive effects on spawning and rearing success in habitat types that may occur by holding water during the entire spawning and rearing period beyond any ADFA increase. 3. Monitor mitigation areas to determine if HSI values initially assigned are appropriate, or if adaptive management changes need to be considered to achieve the desired HUs.

Comment 6:
The Waterfowl Assessment Method (WAM) appears to be appropriate; however, the parameter estimates for the model are based on fall migratory and wintering ducks and do not appear to consider spring migrants.
Basis for Comment:
The current Waterfowl Assessment Method (WAM) is parameterized based on data collected from waterfowl wintering locations and adjusted for spring when data allow. Recent studies (see below) now provide estimates for these same parameters during the spring migratory period. For example, Hitchcock (2009) provides estimates of diets for five species of duck during spring migration. These data indicate aquatic invertebrates are a more important component of the diet in four of the five species than previously expected; thus the WAM should rely more on aquatic inverts during spring. Data from Eichholz and Yerkes (in prep.) indicate that spring migratory ducks are acquiring nutrient reserves during spring migration, thus the estimate of daily energy expenditure (DEE) used in WAM is likely an underestimate of true DEE during spring (this concern was also recognized during the Model Certification review for the Waterfowl Assessment Method, [Battelle, 2010]). Finally, aquatic invertebrate and moist soil seed availability estimated directly from samples collected during the spring migratory period differ considerably from estimates derived using the WAM model, especially for agricultural habitat.
Significance – High:
Use of the parameters outlined in the Project Work Plan may result in underestimating the required waterfowl habitat mitigation.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should use parameter estimates from data collected during the spring migratory period for parameterization of the model.

Literature Cited:

Battelle Memorial Institute. 2010. *Model Certification Review of the Waterfowl Assessment Method*. Prepared for Department of the Army, U.S. Army Corps of Engineers, Ecosystem Restoration Planning Center of Expertise, Rock Island District, under Contract Number W911NF-07-D-0001,Battelle, Columbus, OH.

Eichholz, M. W. and T. Yerkes *in prep*. Body condition of spring migratory ducks.

Hitchcock, A. N. 2009. Diet of spring-migrating waterfowl in the upper Mississippi River Great Lakes Region. M.S. Thesis. Southern Illinois University Carbondale, Carbondale, IL.

Straub, J. N. 2008. Energetic carrying capacity of habitats used by spring-migrating waterfowl in the Upper Mississippi River and Great Lakes Region. M.S. Thesis. The Ohio State University, Columbus, OH.

Comment 7:
It is unclear if the application of the Hydrogeomorphic (HGM) approach to evaluate project impacts and develop proposed mitigation will yield scientifically credible results.
Basis for Comment:
The Project Work Plan calls for the use of HGM (described in Klimas et al., 2009) to estimate wetland function lost and compare it to wetland function gained in mitigation. The procedure has been in development for over 20 years and has been used by USACE on many occasions. The IEPR panel recognizes that the HGM approach, even with its shortcomings, is one of the few methods available to compare wetland functions. Furthermore, the panel recognizes the need for a quantitative assessment of wetland functions to be used in impact evaluation and mitigation development. However, giving HGM "model" status implies that it has a dynamic modeling capability similar to the hydrologic models used by USACE. In ecology, and certainly in wetland ecology, data are generally ±20%. Such field data are used to estimate and calibrate functional capacity indices (FCIs, usually ranging from 0.0 to 1.0) in the HGM. In turn, these data are used to determine mitigation and impacts with the HGM approach. Given that the site is divided into many wetland types, it is obvious there are large data requirements to split the functions among these types with any degree of certainty. The panel does not believe that there is sufficient wetland science to support the detail required in the report for different wetland types. Therefore it is the IEPR panel's opinion that the method may not produce defensible data. The amount and type of mitigation for the proposed project are greatly dependent on the results obtained from the HGM model Furthermore, the Draft Model Certification Review Report for the HGM Guidebook (Battelle, 2010) stated that there "were some issues identified with the models' documentation, application, and variables, and some potentially serious errors were noted in the spreadsheet calculations and formulas." This HGM Model certification review did not provide assurance to the Phase 2 IEPR panel that this method will provide a scientifically defensible method for estimating impacts and mitigation. It also appears that all of the wetlands in this bottomland area should be categorized as "riverine" (see Table 9.2), with only a few categorized as lacustrine. To call some depressional and some fringe is not looking at the main forcing function of this system–the river–and it adds unwanted detail. Depressional or basin wetlands were originally meant to describe isolated wetlands, whereas fringe wetlands were mostly used for bidirectional coastal wetlands or lacustrine wetlands. Neither is usually associated with floodplain landscapes.

Significance – High:
The HGM model results may be of key significance in estimating the impacts of the entire project.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Use a safety factor as high as 4x (there are ample precedents for this) when estimating the amount and type of mitigation that this project should propose; this will resolve the uncertainty in the HGM method and its parameters. 2. Continue to evaluate other models that are more related to the function and structure of wetlands to assess comparison of wetland functions for mitigation. This of course will not be possible in the short term of this investigation.

Literature Cited:

Battelle Memorial Institute. 2010. *Draft Model Certification Review Report for the Delta Region of Arkansas Hydrogeomorphic Methodology (HGM) Guidebook*. Prepared for Department of the Army, U.S. Army Corps of Engineers, Ecosystem Restoration Planning Center of Expertise, Rock Island District, by Battelle, Columbus, OH.

Klimas, C.V., E.O. Murray, J. Pagan, H. Langston, and T. Foti. 2009. *Revision to the 2005 - 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*. U.S. Army Corps of Engineers: Engineer Research and Development Center Publication ERDC/EL TR-04016

Comment 8:

There is an insufficient level of detail in the Project Work Plan to evaluate the validity of the proposed compensatory mitigation plan.

Basis for Comment:

There is insufficient detail on the method used to estimate wetland habitat loss and function. For example, the IEPR panel is concerned that the method to estimate changes of wetland functional condition among and within subclasses is not adequate. This concern is also emphasized in the Draft Model Certification Review Report for the HGM Guidebook (Battelle, 2010), which was provided to the panel during the review of the Project Work Plan. Furthermore, it is impossible to form an opinion as to whether mitigation will offset loss without greater detail in the proposed mitigation plan, For example:

- The plan does not describe how USACE will determine the environmental value of managed moist soil habitat when being managed to simultaneously support waterfowl, shorebirds, and fish. In addition, the Project Work Plan needs to state how management of moist soil units and levies for other inundated habitat will be funded in perpetuity to ensure that the habitat value of the units is adequate to replace lost wetland function.
- In Section 8.5.1 of the Project Work Plan, the discussion on reforestation is brief and lacks the necessary detail, considering the importance of this mitigation measure. The panel agrees that reforestation may need to include, in addition to planting appropriate tree species, restoration of topography and hydrology to be considered a successful mitigation measure.
- More detail is needed when identifying specifics of types of ecosystems that would be expected from this mitigation and time over which they will reach maturity or at least stability.
- There is too little detail in the methodology of the restoration of Big Oak Tree State Park to determine the feasibility of restoring Big Oak Tree State Park, given its importance to successful mitigation.

Significance – High:

The project success is dependent on determining the appropriate level of mitigation.

Recommendations for Resolution:

To resolve these concerns, the future NEPA document should address the following:

1. Provide more detail as to how wetland habitat loss and function will be estimated.
2. Provide more detail on how estimated wetland loss and function will be mitigated.

Comment 9:
The adaptive management plan requires a detailed analysis of the ongoing mitigation management costs and a clear funding source adequate to support those activities.
Basis for Comment:
Comparing the costs and benefits of the proposed project requires a complete accounting of the costs. One major cost associated with the mitigation plans proposed in the Consolidated NEPA Document, and discussed in detail in the Phase 1 IEPR, is the monitoring and management required to successfully implement an adaptive management program. The mitigation sites cannot be managed adaptively without both an ongoing monitoring program sufficient to detect areas where actual function falls short of proposed goals, and a management program designed to correct those inadequacies. In addition, general ongoing management is required for moist soil management impoundments in perpetuity for them to function effectively and provide high levels of wildlife habitat for waterfowl and shorebirds. The Phase 1 IEPR pointed out the lack of a designated funding source for these ongoing activities, and the Project Work Plan does not include a proposal to address this issue. In addition, the adaptive management discussion leaves most details to be addressed during the development of the future NEPA document. The IEPR panel suggests that the Project Work Plan would be significantly improved by a discussion of possible monitoring results that would trigger management changes for each of the significant resources.
Significance – High:
Without a demonstrated source of funding, adaptive management cannot be applied to the mitigation sites, and therefore full mitigation for project impacts cannot be achieved.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document must include a source of funding for adaptive management activities, including ongoing monitoring and management as part of the mitigation plan.

Comment 10:

The methodology to determine the extent of the wetlands in the project area requires further detail to determine if it is valid.

Basis for Comment:

An accurate measure of wetland types in the project area is one of the important pieces of information needed to make a fair assessment of wetland impacts and mitigation. The IEPR panel notes that the Project Work Plan calls for a generally appropriate approach to estimating wetland area. Areas that meet the definition of wetlands based on hydrology and soils will be considered wetlands. Given the extensive agriculture and other management on the site over the years, this appears to be an acceptable definition.

The panel is also pleased to see that an interagency team is being used to assess the overall effect of the project on wetlands. The team properly includes state agencies, USEPA, and USACE. It is not clear why USFWS is not included.

The panel is concerned that the level of detail in the methodology presented is not sufficient to determine how well that inventory will meet the needs of this Project Work Plan:

- The description of a wetland "scene" includes identification of soils from hydric soils and hydric soil inclusions on USDA soil maps, identification of wetland hydrology in the growing season from site hydrology data, estimates of growing season, and a model WETSORT. The panel was provided with little detail on what the model WETSORT does. It is a key component to this estimate of wetland area.
- For field sampling, the Project Work Plan suggests that random set of plots/samples will be used. It is not clear how many will be taken; the panel needs this information to determine the precision of the wetland area estimates.
- Agricultural land is one of the important variables in estimating the extent of wetlands. How much of the site will be exempted because it is agricultural land? Will it always be exempted or can it convert to jurisdictional wetland some day? There are also agricultural wetlands (agricultural fields that seasonally flood) that have major implications for shore birds.

Significance – High:

An accurate determination of the area of wetlands is needed to estimate the impact of this project.

Recommendations for Resolution:

To resolve these concerns, the future NEPA document should address the following:

1. Provide a more detailed description of the methods needed for estimating the area of wetlands, especially on the field sampling, to determine the total area of wetlands on the site.
2. Provide details of the WETSORT program.

Comment 11:
The assessment of economic impacts of the proposed project may not be valid because the method used to document the future with and without project conditions does not consider trends in real prices and costs.
Basis for Comment:
The project's projected net benefits largely pertain to agricultural profits in the future; therefore, a good understanding of potential future costs and revenues is essential. A complete stream of net benefits to agricultural producers fundamentally depends on real trends in prices and costs. The issue is not about inflationary trends in general (all prices for all commodities in the country or region moving up or down), as price indexes typically are used to examine inflationary trends. The primary concern is about future changes in real prices and costs because of possible changes in the importance of agriculture. It is impossible to know the future with certainty, but a regular part of economic analysis under uncertainty considers various possible scenarios. For instance, future real (inflation-adjusted) agricultural prices may rise because of increasing relative scarcity of agricultural land and water. Agricultural land has declined in the United States because of conversion to other uses. In addition, water scarcity may be a future issue due to global warming. Energy prices may also rise as society converts to alternatives to fossil fuels. Thus, real price and cost changes may be a reality for agricultural producers in this and other regions of the United States.
Significance – High:
Nearly all project benefits relate to agricultural profits for the life of the project, and fundamentally depend on future prices and costs.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. The agricultural crop price indexes from the Economic Research Service should first be carefully evaluated for signals of trends in real (inflation adjusted) crop prices. 2. The economic analysis (the benefit-cost analysis) should be conducted under various scenarios pertaining to future price and cost changes, considering for example, a constant real rate of growth in prices, a zero rate of growth, and perhaps a decline in the real rate of change in prices. Similarly, such scenarios might be done as well, for key agricultural input costs, such as energy.

Literature Cited:

Cline, William R. 2007. *Global Warming and Agriculture: Impact Estimates by Country*. Washington D.C.: The Peterson Institute.

Hertel, Thomas W. et al. 2010. *The poverty implications of climate-induced crop yield changes by 2030*. GTAP Working Paper No. 59, Center for Global Trade Analysis.

Comment 12:
The use of two discount rates for the same analysis is confusing and is not warranted in any conventional economic analysis.
Basis for Comment:
Multiple discount rates are used in the economic analysis: the first discount rate is grandfathered in and this rate is used for selected parts of the project and selected years of the project. The second rate used in the analysis is a more current rate that is applied to other parts and years pertaining to project impacts. The standard procedure for benefit-cost analysis dictates that an analysis be prepared using a single discount rate for all benefits and costs, including all years of construction and operation of the project. The primary reason for this rationale is that the use of a single rate provides consistency in decision-making: once society commits to a project, it would be inconsistent to stop half-way through and decide a different discount rate should be used from then on, because this may suggest the project never should have been undertaken in the first place (Heal, 2009). Federal projects are evaluated using guidelines for a single discount rate provided by the Office of Management and Budget, but because of controversy over exactly what this rate should be, the current recommendation is to evaluate projects at 3% and 7%, conducting separate analysis with each rate. The project's grandfathered rate of 2.5% is lower than either current rate; therefore, evaluating all impacts at this rate results in a different benefit-cost ratio than would result from using 3% or 7%. In response to new theoretical economic analysis pertaining to the discount rate, the current procedure for calculating the benefit-cost analysis using a single discount rate for the entire period is under debate. The new findings suggest that society's true discount rate may actually fall over long periods of time, not rise. Therefore, using one single discount rate for the entire period may not be consistent with society's preferences. Laibson (1997) and Weitzman (1998) suggest that it is appropriate to use a higher discount rate at the beginning of the project, and a lower one much later in the profile of analysis, such as 40 or 50 years out. The project's use of the grandfathered rate and a second, higher discount rate for later years implies the opposite of what the literature finds. Since dictated and federally mandated procedures have not yet changed in response to this emerging literature, the current analysis needs to use the single discount rate approach.
Significance – High:
The project's benefit-cost ratio fundamentally depends on the chosen discount rate.

Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. First, the benefit-cost-analysis should first be conducted in its entirety for a well-defined period beginning with the very first project construction (for which only costs, and no benefits would be expected in the profile), and extending through the life of the project, using a single discount rate of 2.5%. 2. Second, the benefit-cost analysis (i.e., entire accounting exercise) should then be repeated at the single discount rate of 3%, and then repeated again at the single discount rate of 7%, resulting in three benefit-cost ratios, one for each discount rate assumed. 3. Results from each analysis, i.e. for each discount rate, should be clearly presented and contrasted to show the effect of using the range from lower to higher discount rates. This is consistent with doing sensitivity analysis for a long-term project.

Literature Cited:

Heal, Geoffrey, 2009. Climate economics: A meta-review and some suggestions for future research. *Review of Environ. Econ. and Policy* 3(1/Winter):4-21.

Laibson, D. 1997. Golden eggs and hyperbolic discounting. *Quarterly J. of Economics* 112:443-477.

Weitzman, M.L. 1998. Why the far-distant future should be discounted at its lowest possible rate. *J. of Environ. Econ. and Manage*. 36:201-208.

Comment 13:
The farming survey may not be credible unless a large enough sample size is used, producing a smaller statistical error for the analysis and avoiding many possible sources of bias.
Basis for Comment:
Most, if not all, of the project's benefits relate to agricultural net benefits, which in turn, relate to before- and after- production decisions. These decisions cannot be determined without conducting a survey, which USACE acknowledged in the Project Work Plan. This survey will be a very difficult task, as credible survey results relate to large, unbiased samples of the population of interest, which in this case, will be the population of affected farmers. The opportunity for strategic bias is strong because the farmers have a vested interest in the project. Therefore, a careful survey design must ensure responses that are incentive compatible (consistent with true underlying preferences and beliefs). Sample selection bias may also be an issue as often only those most interested in the project will respond to a survey. The results will then pertain to biased samples, not the general population. Strategic bias may also be a factor in influencing the outcome of the analysis. Strategic bias occurs when individuals do not respond truthfully to questions, and are smart enough to see that by over or under-stating responses to the survey. The IEPR panel notes that experimental procedures used by psychologists and increasingly, by experimental economists, might be used to design laboratory experiments that will identify several types of bias, provide incentive compatibility and meaningful results for small samples of subjects. Using a laboratory setting provides controls that survey-settings (mail, telephone, or even in-person), do not.
Significance – High:
Agricultural production decisions and behaviors after flood risks have been reduced must be convincingly identified or the project's main economic benefits cannot be calculated. Because this must be done before actual flood risk reductions are realized, a survey of farmers must be implemented to provide a convincing and credible analysis of these decisions and behaviors.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Mention the above details in the scoping the future NEPA document. 2. State that state-of-the-art survey or experimental design will be conducted when the time comes to research behaviors of farmers in the region.

Comment 14:
The cumulative impact approach lacks specific information on how the conceptual matrix will be used to evaluate the incremental impacts of the proposed project or address the unique aspects of the study area.
Basis for Comment:
The Consolidated NEPA Document provided a descriptive historical account of the St. Johns Bayou and New Madrid Floodway, along with statistics on acres of present land uses, but did not provide an analysis of the incremental impacts of the proposed project within the context of the cumulative loss of wetlands and river-floodplain connections in the lower Mississippi River Basin. The Project Work Plan proposes a conceptual matrix that will incorporate information on causes, processes, and effects of all project alternatives. This conceptual approach will include historic habitat condition, past impacts that have contributed to the overall decline of habitat in the project area, future impacts that will continue the decline of the habitat, and potential future benefits. In addition to the project area, the cumulative effects assessment will include applicable areas within the lower Mississippi River Basin, such as the remaining batture areas and backwater areas located within adjacent states. The proposed conceptual matrix is a necessary first step, but it is not considered a detailed methodology. According to the Council on Environmental Quality (1997), after developing a conceptual framework, the analyst must choose a methodology to determine and evaluate the cumulative effects of the proposed project. While a matrix is one of 11 generic methods summarized in the CEQ guidance, it does not constitute a methodology with specific spatial and temporal boundaries, as well as thresholds of significance (e.g., capacity of the resources to accommodate stress). In particular, the Project Work Plan lacks specific information on how the proposed conceptual matrix will address the unique aspects of the study area. The Project Work Plan should describe how the methodology will weigh each factor in determining whether the cumulative effects are significant.
Significance – High:
An accurate assessment of cumulative effects is essential to avoiding and minimizing adverse consequences, and to developing an adequate compensatory mitigation strategy.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Identify the specific methodology for using the proposed conceptual matrix to address the incremental impacts of the proposed project and the unique aspects of the study area. 2. Identify how the results and findings from this methodology will be used in the decision process for the proposed project.

Literature cited:

Council on Environmental Quality. 1997. *Considering Cumulative Effects under the National Environmental Policy Act*. January.

Comment 15:
More precise contour data (i.e. greater than a 1-foot contour interval) are required to estimate wetland availability and mitigation for waterfowl and shorebirds.
Basis for Comment:
The IEPR panel is concerned that the 1-foot contour interval outlined in the Project Work Plan will not provide adequate precision to estimate wetland loss and to determine shallow water wetlands necessary for mitigation of shorebird and waterfowl habitat. For example, the Shorebird Model Certification Review (Battelle, 2010) requests using survey data taken from 0.1 ft contour intervals. Furthermore, waterfowl require water depths less than 12-15 inches for foraging.
Significance – High:
The use of a 1-foot contour interval to determine the availability of shallow water wetlands may lead to underestimating the existing resources and the requirements to replace habitat impacted by the proposed project.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should consider using mapping with a contour interval of 0.25 - 0.50 feet to estimate wetland loss and function and to mitigate estimated habitat losses.

Literature cited:

Battelle Memorial Institute. 2010. *Model Certification Review of the Habitat Model for Migratory Shorebirds in the Upper Mississippi Alluvial Valley*. Prepared for Department of the Army, U.S. Army Corps of Engineers, Ecosystem Restoration Planning Center of Expertise, Rock Island District, by Battelle, Columbus, OH.

Comment 16:
The list of significant resources is not complete because it does not include a discussion of the quality of the wetland resource, which is dependent upon the dynamic nature of the ecosystem's function and its connection to the river.
Basis for Comment:
The river-floodplain connection has significant impacts on the maintenance of wetlands and on the flooded areas providing shorebird habitat, even if these areas do not meet the wetland requirements for duration of saturation. Removing the connection will change the ecological function of the remaining wetlands significantly, and, in turn, affect wildlife habitat. The impact of removing this connection on wetland function and value should be analyzed fully, so that its effect on wetlands and their wildlife habitat values is completely documented, and mitigation for all impacts can be carried out. As noted in the Project Work Plan, the list of significant resources should include all of the types of habitats within the project area. In addition, the list should also include the characteristics of the habitats that affect their function and make them unique. The project area includes the only significant remaining section of floodplain where Mississippi River backwater flooding still occurs. The dynamic nature of the hydroperiod is a significant aspect of the wetland resources in the project area. This is a critical characteristic of the wetlands that would be affected by the project. Dynamic hydroperiods significantly affect the function of wetlands in many ways, including their ability to process nutrients and to provide wildlife habitat. The river connection allows the exchange of nutrients between the wetland systems and the river, which is a unique aspect of riverine wetland function. Mitigation for the loss of wetland function will be more difficult to achieve because of the loss of this dynamic hydroperiod. Planning a mitigation proposal that replaces all of the lost wetland functions will require that the dynamic nature of the wetlands that occur in the project area be replaced, so this aspect of the existing resources should be stressed in the significant resources list.
Significance – Medium:
Mitigation of proposed project impacts requires a complete list of site resources. To be complete, the list of resources should include the unique nature of the wetland ecosystem.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should add a discussion to the list of resources that clearly describes the unique nature of the wetlands in the project area, including the features that result from a dynamic water level and periodic flooding by the river.

Comment 17:
The water quality analysis in the Project Work Plan does not address water quality conditions in any of the study area water bodies and does not compare nutrient loads to the Mississippi River with and without project conditions.
Basis for Comment:
The Project Work Plan states that the water quality analysis completed in the Consolidated NEPA Document will be re-analyzed utilizing updated land cover data, period of record, and corrected denitrification rates from inundated farm fields. Although these re-analyses are appropriate and will improve the water quality analysis, they will still not meet the stated water quality objectives of the study for the same reasons the analysis in Consolidated NEPA Document failed to do so. First, the mass balances to be conducted do not represent water quality conditions in any of the waterbodies in the project area (St. Johns Bayou and New Madrid Floodway) under current conditions (without project) or with the proposed project, but only the total amounts of mass transported or retained. Second, these mass balances did not compare nutrient loads from the project area to the Mississippi River under current conditions (without project) to those with the proposed project. They compared nitrogen removal efficiencies at an assumed water surface elevation of 290 feet NGVD between current conditions (without project) and with mitigation associated with restored acreage. None of the hydrologic scenarios in the Consolidated NEPA Document accurately represented the actual project because each considered the same flooded acres at 290 feet NGVD, whereas the proposed project involves blocking the water level beyond 284.2 feet NGVD in the New Madrid Floodway.
Significance – Medium:
It will not be possible to draw any conclusions about whether water quality in both basins (St. Johns Bayou and New Madrid Floodway) will remain unchanged because the proposed analysis does not include investigations of local water quality in either basin under actual project conditions.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Conduct quantitative assessments of the impacts of the actual proposed project on waterbodies in the St. Johns Bayou and New Madrid Floodway. 2. Conduct a quantitative assessment of the nutrient loads from the project area to the Mississippi River under the actual proposed project.

Comment 18:
The validities of several assumptions for the future without project alternatives are questionable.
Basis for Comment:
The Project Work Plan makes a number of assumptions regarding the future without project conditions. While the IEPR panel recognizes that it is impossible to predict the future, the panel believes there is ample evidence to indicate that three of these assumptions are invalid. • The panel questions the validity of the assumption "There will be no change in overall land use" (Project Work Plan 8.3). Flood-prone agricultural habitat in areas near but outside the project area have been enrolled in the Natural Resources Conservation Service (NRCS) Wetlands Reserve Program (WRP). Based on this activity, the panel believes the potential for this project has prevented farmers within the project area from doing the same. If this project were abandoned, the panel believes a number of the frequently flooded fields would be enrolled in WRP. The USACE appears to recognize the potential for wetland restoration through WRP with a footnote and suggests this statement may change with the development of the future NEPA document. The panel suggests it would be more appropriate to recognize the potential influence of the WRP. • The panel questions the validity of the assumption "Existing drainage ditches and infrastructure will be maintained" (Project Work Plan 8.3). While the panel agrees that drainage structures will be maintained on farmed lands, we believe a substantial component of the frequently flooded areas will be enrollment in WRP, thus likely leading to a modification of some of the ditches and drainage structures. This is not considered in the Project Work Plan. • The panel questions the validity of the assumption "No plans with funding mechanism have been identified to restore Big Oak Tree State Park. Therefore, the observed progression from hydric vegetation to drier species will continue to occur" (Project Work Plan 8.3). It is the panel's understanding that the State of Missouri appropriated $1.5 million in 1996 to restore hydrology to the park but abandoned the project when it became part of the planning for St. Johns Bayou. Thus, the panel believes that if the St. Johns Bayou project is abandoned, resources from the State of Missouri to restore hydrology to the park would likely again become available.
Significance – Medium:
The validity of the assumptions used to determine impacts for the without project alternative affects the completeness and understanding of the Project Work Plan and the justification of the project.

Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the potential for the Wetlands Reserve Program and the likelihood that the State of Missouri will restore hydrology to Big Oak Tree State Park.

Comment 19:
The potential impact of global climate change on the proposed project and the conceptual mitigation plan should be acknowledged.
Basis for Comment:
The IEPR panel generally agrees with the strategy outlined in the Project Work Plan (Section 8.3.1, Global Climate Change [pages 36-37]), but also must emphasize the need to qualitatively assess the potential effects of climate change, recognizing the additional uncertainty imposed on planning and decision-making processes by these effects. Use of historical hydrology in the studies is necessary; however, a qualitative consideration of possible impacts on proposed flood control and environmental mitigation plans by potential future changes in hydrology resulting from global warming or other factors is appropriate. The need to consider how climate change can affect the environment of a proposed action is included in the February 18, 2010 memoranda from the Council on Environmental Quality (CEQ). The online Water and Climate Bibliography (http://biblio.pacinst.org/biblio/) maintained by the Pacific Institute contains more than 4,300 publications dealing with the impacts of climate change on hydrology. Numerous studies are reported in the literature in which global circulation models (GCMs) are combined with watershed precipitation-runoff models to assess the impacts of global warming on hydrology. The capabilities of GCMs to predict future climate are generally recognized as approximate, strongest in predicting temperature changes, and weak in predicting precipitation changes. Climate change modeling capabilities are strongest in predicting changes over large regions of the world and weak in downscaling to watersheds. Thus, the panel agrees that accurate quantitative predictions of future changes in stream flow characteristics at the project site would be extremely difficult, if not impossible. Hydrology is highly variable and uncertain even without consideration of future long-term climate change owing to global warming, which adds to the uncertainties. Key questions to be acknowledged and discussed in the studies are as follows: • What is the effect on proposed flood control and environmental mitigation plans if stream flow characteristics are different in the future than indicated by historical hydrology? • How robust are recommended plans to variations in hydrology?
Significance – Medium:
Although highly uncertain, the potential effects of climate change have important consequences for the project and mitigation plans, and therefore an assessment of these effects is needed to support a complete evaluation as required by NEPA.

Recommendations for Resolution:
To resolve these concerns, the future NEPA document should, at a minimum, address the impacts of potential future climate impacts on the project and proposed mitigation plan on a qualitative basis.

Literature cited:

Council on Environmental Quality. 1997. *Considering Cumulative Effects under the National Environmental Policy Act*. January.

Comment 20:
The gate closure and pump operation management alternatives proposed for St. Johns Bayou and New Madrid Floodway require further clarification.
Basis for Comment:
The Project Work Plan states that a variety of adaptive management scenarios would be explored (Section 8.4.2.1 and 8.4.2.2, subheading Gate and Pump Management). The list includes gate closings for falling river stages during fish spawning and rearing seasons to create a spawning and rearing pool. This action could prolong an existing spawning and rearing pool created by backwater flooding from the river and watershed runoff. However, if the gates are closed, the pool would not be created by river backwater flooding as implied in the Project Work Plan, since the river is disconnected from the floodways. During gate closure and falling river stages, the pool would be maintained only through watershed runoff and site-specific floodway water control structures. However, this scenario assumes that fish have already entered the floodways from the river prior to gate closure. Overall, the timing and environmental conditions during this scenario are critical and bring into question fish floodway access opportunities during periods of gate closure.
Significance – Low:
For a successful project, it is important to maintain existing fish access and to create and maintain a spawning and rearing habitat in the floodways.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should include a more detailed description of how gate and pump management will: 1. Achieve project objectives for each of the alternatives (flood frequency elevations and/or inundated acres). 2. Provide fish access during appropriate river stage and water temperature periods.

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Appendix B
Draft Evaluator Questions/Responses and Draft BackCheck Responses

for the

St. Johns Bayou and New Madrid Floodway, Missouri
Project Work Plan, Phase 2
Environmental, Economic, and Hydrologic and Hydraulic Review

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Comment 1:
There are significant gaps regarding the application of the Shorebird Model, and the major concerns raised in the Phase 1 IEPR of the Consolidated NEPA Document have not been addressed.
Significance – High:
The major concerns raised in the Phase 1 IEPR must be addressed prior to developing a detailed proposal to mitigate for shorebird habitat impacts.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Develop methods for calculating the total area of sparsely vegetated habitat that floods and is then exposed; these methods should be subjected to peer review. 2. Reduce the value of moist soil units for both shorebirds and waterfowl to reflect the difficulties of managing the same area for both species groups. 3. Develop a permanent management plan to ensure that the dynamic nature of the area to be impacted, and the high level of function that results, is replaced in perpetuity once natural function is lost.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
Question 1a: Given that the project area was historically a bottomland hardwood that provided minimal shorebird habitat (due to vegetation), is existing shorebird habitat due to a manipulated (*i.e.,* farmland) condition or something else? *The Panel's understanding is that the goal of the mitigation plan as proposed by USACE is to compensate for any difference in with-project conditions relative to current without-project conditions. Current shorebird habitat includes all areas of shallowly flooded and sparsely vegetated area exposed by natural drawdowns, which include both wetlands and farmed flooded areas.* **Question1b:** Are shorebird numbers greater than or less than historic population levels and if so, why? *Many species of shorebirds have experienced dramatic population declines since historical levels (Brown et al. 2001). In addition, many species continue to experience significant declines in the recent past (Morrison et al. 2006, Bart et al. 2007). The causes for these declines are not well understood, but are thought to include habitat loss, increases in predation pressures, historical hunting impacts, climate change, and a variety of other factors. Habitat losses on migration may be an important factor (Skagen 2006) , which makes mitigation for loss of foraging habitat on migration important.* **Question 1c:** What is the limiting factor (number of acres of habitat) that maintains shorebird population (*e.g.,* If the project area reduces inundated habitat by 50%, will this impact overall shorebird numbers) in regards to the project area?

Currently available data are sufficient to determine population limiting factors for only a small number of shorebird species. Skagen (2006) argues that migration habitat may be limiting for some small shorebirds common in the project area.

Question 1d:
Since shorebirds are opportunistic and since there will likely be available habitat throughout the LMAV during the spring, will reducing inundated habitat in the project area significantly impact shorebird populations and why? For example, available habitat will remain immediately adjacent to the project area.

As stated above, it is impossible with current data to determine the population level impact of the loss of a particular amount of habitat. However, it is the Panel's understanding that the goal of the mitigation plan is to replace all lost habitat functions of current without-project conditions that would occur with implementation of the project.

Question 1e:
Regarding the statement develop "methods for calculating the total area of sparsely vegetated habitat that floods and is then exposed; these methods should be subjected to peer review."

The Panel supports the development of a new methodology for calculating impacts of the proposed project to shorebirds, but maintains that the procedures should be fully developed, justified with a literature review, and then subjected to a model certification review.

(1) First issue discussed
Question 1f:
The following Shorebird Methodology (Twedt, personal communication) is proposed:

1. Discussion of elevation contours is required during the teleconference, specifically interpolation of elevations <1-foot.
2. Most shorebirds use suitable habitat within the St. Johns and New Madrid Basins as foraging habitat during spring (northbound) and fall (southbound) migration with few species and individuals breeding or over-wintering within these Basins.
3. Migration periods will be restricted to 15 April – 15 May during spring and 15 July – 15 October during fall.

Selection of the migration period is a critical factor in designing an adequate mitigation plan, and these dates should be given further review. One major document on the timing of migration in the region suggests that these windows would contain the peaks of migration, but are too narrow to include the full migration period (Skagen et al. 1999). For the latitude band of the project, 35-40 degrees North in spring, Skagen et al. show the migration window as including approximately March 15th through June 15th for all shorebirds (Skagen et al. 1999, p. 17). Particularly for small sandpipers, the distribution indicated on p. 27 includes substantial numbers throughout most of that period in spring. For fall migration for small sandpipers, the period includes July 1 through October 30 (p. 27). Additional review of available data should be conducted to ensure that the full migration period is considered

USACE Response/Question 1g:

4. Small and medium sized shorebirds that forage primarily in water depths from 0 – 9 cm
5. (0-4 inches) represent the preponderance of shorebirds likely to use the St. Johns and New Madrid Basins.
6. These shorebirds, and other less abundant shorebirds, may also forage in exposed mudflat habitat and in floodwater of depth from 9-18 cm (4-8 inches).Sparsely vegetated areas (e.g., cropland, bare soil, grasslands) that are exposed or shallowly (<8") flooded within the previous 2 days will be counted as suitable shorebird habitat (*i.e.,* mudflats).
7. Shorebird habitat will be separated into optimal (< 4 inches) and sub-optimal (4-8 inches including areas of exposed mudflats).

Recently exposed mudflats are likely to be valuable shorebird habitat. The Panel agrees that water deeper than 4 inches is likely to have less use than shallow water, but lumping mudflats with deep water does not seem appropriate. The panel recommends that the final categories chosen for use in the EIS analysis be developed based on a thorough review of available scientific information and a peer review process.

Question 1h:

7. These categories will be summed on each day during the spring and the fall migration periods over the period-of-record. These estimates will quantify the total, temporally available, shorebird habitat during spring and fall migration periods as a total "ha-days" of shorebird habitat. Separate estimates will be made for each migration period and separate yearly estimates will be possible for each year from which Mississippi River stage data are available (entire period of record).

The Panel is pleased to see the use of total area, as recommended in the Phase 1 IEPR process, and believes this approach will provide a much more reliable estimate of habitat value across the project area.

[Note that 1 ha-day of shorebird habitat represents 1 ha of sparsely vegetated habitat under suitable flood conditions for a period of 1 day.]

Question 1i:

Sub-optimal areas will have a HSI value of 0.5.

The choice of value has a significant impact on the calculation of mitigation area required, so should be fully justified when the mitigation plan is developed, and should be subjected to peer review. The literature cited below documents less use of shorebirds in deeper water, but does not unambiguously support this value as being the most appropriate.

USACE response continued:

Optimal areas will have a HSI value of 1.0. Justification for optimizing shallowly flooded areas is based on observed shorebird abundances as reported within the Lower Mississippi Valley Joint Venture Shorebird Monitoring Program (http://www.lmvjv.org/shorebird/default.asp), Loesch et al. (1999), and Elliott and McKnight (2000). As further confirmation, Davis (1996), in his assessment of shorebird use of Playa Lake wetlands, reported between 39% and 46% of shorebird flocks (weighted for abundance) used areas with water depth < 4 cm (<2 inches), circa 30% of shorebird flocks used areas

with water depth of 4 – 16 cm (circa 2-6 inches), whereas only 19% of shorebird flocks used mudflats, and <8% used areas within water depth >16 cm (>6 inches).

Project impacts will be calculated for each alternative and is defined as the difference between future without project conditions and future with project conditions.

USACE response/Question 1j:
Moist soil management remains a practical mitigation method. Regarding the statement, "The actual habitat value of moist-soil units for shorebirds will be substantially less than calculated because the same units are being managed for waterfowl as well." And, it is recommended that the future NEPA document should "Reduce the value of moist soil units for both shorebirds and waterfowl to reflect the difficulties of managing the same area for both species groups." These statements have no foundation and misrepresent the actual seasonal and long-term vegetation/water composition and management of moist-soil impoundments.

Management of seasonally flooded impoundments (i.e., moist-soil units) involves purposeful manipulation of soil, water, and vegetation that seeks to emulate natural dynamics of seasonal herbaceous plant communities, at least in the MAV (Fredrickson and Taylor 1982, Fredrickson 1996, Strader and Stinson 2005). Management of these impoundments is not exclusive to either waterfowl or shorebirds, and in fact, managing the seasonal dynamics of water levels required to support herbaceous wetland vegetation provides a seasonal and inter-annual continuum of dry to flooded, and mud flat to densely vegetated, conditions. These habitats then provide resources to, and are used by, over 150 species of birds and numerous mammals, amphibians, reptiles, and fish that regularly use these impoundments (e.g., Fredrickson and Taylor 1982, Reid 1989, Sargent 1996). Long term management of seasonally flooded impoundments also uses regular disturbances to soil and vegetation that periodically increase the time of mud flat or shallowly flooded, sparsely flooded habitats. In effect, the proper management of seasonally flooded impoundments will provide a diversity of water, soil, and vegetation conditions through time similar to natural dynamics of herbaceous communities in the MAV (see again Fredrickson and Taylor 1982, Fredrickson 1996, Strader and Stinson 2005).

This section provides a good description of the application of moist soil management techniques for maximizing diversity of wildlife habitat values in managed areas. However, it is important to distinguish the use of these techniques for managing wildlife areas from their application in a mitigation context. The Panel believes that USACE did not understand the concerns being raised, and that it's concerns do have a foundation in wetland management science and do not misrepresent moist soil management in practice. We will attempt to clarify the important points here.

The project area currently includes habitats subjected to natural variation in hydroperiod. Replacing these naturally dynamic areas with managed areas is a difficult undertaking. While the Panel supports the application of moist soil management to increase diverse wildlife habitat benefits of managed areas, there is still an important issue regarding HOW MUCH habitat it takes to replace lost functions. Habitats managed to maximize value to one group of species generally have reduced value for other groups, which was the point of the moist soil management literature cited above, and Dr. Fredrickson's work to support an increase in integrated management.

It has been difficult for the Panel to determine whether USACE intends to manage moist soil units for multiple species groups, and appreciates the clarification included in this response that they will be targeted at providing shorebird habitat. The Panel raised this issue because it appeared that there were multiple mitigation goals for the managed areas, including both shorebird and waterfowl habitat, that would have impacts on how much habitat was required to replace lost functions for both groups. The former wetland model assigned an HSI of 1 to moist soil units for shorebirds, which would be appropriate if all of the managed area is available, and managed for shallow water levels during migration. If, for example, the management plan included deeper water levels for waterfowl during the shorebird migration period, some of the area would be inaccessible to shorebirds, and additional area would be required. Overall, sites managed for diversity of wildlife include some areas that are optimal for some species at particular times, and other areas that are not optimal for the same species. This is important in a mitigation context.

Question 1k:
*USACE wrote above that "*Management of these impoundments is not exclusive to either waterfowl or shorebirds, and in fact, managing the seasonal dynamics of water levels required to support herbaceous wetland vegetation provides a seasonal and inter-annual continuum of dry to flooded, and mud flat to densely vegetated, conditions."

*This is true, and it emphasizes the major point the Panel was trying to make. When there is a continuum of habitat conditions being maintained in the same area, some parts of that area will be optimal for particular species, while others will not be optimal at any given time. This means that the entire area of the mitigation habitat parcel cannot be considered to be providing optimal habitat for each species group at any one point in time. In a context of managing wildlife habitat at publicly managed sites, this is often an appropriate management goal. In a mitigation context, the total amount of habitat area lost must be compensated for by the total appropriate habitat area provided. A managed area with dry or deeply flooded conditions in part of the management unit during shorebird migration would not mitigate for the loss of shorebird habitat equal to the entire area of the unit. A portion of the managed area that has been drawn down to provide habitat for shorebirds and is now dry or in a mudflat state cannot provide optimal habitat for waterfowl. In a mitigation context, a larger managed area is necessary to provide the amount of optimal habitat that replaces the habitat functions lost in the habitat areas impacted by the project. In fact, this point is made explicitly by Dr. Fredrickson (1982) on p. 7, where he states : "*Ideally, several moist soil impoundments should be available on each management area. Each impoundment can then be managed individually for different types of wildlife. A master plan involving a group of impoundments can provide a maximum diversity of wildlife continuously by rotating management options among the different units.*" In addition, Fredrickson and Taylor (1982) provide specific recommendations of water depths appropriate for different species groups. The critical point is that applying moist soil management effectively involves rotating through different habitat types and water levels, and therefore requires greater amounts of area to provide habitat targeted at one species group such as shorebirds during migration so as to replace lost functions from the impacted areas.*

The Panel recommends that in development of the mitigation plan in the EIS, the total habitat area lost for each species group be completely replaced by available habitat of equal or

greater value, as USACE has stated is its goal. To accomplish this, moist soil units must have a specific management plan that includes how long areas will be in shallow water or mudflat, and will likely require greater area to make up for the times when management requires water levels not appropriate for shorebirds during migration. Even if managed primarily for shorebirds, as indicated in the USACE comments above, the fact that these are mitigation areas where a specific total amount of shallowly flooded and sparsely vegetated area is required to replace lost functions will require more area than can likely be achieved in practice with 1:1 replacement of acreage. The exact amount of additional area will depend on the specific management plan put in place to maintain conditions over time, and cannot be determined in advance of the development of that plan.

The response to this comment suggests that moist soil units will be managed primarily for shorebirds, with waterfowl benefits being a secondary goal. This approach simplifies the issue the Panel has raised in the past. If the moist soil units are managed for shorebird habitat, a greater percentage of the managed area can provide shorebird habitat at any one time. However, consideration must still be given to the fact that only a portion of the mitigation area will be providing optimal habitat at any one time, depending on the topography of the site and the management plan being implemented. The goal should be to provide at least the same number of hectare-days of shallowly flooded habitat as occur on the project area under existing conditions.

USACE response/Question 1l:
The recommendation that estimates of food availability in seasonally flooded impoundments be reduced because they may be used by both waterfowl and shorebirds (and also other species – see above) is not appropriate and this recommendation should not be adopted. The purpose of carrying capacity models, such as the WAM, is to estimate **potential** carrying capacity of habitats and sites for a species group and not to speculate on the proportionate use of a site by multiple species. No data exist that indicate that waterfowl and shorebird use of seasonal herbaceous impoundments are exclusionary or competitive. In fact, shorebird use of SJNM sites is predominantly in July-August and April (while waterfowl use is greatest from November through February (Heitmeyer, aerial survey data 2000-2004). And, seasonally flooded impoundments consistently support large numbers of both shorebirds and waterfowl on the Ten Mile Pond CA. The WAM does account for some non-availability of foods (of all types) to waterfowl from consumption by other species, such as shorebirds, decomposition, disturbance, etc. and some further speculated estimate of reduced availability because of shorebird use ,as suggested by the reviewer, is not supported.

The Panel's comment did not recommend that estimates of food availability in seasonally flooded impoundments be reduced because of <u>use</u> by both shorebirds and waterfowl, but rather because it appeared that they may be <u>managed</u> with provision of habitat for one or the other as the primary goal. The panel is suggesting that if the hydrologic conditions are managed, for example, to maximize resources for shorebirds, the resources produced by the moist soil wetlands will not be as high as the expectations in the WAM.

Question 1m:
Regardless, moist soil units will be proposed and managed to maximize shorebird habitat. However, waterfowl benefits will be quantified if appropriate as well as any benefits to wetlands, fish, and water quality.

The panel agrees that moist soil units managed for shorebirds will produce resources for waterfowl; the panel does not believe, however, that the level of these resources will be at the level assumed in the current WAM.

Question 1n:
Since moist soil units will be managed for shorebirds, what type of reduction to waterfowl DEE does the panel recommend?

The panel assumes the USACE meant reduction in DUD to waterfowl not DEE sine DEE will not be impacted by habitat management. It is impossible to answer this question without first knowing how the USACE intends to manage the moist soil areas. Moist soil units produce anywhere from 50 to 2000 kg/ha of food depending on how the hydrology and vegetation is managed. There is no way to provide an estimate of the resources for waterfowl produced by the moist soil units without first knowing the hydrologic management of the wetlands.

Question 1o:
How would you manage the moist soil units to maximize both shorebirds and waterfowl?

As discussed above, maximizing the habitat value of the moist soil units for shorebirds provides an efficient approach to replacing lost shorebird habitat. The Panel recommends this approach, with drawdowns timed to coincide with shorebird migration, and the overall goal of providing the same number of hectare-days of habitat as existed in the without project conditions. As USACE states above, some waterfowl use can be expected where water remains during drawdowns, and documented waterfowl use of these moist soil units can contribute to waterfowl mitigation goals, but should be measured in the field and quantified in the mitigation areas once they are constructed.

Question 1p:
Should USACE consider providing fall shorebird habitat to compensate for spring shorebird impacts (borrow pits, moist soil units, etc.) and if so, how much more valuable is fall habitat than spring habitat?

The Panel recommends that the mitigation goal should be to replace all of the habitat losses that would occur from implementation of the project. If the analysis indicates an impact on fall habitat, then mitigation should be provided for this impact. Because shorebirds are likely to be most limited by fall habitat, ensuring complete mitigation for any fall impacts should be an important goal of the mitigation plan, and anything that can be done to provide fall shorebird habitat would be valuable in addition to fully compensating for spring habitat losses. There is insufficient information about shorebird populations and ecology to precisely determine the relative values of spring and fall habitat in regulating shorebird population dynamics, but the Lower Mississippi Valley Joint Venture Shorebird Monitoring Program suggests fall habitat is likely limiting for shorebird populations in this region (http://www.lmvjv.org/shorebird/default.asp).

USACE response/Question 1q: A conceptual management plan will be developed in the EIS once impacts are determined. A permanent management plan will be developed during the completion of the site specific mitigation plan. *Comment noted.*

Comment 2:
The Project Work Plan does not respond to the concerns raised during the Phase 1 IEPR regarding the method to analyze the project's impact on shorebird habitat.
Significance – High:
The impacts of the proposed project on shorebird habitat cannot be determined without a thorough review of the methods to be applied in estimating those impacts.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Conduct a review of the application of the shorebird model; such a review did not occur either during the Phase 1 IEPR or during the Shorebird Model Certification Review. 2. Clearly outline the methods for carrying out the analysis of impacts on shorebird habitat before they are applied during the development of the future NEPA document. 3. Address all of the concerns raised in the Phase 1 IEPR and the Shorebird Model Certification Review.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response: The shorebird model that was developed by the Fish and Wildlife Service for past NEPA analyses underwent an independent model certification review. That review did not recommend its use. Comments received during the Phase 1 IEPR also found problems with the model. Therefore, USACE has abandoned the Fish and Wildlife Service model. The revised methodology that is planned for subsequent project analysis is found in Response 1. **Question 2a:** Does this alternate methodology address the IEPR concerns? Specifically what changes are necessary and why? *In general this methodology appears to be an improvement over the past methodology with respect to shorebird habitat impacts. Some notes were provided by the Panel in response to the methodology above under Comment 1.* *In past discussions, USACE has indicated that finer discrimination of water depths was not feasible. The Panel is interested to learn how USACE will accomplish the finer discrimination proposed here.* **Question 2b:** The Project Delivery Team (USACE and its private contractors) have reservations that require discussion during the teleconference concerning the comment to expand the model to include other variables. *The Panel's comment simply noted that the Model Certification Review suggested expansion of the past model to incorporate these factors. Whether they are relevant to the proposed new model will depend on how that model is constructed, and is one reason that the Panel*

recommends that whatever model is developed be subjected to peer review.

USACE response/Question 2c:
Migrating shorebirds only use certain land cover in the MAV (Loesch et al. 2006). All of the farmland in spring will be the same (barren earth). Therefore, it should all "count" the same. We will not count any vegetated areas (fallow, BLH, etc.).

It is important to remember that some shorebirds, particularly plovers, use vegetated areas on migration. Depending on how the term is defined, some "fallow" areas, such as grasslands, may provide important shorebird habitat. However, there may be relatively little impact of the proposed project in these areas.

USACE response continued:
In the early fall, the majority of the farmland will still be vegetated. The primary use within the project area will be from Mud and Wading Shorebirds. Most of these shorebirds do not prefer vegetation that limits their view. Therefore, there will be little available habitat in the fall. Furthermore, this is the period that coincides with low river conditions. By late fall, when the crops are harvested and the river tends to rise, most of the shorebirds will have left the project area.

USACE response continued:
PERCENT COVER: In the revised shorebird analysis, the basic assumption is that all crops, bare soil, and grasslands constitute suitable shorebird habitat when appropriately flooded. Heavily vegetated habitats (e.g., forest and shrub) will be excluded from consideration as shorebird habitat.

TEMPERATURE: Although incorporation of temperature will not be feasible, it may be possible to include correlated surrogates such as day of year or duration of flooding.

PROXIMITY TO OTHER WETLANDS: Indeed, the proximity among wetland has been deemed important for "resident" shorebirds (i.e., birds spending extended periods within a local landscape during breeding or while over-wintering). However, the importance of wetland proximity during migration has not been established. The total area of available habitat may be an important attractant for increasing the likelihood of migratory stop-over at a site, with larger areas having increased likelihood of occupancy. However, specific area requirements with regard to patch size or proportion of landscape in shorebird habitat are unknown. Therefore, any attempt to include these parameters within models assessing suitable shorebird habitat would be without justifiable foundation.
Regarding the development of HSI values for different shorebird guilds comment and development of HSI values. Twedt, personal communication, Loesch, 2006 and other cites.

The revised shorebird analysis will quantify sparsely vegetated habitat conditions under 3 flooding regimes that are associated with different shorebird feeding guilds: (1) shallowly flooded with water depth <4 inches, (2) more deeply flooded with water depth between 4 and 8 inches, and (3) mudflat habitats which are not flooded but which had been flooded to any depth within the previous 2 days.

Because the preponderance of shorebirds migrating through the St. John's and New Madrid

Basins are likely small and medium-sized shorebirds that predominately forage in water <4 inches deep, the shallowly flooded area have maximum suitability for shorebirds (i.e., HSI value = 1.0).

Conversely, more deeply flooded areas provide access for few species and individual shorebirds: thus the suitability of areas with water depth form 4 – 8 inches is less than optimal. Similarly, mudflat habitats are less than optimal because fewer species and individuals may use these areas. In addition, the longevity of mudflat suitability is likely variable, being highly dependent on evapo-transpiration, thus increasing variability in area estimates of mudflat habitat.

Regarding the testing and validation comment. Verification and validation of the revised shorebird analysis is beyond the scope of the development of the revised shorebird assessment. However, a methodology for verification and validation of the assessment is outlined below for the specific application to the St. Johns Bayou and New Madrid Floodway Project. The procedures verify potential shorebird habitat in relation to depth and inundation, they do not necessarily equate to actual shorebird usage. Therefore, no quantitative shorebird counts and or population estimates will be necessary

VERIFICATION - We will verify the predictive ability of the assessment using remotely sensed data (*e.g.,*Landsat TM imagery, aerial photography, etc.). Imagery with known date of origin that includes the study area will be obtained (ideally from in-hand images within archives of USACE, USFWS, and Ducks Unlimited). These images will be classified into a binary depiction of water versus non-water (dry). We will compare the geographical depiction of shorebird habitat (as determined based on the revised shorebird assessment using the river stage associated with the date of the imagery) with the water-dry interface. Areas of estimated shorebird habitat that coincide within or are in reasonable proximity (distance yet to be determined) to the water-dry interface on the images will be assumed to be verified. The proportion of estimated shorebird habitat that is verified versus the proportion that is unverified will provide an estimate of overall verification. Model verification will be repeated using up to 10 images from different dates; ideally each date would be associated with a different river stage reading.

VALIDATION – We propose that validating the predictive ability of the shorebird analysis will require an on the ground assessment of water depths and soil saturation. During flood events, transects will be established in both basins that transition from dry to mudflat to wet conditions. The locations will be selected a priori and entered into a database or global positioning unit. Thereafter, upon obtaining the river stage at New Madrid and the interior staff gage on St. Johns Bayou, field personnel would visit each transect and assess shorebird habitat at that location (e.g., measure water depth, presence of soil saturation, distance to nearest water edge, etc.). This process would be repeated at various river stages during flood events. The proportion of locations where the estimated shorebird habitat that was validated as present (at or near the evaluation point) versus the proportion of locations that were not validated will provide an estimate of overall validation of the revised shorebird assessment.

USACE Literature Cited:

Elliott, L. and K. McKnight. 2000. U.S. Shorebird Conservation Plan: Lower Mississippi Valley/Western Gulf Coastal Plain. Mississippi Alluvial Valley/West Gulf Coastal Plain

Working Group, Lower Mississippi Valley Joint Venture. 29 pp. <http://www.lmvjv.org/library/USSP_LMVWGCP.doc >

Davis, C.A. 1996. Ecology of Spring and Fall Migrant Shorebirds in the Playa Lakes Region of Texas. PhD Dissertation. Texas Tech University, Lubbock, Texas. 224 pp.

Loesch, C.R., D.J. Twedt, K. Tripp, W C. Hunter, and M.S. Woodrey. 2006. Development of Management Objectives for Waterfowl and Shorebirds in the Mississippi Alluvial Valley. http://www.birds.cornell.edu/pifcapemay/loesch.htm

Comment 3:
Information is not provided to support the importance of flood pulses (different from 2-year frequencies) in wetland ecosystems and for wetland-dependent organisms.
Significance – High:
Changing either the frequency or amplitude of flooding on the project site has great implications on how well the impacts can be mitigated on site and on the ability of the site biota, especially fish and shorebirds, to adapt to that change in flooding.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Understand and recognize the importance of flood pulses to the remaining natural ecosystems on the site. 2. Consider impacts of these important seasonal pulses by evaluating the effects of floods with other than a 2-year recurrence interval.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
Recommendation 1 *The panel is pleased to know that the Corps recognizes the importance of concepts such as flood pulses such as the theories of Junk et al. We are also pleased to see that these will be brought up as important issues in the future NEPA documents. We also were aware that there would be some attempt to connect Big Oak Tree State Park to the river in a limited way. Our comment was based on the management of the entire site and the importance that flood pulsing once had on the integrity of the bottomland forests that once were there and which still remain in remnants.* **Recommendation 2** The Phase 1 IEPR stated that the 2-year floodplain was acceptable to determine fish impacts. The EnivroFish Model Certification also validated the use of the 2-year floodplain as the upper limit to quantify spawning and rearing habitat. **Question 3a: Please clarify the panel position, and why?** *This comment is not only based on fish use of the floodplain (which is the basis of EnviroFish model) but also the general ecosystem health of bottomland ecosystems, which depend on a wide frequency of flood pulses. The panel would like the Corps to consider the importance of a wide variety of flooding frequencies for waterfowl and bird use, for fish habitat and spawning, for introduction of plant and animal propagules, for movement of large-scale detritus (thereby forming new habitat structures for example), for scouring effects and export of large woody debris to the river, and so on. An ecosystem that is only flooded, on average, once every other year and with a similar flood intensity each time, will not mimic the natural world. As we already stated in our support for these recommendations "Fluvial processes such as sediment deposition and erosion are often dramatic during these less frequent flood events. Fish and wildlife are influenced by these rare events, which generate new habitats, different hydrology, and major inputs of nutrients and sediments." Thus the*

Corps should consider floods with a longer recurrence interval as well in their analysis for reasons other than fish spawning and rearing.

Question 3b:
Please provide rational and documentation for the statement about 25-year and 100-year events having a significant impacts to the wetlands within the project area.

The panel is aware that this is a dramatically drained site and that "no natural habitat that remains in either the St. Johns Basin or the New Madrid Floodway." It is no longer subjected to natural flooding from the Mississippi-Ohio complex as it once was. But we also believe that there could be much more imaginative solutions to restoration and/or mitigation at the site, in addition to the effort at Big Oak Tree State Park, to use the complex and widely varying frequencies of current Mississippi-Ohio flooding to provide both mitigation and adaptive management opportunities to allow small areas to recover to something approximating pre-drainage conditions. The newly forming batture land, as recognized by the Corps as possible mitigation and compensation areas is one area (see Comment 4).

The panel also recognizes that the site is not entirely isolated from the river as groundwater connections remain. High river stage means high groundwater and backwater effects, if only due to local runoff and precipitation, in the sites themselves. Floodplains can never be totally isolated from the rivers and streams that used to nourish them, even if the nourishment has been replaced by more subtle backwater and groundwater effects.

Comment 4:
A more complete discussion of fish access in St. Johns Bayou and New Madrid Floodway is needed, and the potential quantification of losses and potential mitigation due to access restrictions must be addressed.
Significance – High:
River connectivity to the floodways allowing fish access for spawning and rearing is a significant ecological feature of floodplain river ecosystems and any potential impact should be quantified for the proposed project.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Expand current fish access studies in the St. Johns Floodway to include the New Madrid Floodway. This would allow a comparison of fish access between a culvert access floodway and an open access floodway. Noted fish access restrictions due to the proposed culverts or gates should be subject to a detailed compensation plan as part of the overall mitigation program. 2. Use existing gate operations to conduct a study to quantify fish access restrictions for each spawning period, including stage and water temperatures. Any impact or loss should then be compensated in the mitigation plan. If fish access is restricted, then nearby batcher land mitigation should be considered to offset spawning and rearing loss attributed to access loss.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response/Recommendation 1: The studies outlined in the USACE Evaluator Response above addresses recommendations by the panel to evaluate fish access prior to project construction. These studies should be continued after construction to provide a better evaluation of fish access and potential access restrictions for early, mid, and late spawning season species across several years of hydrologic variation and gate operations. The USACE Evaluator Response did not address the lack of methodology in the Work plan needed to evaluate potential loss of spawning access and mitigation alternatives for early, mid, or late spawning species. **Recommendation 2.** **Question4a**: Are ancillary and telemetry studies sufficient to document that fish are passing through the St. Johns Bayou structure and does the Panel feel other studies are warranted, and if so, what type of studies? *The telemetry studies outlined in the above USACE Evaluator Response should provide a comparison of access prior to project construction for early, mid, and late spawning season species. However, coupling fish movement studies with spawning/rearing habitat use and successful reproduction (spawning adults, larval, and juvenile sampling in each of the main habitat types) is needed to fully evaluate habitat use and spawning/rearing habitat value (HSI scores). This is further supported given the poor recapture rate of marked fish in the floodways.*

Question 4b:
What specific data is needed to trigger additional mitigation due to changes in access?

A general principle of adaptive management is that adjustments should be made when the level of function falls below expected levels, as described by USACE above. The Panel's intent was to request that USACE include a specific statement that mitigation would be increased if ongoing monitoring shows that expected levels of function have not been achieved. This was missing from the Work Plan, but has been adequately addressed in the response to comments in this review. USACE notes that the specifics of the mitigation plan are to be developed in the EIS, and therefore cannot provide a specific list of adaptive management triggers. The same limitation applies to the Panel, which recommends simply that the EIS include a clear statement that mitigation shortfalls will be addressed for each resource. In general, the approach should include both the quantity of habitat and the quality of habitat created for each resource category.

USACE response/Question4c:
The Fish and Wildlife Service has repeatedly indicated that batture land mitigation is not suitable to mitigate for project impacts because it does not provide habitat (in-kind) that is similar to that found in the Floodway. USACE is of the opinion that batture land habitat is appropriate to compensate for project impacts. Although the Phase 1 IEPR review stated that batture land is appropriate and this comment suggests it is appropriate, please confirm the panel's position on batture land mitigation for fish.

The Panel agrees with the USACE opinion that batture land habitat may be an appropriate compensation alternative for project impacts if floodway compensation is not achievable. For example, if fish access studies indicate a reduction of fish spawning use of the floodways due to culverts and/or gate operations then compensating this loss through nearby batture land mitigation is appropriate.

Comment 5:

The fisheries methodology is not adequate to quantify actual spawning and rearing habitat based on Habitat Suitability Index (HSI) values.

Significance – High:

The HSI values are critical in calculating existing and lost HUs for project alternatives, as well as for evaluating mitigation alternatives.

Recommendations for Resolution:

To resolve these concerns, the future NEPA document should address the following:

1. Evaluate and compare existing spawning and rearing habitat types within the St. Johns and New Madrid floodways that will allow the development of quantitative HSI values for each habitat during each of the three spawning/rearing periods.
2. Evaluate any positive effects on spawning and rearing success in habitat types that may occur by holding water during the entire spawning and rearing period beyond any ADFA increase.
3. Monitor mitigation areas to determine if HSI values initially assigned are appropriate, or if adaptive management changes need to be considered to achieve the desired HUs.

Draft Evaluator Response in bold

Draft Panel BackCheck in italics

Recommendation 1.
Question 5a:
What is the basis for the statement regarding HSI values not supported in the project work plan?

The Work Plan does not provide details of a scientifically based approach that was used to assign HSI values for each habitat type. For example, the Work Plan assumes that all habitat types have equal value for the early, mid, and late season spawning fish community without supporting information. In addition, the detailed bases for HSI score differences among agriculture fields (0.1), fallow fields (0.5), bottomland hardwoods (1.0), and waterbodies (1.0) is not provided in the Work Plan.

Question 5b:
Do the similarity of delta streams and their associated floodplains in the Lower Mississippi River basin indicate that HSI values are transferable from one project area to another? If not, are there any unique differences in landuse categories or species utilization curves in the St. Johns Bayou and New Madrid basins that require a separate field study?

The Panel would support initial use of Lower Mississippi River basin HSI values for each of the habitat types if these values were developed based on sound scientific investigation with meaningful quantitative HSI differences among habitats. However, the Panel recommends that the HSI values be tested/validated for use in the St. Johns Bayou and New Madrid basins though field studies.

Question 5c:
Do you agree with the relative ranking of least valuable to most valuable habitats for spawning and rearing fishes: Agricultural land – Fallow land – Bottomland hardwoods - Floodplain waterbodies?

The Panel agrees with the relative ranking of the above habitats as indicated in the basis of this comment above.

Question 5d:
Does the panel agree that the stated fish HSI values are appropriate for use on this project?

The panel supports the community based approach for HSI values. However, as indicated above, the Work Plan does not provide detailed support of specific spawning period habitat HSI values.

Question 5e:
Does the panel recommend the Delphi process or something else to establish the HSI values for the project?

The Panel supports the Delphi process using scientifically based information that would provide qualitative and quantitative habitat and season specific fish community HSI values.

Question 5f:
What qualifications are necessary to serve on the Delphi Panel?

A main purpose of the Delphi process is to develop agreement/consensus among panel members. Therefore, the panel should have representatives of important basin stakeholders. Specific expertise should be based on the questions the panel will answer. In this case fisheries scientists/managers with a background in floodplain fisheries habitat in the lower Mississippi River basin should be part of the panel that assigns HSI scores.

Question 5g:
The model certification report noted that less valuable habitat (farmland) may need to be excluded because fish may choose to use optimum habitat (bottomland hardwoods or borrow pits) instead of sub-optimum habitat (farmland). Although not proposed in the work plan, should USACE exclude all sub-optimal habitat (farmland) from its fishery impact assessment and only assess optimal habitat (BLH and waterbodies)?

The Work Plan HSI values indicate that farmland and fallow fields do provide spawning and rearing habitat. Although HSI values are community based, these "sub-optimal" habitats may provide species specific spawning and rearing habitat across a changing temporal and spatial scale as water inundates and recedes from the floodplain. The Panel recommends inclusion of these habitats in the context of HSI values discussed above.

Recommendation 2: (need clarification)
By pooling water with the control structure, acres of habitat remain relatively constant. The primary purpose of managing water levels is to maximize duration and habitat quality of the

waterbody. Therefore, we assume that the habitat value remains constant during the time the pool is maintained. The panel comments suggest that habitat value is constantly changing during this period. If this is the case, how should the HSI values be adjusted to reflect changes, if any, that occur in the spawning pool or other semi-permanent waterbodies?

The Panel did not suggest that HSI values should change due to the number of days the spawning/rearing pool is maintained. This HSI change was outlined on page 76 of the Work Plan. The Panel supports a scientifically based approach to determine if (and how) quality of flooded habitat increases (HSI value) due to maintaining a pool through the spawning/rearing period. If a HSI value change is not supported, habitat units will still increase due to a longer pool duration that is reflected in increased ADFAs.

Recommendation 3:
Monitoring of mitigation sites and adaptive management will be discussed in the EIS after impacts are quantified.

USACE response noted by the Panel.

Comment 6:
The Waterfowl Assessment Method (WAM) appears to be appropriate; however, the parameter estimates for the model are based on fall migratory and wintering ducks and do not appear to consider spring migrants.
Significance – High:
Use of the parameters outlined in the Project Work Plan may result in underestimating the required waterfowl habitat mitigation.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should use parameter estimates from data collected during the spring migratory period for parameterization of the model.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***

USACE response/Question 6a:

Nonbreeding migrant waterfowl are present in the SJNM from September through March. This is the time frame used in the WAM. Numbers of waterfowl in the SJNM gradually increase through fall to peaks in December and January and then decline through March (Bellrose 1980, www.mdc.mo.gov). This chronology of occurrence includes the sequential annual cycle events of waterfowl of fall migration, prealternate molt, pair formation, prebasic molt, reserve deposition, and spring migration (Heitmeyer 1988, 2002). Consequently, a continuum of annual cycle events is occurring among species and individuals within the SJNM and the SJNM is not a region or complex of habitats that is used solely or primarily for spring migration.

Weekly waterfowl counts in the SJNM have been made by the Missouri Department of Conservation from ca. October through January, and often through March since the early 1980s. U.S. Fish and Wildlife Service coordinated mid-winter inventories of the SJNM and surrounding Upper Mississippi Alluvial Valley (MAV) region have been made since the 1960s. Biweekly surveys throughout the year were made for 15 randomly selected four-square mile blocks in the SJNM region from 2000 through mid 2004 (Heitmeyer, unpublished data). All of these data indicate peak waterfowl presence in the SJNM is in December and January. Numbers of waterfowl in the SJNM regional area often are 70% less in March (when most waterfowl species are in spring migration in the Upper MAV – Bellrose 1980) than during mid-winter peaks. Peak numbers of waterfowl (combined ducks and geese) at the Ten Mile Pond Conservation Area (CA) in the SJNM are regularly > 100,000 birds in December and January. Surveys in 2009-10 indicated over 3 million waterfowl use days occurred from November through January. In 1997-2000 over 9 million waterfowl use days occurred each year from November through January at Ten Mile Pond CA. In addition to Ten Mile Pond CA, the SJNM region includes many other important public and private wetlands in western Kentucky (e.g., Ballard County CA), northwest Tennessee (e.g., Reelfoot Lake), and southeast Missouri and northeast Arkansas (e.g., Big Lake National Wildlife Refuge) that support large numbers of waterfowl from fall through spring. For example, waterfowl numbers at Reelfoot Lake alone often exceed 300,000 during

December and January and many of these birds move between the SJNM and the Reelfoot Lake area daily. Consequently, the SJNM provides resources to more birds than are present on Ten Mile Pond CA or other regional areas on any given day. Conservative average estimates of total waterfowl within a 30 mile radius of Ten Mile Pond in early January are > 500,000 birds (http://www.fws.gov/birddata/databases/mwi/mwidb.html). Clearly, the SJNM is heavily used by waterfowl from fall through spring periods, and is not primarily a spring migration region.

The panel does not disagree that waterfowl are used during all potions of the year and has never made that assertion. The panel is suggesting, however, that this region likely has the greatest influence on populations by providing spring migratory habitat, an assumption we thought the USACE agreed with at this point. This assumption is based on the annual life cycle and the need for waterfowl to acquire nutrients for reproduction at this time and not on the abundance of waterfowl in the region at any given time. Thus, although it is important for the project mitigation to replace habitat lost to waterfowl at all time of the annual cycle in which the region is used, it is most important to ensure loss of spring migratory habitat is appropriately mitigated.

USACE response/Question 6b:
Regarding the statement "… the parameter estimates for the (WAM) model are based on fall migratory and wintering ducks and do not appear to consider spring migrants." This statement is incorrect and appears to be based on the false assumption that the SJNM is most important for spring migration (see above) and does not understand the data, timeframe, energetic basis, and habitat and food production analyses in the WAM. First, the WAM includes estimates of food abundance and energetic requirements of all waterfowl species using the SJNM from September through March. As stated above, this timeframe accurately represents the entire suite of nonbreeding events, species, and times for the SJNM from September through March. Consequently, the WAM does provide quantitative methods to determine food abundance and energetic requirements for the late winter and spring period through March.

The panel agrees the WAM estimates the food availability during spring by estimating depletion and decomposition from fall estimates. The pane is suggesting, however, it would be more appropriately to use actual data collected during spring that is now available instead of using estimates from data collected during fall and winter then adjusting them with depletion and decomposition curves.

USACE response/Question 6c:
Annual food production, and subsequent availability to waterfowl species, is a function of when specific foods are produced and how the standing crop changes over time. For most plant foods (excepting some above-ground browse), the actual production is during the growing season and usually peaks in late summer or fall. Consequently, estimating potential food abundance must start with understanding the standing crop in summer or fall and then determine changes thereafter through spring. For invertebrates, the chronology of production and turnover rates vary by taxa and habitat. For some benthic crustaceans (e.g., *Cranonyx*) in the Upper MAV the peak production is in spring (e.g., White 1985). In contrast, many aquatic insects (e.g., Chironomidae) reach peak levels in late summer. Throughout the WAM, food production estimates are based on the life history characteristics of the

plants/invertebrates involved and state-of-the-art understanding of availability dynamics. Consequently, the parameter estimates are founded on basic plant/invertebrate ecology and reflect their potential abundance and use by waterfowl in the SJNM regardless of when, or which species, uses them. This includes all time periods and events from fall through spring migration.

Again, the panel is not suggesting the data used in the WAM is inappropriate, only that the model uses various methods to estimate abundance when data on actual abundance now exists.

USACE response/Question 6d:
The comments seem to imply that invertebrates are the primary food consumed by spring migrant waterfowl in the SJNM and that the WAM should be based primarily on invertebrates. First, the WAM does provide estimates of invertebrates in all habitats and times. It also provides estimates of all other foods potentially consumed by waterfowl species. Consequently, the WAM provides appropriate estimates of potential carrying capacity of a region (such as the SJNM) regardless of species, time, or annual cycle event the bird is engaged in.

The assertion that spring migrant waterfowl eat mostly invertebrates is not true for all species or areas. Knowledge that some duck species seek habitats that have, and eat, a higher proportion of invertebrates in late winter and spring compared to fall and early winter periods is well documented and not new (e.g., Heitmeyer and Vohs 1984, Heitmeyer 1985, LaGrange 1985, LaGrange and Dinsmore 1988, Heitmeyer and Fredrickson 1990, Gammonley and Heitmeyer 1990, Heitmeyer 2006 and many others). However, not all species consume large quantities of invertebrates in spring (e.g., wigeon, geese, etc., Heitmeyer and Raveling 1988, Heitmeyer 2002) nor do individuals of a species, such as mallards, always eat large amounts of invertebrates by sex (Combs and Fredrickson 1996) or location (Gruenhagen and Fredrickson 1990). In fact, few invertebrates may be eaten in some locations. Consequently, it is inappropriate for the WAM to speculate on which species will eat what amounts of specific food types by time period.

The panel never asserted WAM should speculate on which species should eat what amount of specific food types at any given time, only that recent data specific to spring migratory ducks is now available and invertebrates appear to be an important component of their diet, thus, invertebrate loss should also be mitigated.

USACE response/Question 6e:
The references used as the supporting evidence by the reviewer are not peer reviewed and/or available for analyses at this time. No doubt, the studies were well conducted, however the locations of the study sites used in these references are not stated, but appear to have been in central Wisconsin, Saginaw Bay in Michigan, Lake Erie, the Scotio River in central Ohio, the central Illinois River Valley in central Illinois, and the Cache River area in southern Illinois (Yerkes 2010). None of these study sites were within the SJNM and only the Cache River location may have had similar habitats as the SJNM. Using data from sites in the Great Lakes region, and even the central part of the Illinois River Valley, to indicate and project resource use, energetic requirements, habitat food type and abundance, and inclusion in WAM models is scientifically inappropriate.

The WAM clearly states that the model parameter estimates may be refined as new information becomes available from sites that represent the area of coverage, i.e. within the MAV. Consequently, if new studies can convincingly validate and suggest changes to the parameter estimates, based on equivalent MAV habitats and locations, then food estimate changes can easily be made in the WAM tables. New production information will not change the form of the DUD equations, however.

The citations are all theses or dissertations which are commonly used for management purposes. Most of the data from these documents are currently being submitted to peer reviewed journals. The panel does not believe the fact the data have not been published in peer reviewed journals is an adequate excuse to exclude it from use. The panel agrees the data from most of the sites in these citations are not appropriate for the use in this instance, however, the panel feels data from the cache river study site, which is only about 45 miles from and at similar latitude to the project area is more appropriate than data for most parameter estimates currently being used in the model The panel would be happy to provide copies of each of the cited theses to the USAE for their use..

The response further suggests that the DEE used in the WAM may underestimate "true" DEE during spring. The reviewer offers no data to support this assertion and the comments appear to have been based on non-MAV locations mostly from the Great Lakes region (see above).

USACE response/Question 6f:
The review comments imply that because waterfowl are storing reserves during spring migration a different DEE estimate should be used than during winter. Nutrient reserve deposition for many waterfowl begins in late winter including during flood events (e.g., Heitmeyer 1988, 2006) and is not confined to spring. The WAM clearly indicates how the DEE estimates for all waterfowl species using the Upper MAV were calculated. The actual estimate of 4x RMR is higher than earlier published estimates and it is acknowledged that the estimate may be conservative. However, until new validated information becomes available for DEE in the Upper MAV and SJNM, the WAM estimates represent the state-of-the-art understanding of DEE for the SJNM and are appropriate for the SJNM project analyses.

The data supporting this assertion are in a manuscript in preparation. The panel would be happy to provide this information. It is unclear to the panel why the USAE has chosen to belabor this point. The panel is not suggesting the WAM is inappropriate, only that there is more recent data that would be more appropriate to this specific project area.

Comment 7:
It is unclear if the application of the Hydrogeomorphic (HGM) approach to evaluate project impacts and develop proposed mitigation will yield scientifically credible results.
Significance – High:
The HGM model results may be of key significance in estimating the impacts of the entire project.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Use a safety factor as high as 4x (there are ample precedents for this) when estimating the amount and type of mitigation that this project should propose; this will resolve the uncertainty in the HGM method and its parameters. 2. Continue to evaluate other models that are more related to the function and structure of wetlands to assess comparison of wetland functions for mitigation. This of course will not be possible in the short term of this investigation.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE Response We agree with the panel's assessment that HGM has a long record of development and application in the estimation of functional losses and gains of wetland resources for Corps planning projects. More importantly, the specific Guidebook in question has been used successfully in similar Corps projects in Arkansas, where multiple wetland types and proposed mitigation types were employed, and changes in flood frequency and duration were components in the wetland impact. HGM reviewers concluded that the guidebook has been in use for approximately five years and could potentially be used with the same level of accuracy under the condition that existing users will be the ones who continue to use the method. One or more members from team of experts who developed the regional HGM guidebook will perform the assessments for all wetland sites to ensure the models are used as intended and that there is consistency in the results. The minimum requirements of the review team will be met during the SJNM application of the Delta Region of Arkansas Hydrogeomorphic Methodology (HGM) Guidebook. The panel's assertion that calling an approach a "model" automatically implies that it is a specific type of model is not founded. There are many models that have been developed over the years for ecological assessment purposes; one of the most famous and oldest of these is the Habitat Evaluation Procedure, first developed in 1980. HEP models, as they are called, are clearly models: mathematical aggregations of factors to determine a single metric. They do not involve differential equations or other techniques that might be used in dynamic hydrologic modeling. HGM was originally conceived as a way of extrapolating the techniques and methods used in HEP to address the multiple functions that needed to be addressed for wetlands. The model development is quite comparable to that used in HEP. Unlike HEP, however, HGM models are calibrated using reference data specific to the

wetland subclass and a specific reference domain, such as an ecoregion. This makes it actually more scientifically defensible than many models, which are calibrated using literature review data that are aggregated across the entire country. The data collected for the Guidebook in question is from the same EPA Level III ecoregion as the project site, and the models are proven sound by previous use.

The panel is pleased to see this complete discussion of the pros and cons of the HGM technique for assessing ecosystem function of wetlands and the use of mitigation ratios. It provided us with much additional information that was not in the reports we reviewed.

The Corps states that the HGM has been used "successfully" in several previous projects. How does the Corps know that the use was "successful." In one sense if a model is used and results are obtained it could be called success. But there is no absolute criteria that can be used to determine if the results from these previous applications of HGM found results that were even close to estimating wetland function on a quantitative scale. So the panel does not concur with the use of the term "success" in previous applications. Perhaps "used with some quantification of wetland function" is what has been accomplished.

The panel is aware of models such as HEP and even the predecessor model to HGM which was called WET (Wetland Evaluation Technique). While the panel is pleased that HGM has, at its basis, the hydro and geological conditions of the wetlands, it complexity does not, by itself, convince us that it is better (or worse) than these previous models.

Question 7a:
Although the IEPR panel believes that the HGM does not provide a scientifically defensible method for estimating impacts, is the model appropriate to compare project alternatives for this project?

The panel found this to be a very interesting question. In other words, does the model, even though it does not provide any absolute measures of wetland function, provide relative scales that could be used at the same sites to determine relative impact? Perhaps, especially if the same person or persons carry out all of the studies. We do not know what the probability of that would be. Most importantly we believe that the Corps is too far along in using and reusing the HGM technique to abandon it now, and there is no other appropriate model out there, save for ecosystem simulation models, that could provide any resolution needed for mitigation ratios. That is why we called for a "generous" mitigation ratio or safety factor (see below)—to acknowledge that the science of providing indicators of ecosystem function is quite inexact as is the development of mitigation ratios from these indicators.

USACE response:
The HGM guidebook calibration process employed direct measurements of thousands of tree diameters, counts of shrub stems, snags, and logs, and similar specific data, and application of the guidebook uses similar direct measures. Variable values that are estimated (such as litter cover) should be consistent in the way that they are applied, as long as the field team is consistent. Since functional loss and gain are calculated as differences between before and after states, the absolute value isn't as important as the consistent application of the variable. An overestimate of 5% across all the sites will yield the same results once the difference between before and after states are compared.

HGM separates wetlands into classes and subclasses using hydrology and landscape position, which directly affect function. A riverine wetland functions differently than a wet flat or an unconnected lacustrine fringe. To lump these wetland types together and then try to determine changes in function is precisely the sort of illogical analysis that HGM was designed to avoid. It's true that splitting the project site into multiple types will increase the amount of data required for analysis, but that is justified if it is required to develop a defensible analysis. The keys provided in the Guidebook are sufficient for splitting out the types, and since the project will lead to changes in flood frequency and duration that will not only affect function within types, but also lead to type conversion, the idea that these functional changes can be assessed in any scientifically defensible way without splitting the wetlands into classes is not supportable.

Any errors in the calculators will be addressed, but as for the issues with the models, they were ultimately certified for use on this project. The form and component variables in the assessment models and the format of the guidebook were constructed to be consistent with previously published guidebooks (specifically, the Yazoo Basin guidebook) and were reviewed and approved by a team of regional experts and the USACE - ERDC. Calibrations were based on actual field data from within the same EPA Level III ecoregion as the project site, which makes them more scientifically defensible than calibrations used in many HEP models. They are the best available tools for use in this application, and have been extensively tested in the region, as noted by the panel in their opening comments above.
In order to be classified as riverine, a wetland must be within the 5-year floodplain of a river, according to HGM convention. If a site is not subject to flooding at least 1 year in 5, then the river is not the "main forcing function of the system," and is certainly not the principal hydrologic factor maintaining wetland character. The statement that fringe wetlands are not usually associated with floodplain landscapes is curious, as the cypress fringe communities associated with oxbow lakes are among the most iconic and widely occurring of the remaining wetlands in the Lower Mississippi Valley. Other non-riverine wetlands, such as hardwood flats, sand pond depressions, valley train ponds, and various other communities discussed in detail in the guidebook, have been seriously impacted by historic land use in the study area, and merit more, not less, attention.

It is not clear where the panel has obtained the number 4 as a multiplier for any mitigation ratio determined using HGM. HGM analyses in the region have previously tended to produce mitigation ratios in the range of 2:1 to 4:1, depending on the
condition of the impacted wetland, and the type of mitigation proposed. Preservation has been calculated as high as 10:1 due to the lack of functional lift over the course of the project lifetime. In all cases, the rationale and supporting data for calculating these ratios, including developmental trajectory analyses, are presented and discussed clearly, and can be specifically criticized as appropriate if logic or data errors are identified.

The Memphis District Regulatory Branch stated that the following ratios have been developed by the Missouri Department of Natural Resources (MDNR) with cooperation from the Missouri Department of Conservation (MDC), the U.S. Fish and Wildlife Service (USFWS), the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (COE), the Natural Resources Conservation Service (NRCS) and the Missouri Department of Transportation (MoDOT) for wetland creation/restoration. The ratios are

intended for use by projects for which the sequencing requirements have been completed and it has been determined at that point that compensatory mitigation is appropriate. The ratios are not intended for enforcement purposes; however, the high end of the range may be an appropriate place to begin negotiations for enforcement cases.

Farmed Wetlands 1.0-1.5
Emergent 1.0-3.0
Shrub-Scrub Wetlands 1.5-3.0
Wooded Wetlands 2.0-4.0
Open Water 1.0

Question 7b:
What other models are readily available that is superior to HGM that have the possibility to compare alternatives, quantify likely impacts of the project, and determine appropriate mitigation?

Our criticism of HGM is based on absolute, not relative terms. But its methods are simply to prone to error and lack of repeatability. Wetland practitioners have not developed any other standardized and widely accepted approaches for estimating wetland function. It is unfortunate that standard dynamic and statistical models such as those used in hydrologic sciences, to predict ecosystem trajectory over 10 to 100 years, have not been developed and standardized. Among the reasons are that wetland functions are difficult to measure with any accuracy with repeated measurements and there are so many different types of wetlands and wetland functions.

To lump these wetland types together and then try to determine changes in function is precisely the sort of illogical analysis that HGM was designed to avoid. It's true that splitting the project site into multiple types will increase the amount of data required for analysis, but that is justified if it is required to develop a defensible analysis.

We could not agree more that a system was needed to divide the wetlands into hydrological categories and the HGM system does that part fairly well. We are only commenting that these systems, far and away, are systems that used to be and still are to some small degree, riverine. We are further commenting that there is little to be gained from splitting functions between, say a pond-edge cypress swamp, and one in a slow-flowing slough.

The fact that wetlands on the study sites can now be classified in other hydrological categories reflects the dramatic drainage impact that has occurred on these sites in the last 100 years. There would not have been anything approaching a basin or lacustrine wetland per se 100 years ago. While backwater swamps on these sites have lacustrine features when viewed at the small scale, they are really riverine in the landscape scale.

Question 7c:
Please expand and provide rational and documentation for use of a safety factor as high as 4x when estimating amount and type of mitigation. For example should a safety factor of 4x be used for wetlands that lose all wetland characteristics (i.e., jurisdictional wetlands that as a result of the project lose jurisdictional status)?

The table that you provided above shows mitigation ratios (which are sort of an engineering safety factors) up to 4:1 for forested wetlands so you have provided us with examples where the ratio could be that high. We are arguing for this case, just as has been the case in other aquatic resource impacts when the accuracy of measuring the impacts is imprecise and the probability of success of the mitigation is unclear, a mitigation ratio of 4:1 or even higher could certainly be warranted. The numbers provided in your table were undoubtedly a result of consensus by knowledgeable individuals than precise calculations based on analytical techniques. We are arguing that this site, because the large scale prevents both accuracy of methods and prediction of final results, high mitigation ratios are warranted. 4:1 is not uncommon in such situations. So we agree that "the high end of the range may be an appropriate place to begin negotiations for enforcement cases."

Question 7d:
Should this safety factor be reduced for partial impacts (i.e., jurisdictional wetlands will maintain jurisdictional status but may not be inundated as frequent as existing conditions).

That seems reasonable.

Question 7e:
Should benefits to existing wetlands that are not connected to the Mississippi River (e.g., Big Oak Tree State Park and the St. Johns Bayou Basin) be 4x greater than previously thought if river connections are re-established?

The panel believes that reestablishing true river connections to formerly isolated wetlands should be rewarded. If you are able to establish true surface water hydroperiods with some wetlands in the State Park or the Bayou due to river re-connections, it should receive lower mitigation ratio requirements than wetlands that are isolated or lacustrine in nature. The panel believes that these true "riverine" wetlands would provide many more functions for fish and wildlife and water quality improvement and establishing models of such wetlands at this site would provide useful benchmarks and models for future mitigation of wetland loss in riparian areas.

Comment 8:
There is an insufficient level of detail in the Project Work Plan to evaluate the validity of the proposed compensatory mitigation plan.
Significance – High:
The project success is dependent on determining the appropriate level of mitigation.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Provide more detail as to how wetland habitat loss and function will be estimated. 2. Provide more detail on how estimated wetland loss and function will be mitigated.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response: USACE agrees that project success is dependent on determining the appropriate level of mitigation. However, a specific sequence needs to be employed which first describes the impact, determines its significance, seeks to avoid and minimize the impact, and lastly compensates the impact. Obviously mitigation cannot be determined without first determining what the significant unavoidable impacts of the project are. Therefore, the project work plan only contains conceptual mitigation. Although USACE assumes impacts are likely, USACE does not know if impacts are greater or less than past project recommendations. Therefore, mitigation specifics would be discussed in detail in the EIS. If determined necessary, moist soil units will be primarily managed to compensate for impacts to spring shorebirds. Therefore, moist soil sites would likely have to be inundated prior to spring shorebird arrival for several months to maximize invertebrate productivity. This would likely coincide with spring waterfowl migration. Therefore, waterfowl will likely utilize the sites. Please refer to response to comment 1 for further discussion of waterfowl/shorebird use of moist soil habitats. **Question 8a:** If moist soil units will be managed primarily for spring shorebirds, how much should the value be "reduced" for waterfowl benefits? *As stated in # 1, without knowing the actual hydrologic conditions, there is no way to answer this question.* **USACE response/Question 8b:** USACE acknowledges that the discussion on reforestation is brief. This is primarily due to the fact that site specific location needs to be known (elevation, soils, topography, hydrologic regime, etc.) prior to determining the species of trees to be planted, spacing, direct seeding vs. seedlings, etc. The EIS will include a more thorough description of "typical" mitigation sites that would be found throughout the project area. At a minimum the following conceptual sites will be described:

• Lands adjacent to Big Oak Tree State Park
• Lands that are within the project's sump elevation
• Lands that are outside the project's sump elevation
• Adjacent batture sites
• Moist Soil Unit
• Lands within a spawning and rearing pool

The Project Work Plan includes transition periods that discount mitigation based on the amount of time necessary for mitigation sites to reach maturity or when they reach full habitat potential (*i.e.,* forested areas for fish).

There is little shorebird habitat provided in the project area due to Mississippi River flooding in the project area during the critical southward migration (15 July to 30 September, see Loesch et al., 2000). Is it appropriate to compensate for spring shorebird habitat by providing habitat to shorebirds via moist soil units, borrow pits, etc. in the summer/fall and if so, how much more valuable is summer/fall habitat than spring habitat?

Question 8c:
The term "wetlands" - are you referring to lands that meet the definition of Section 404 of the Clean Water Act or other areas such as areas that are defined as functional floodplain habitat in the Project Work Plan?

The panel is referring to all "wetlands" that require mitigation for the loss of form and function.

Question 8d:
The project work plan describes the methodologies that will be used to determine habitat loss and function. What specific additional information is necessary?

The project work plan provides general methodology but is lacking detail adequate to determine if these methods will achieve their desired objectives.

Recommendation 2:
Panel Question: The project work plan describes conceptual methodologies that will be used to compensate likely project impacts, in the panel's opinion what additional information is necessary to satisfy the requirements of NEPA and the Clean Water Act?

Comment 9:
The adaptive management plan requires a detailed analysis of the ongoing mitigation management costs and a clear funding source adequate to support those activities.
Significance – High:
Without a demonstrated source of funding, adaptive management cannot be applied to the mitigation sites, and therefore full mitigation for project impacts cannot be achieved.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document must include a source of funding for adaptive management activities, including ongoing monitoring and management as part of the mitigation plan.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response/Question 9a*:* Recommendations regarding adaptive management were included in the Project Work Plan (see Section 8.6). The cost of this management and monitoring will be determined in the EIS. Applicable funding (Federal funds from the Mississippi River and Levees Program, Federal funds from the St. Johns Bayou and New Madrid Floodway project, and non-federal funds from the project sponsor) will be required to implement the plan. The amount of required funding from each source will be described in the EIS. *The Panel recommends that the full cost of developing, managing, and maintaining the mitigation areas over the entire life of the project be included in the EIS.* **USACE response continued:** Conditions that would "trigger" adaptive management have not been discussed with the interagency team to date because project impacts, and avoid and minimize measures have not been formulated. However, these conditions will be described in the EIS. Mitigation will increase and or site specific adjustments made in the event that they are not functioning as desired. Conversely, adaptive management may reveal that mitigation sites are functioning at greater rates than modeled, or impacts were not as significant as modeled. If this is the case, overall mitigation may be reduced. **USACE response/Question 9b:** Please provide specific examples that would trigger adaptive management in each of the significant resource categories (*i.e.,* fish, waterfowl, shorebirds, water quality, and wetlands). *A general principle of adaptive management is that adjustments should be made when the level of function falls below expected levels, as described by USACE above. The Panel's intent was to request that USACE include a specific statement that mitigation would be increased if ongoing monitoring shows that expected levels of function have not been achieved for any resource. This was missing from the Work Plan, but has been adequately*

addressed in the response to this comment. USACE notes that the specifics of the mitigation plan are to be developed in the EIS, and therefore cannot provide a specific list of adaptive management triggers. The same limitation applies to the Panel, which recommends simply that the EIS include the following: 1) an ongoing monitoring plan sufficient to detect insufficient levels of function for all resources, 2) a clear statement that mitigation shortfalls will be addressed for each resource, and 3) proposed responses to improve levels of function.. In general, the approach should include both the quantity of habitat or function and the quality of habitat or function created for each resource category.

The Panel recommends that for each resource, adaptive management be triggered when the ongoing monitoring plan shows that levels of function have fallen below those proposed for the specific mitigation plan for that resource. For example, for water quality, these should include:

1. Exceedance of any applicable water quality criteria or standards in streams, channels, or other surface waterbodies in the project area.

2. An increase in total nitrogen loads from the New Madrid Floodway to the Mississippi River.

Comment 10:
The methodology to determine the extent of the wetlands in the project area requires further detail to determine if it is valid.
Significance – High:
An accurate determination of the area of wetlands is needed to estimate the impact of this project.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Provide a more detailed description of the methods needed for estimating the area of wetlands, especially on the field sampling, to determine the total area of wetlands on the site. 2. Provide details of the WETSORT program.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response: Wetland ecosystems and their community functions will be analyzed utilizing HGM in accordance with the SJNM Interagency Wetland Team recommendations. USACE will utilize WETSORT, which is based on a 1997 USDA, NRCS method and uses daily water surface elevation readings to determine wetland elevations. The program can be used to determine the median elevation of specified flood durations during the period of record. The flood duration will be fourteen days (according to the supplement to the 1987 Wetlands Delineation Manual). Wetlands above the flooding elevation will also be classified. The team has reviewed available maps and discussed the different approaches (abundance, distribution, and qualitative condition of wetlands as well as FCU's and HGM analyses). The team agreed to use HGM to assess project related wetland impacts, while the probabilistic sampling based on EMAP will provide wetland acreage and a qualitative wetland condition. The team discussed using hydric soil and land use cover maps (and potentially WETSORT data) to help assess farm land (particularly if NRCS cannot provide FW/PC data). The team agreed to use the same proportion of agricultural land on hydric soils that meets wetland parameters (as determined by on-site wetland data collection) within the field- and remote-sampled portions of the project area. Hydric soils will be overlain on the identified agricultural project area landcover GIS layer within the project impact area. Members from the interagency team will assess these probabilistic determined sampling points. After sampling these ~50 points, the same individuals will derive remotely sensed assessments on 50 probabilistic sample points outside of the impact area. These sample points will be determined in the same fashion as the impact sites, except for these sites will be outside the impact zone. Aerial imagery will be used in making these assessments. Concerning lack of involvement by USFWS on the interagency wetland team, the Service was asked to participate; however, they decided they would not be a member on the wetland team. USFWS is free to attend any sub-team meeting and is advised of all sub-team meetings and decisions. The full interagency team (including wetland team participants and the Service) are kept apprised of decisions made at the sub-team level, including Memos for

Records and updates at interagency team meetings.

A detailed description of the WETSORT program was provided to the interagency team and is attached to these responses. Briefly, WETSORT is a utility program written in FORTRAN 77 that uses methods published by the USDA Natural Resources Conservation Service (1997) to determine wetland elevation using daily water surface elevation data and user supplied input. User supplied input to the computer program are: growing season length (begin and end dates) and a percent duration (typically a 5, 12.5 or 15-day duration). WETSORT does not evaluate moist soil conditions, does not evaluate conditions based on shallow groundwater, and does not identify wetlands. WETSORT does identify a median wetland elevation determined by multi-year analysis and requires field verification by experienced professionals.

The wetland team will determine the appropriate classification for agricultural areas (wetlands, farmed wetlands, prior converted cropland). Preliminary estimates suggest that the vast majority of lands in the project area are prior converted cropland. Although these areas may not be subject to Section 404 of the Clean Water Act, the functional floodplain (including agricultural land) value they provide will be assessed with the fish, waterfowl, wetland, and shorebird models. It is possible that areas that are currently in agricultural production could convert to wetlands if farm practices are abandoned and no channel maintenance is conducted on the vast network of drainage ditches. The vast majority of agricultural areas are expected to remain in agricultural production (see response to comment 18). Project mitigation will seek to purchase agricultural areas and restore wetland status to these areas.

Shallowly flooded agricultural land (regardless of wetland jurisdictional status) that provide shorebird habitat will be assessed in the Shorebird impact analysis (See response to comment 1).

See also (attached to FPC #10)
Determination of Wetland Elevation from Daily Water Surface Elevations
Using the Computer Program WETSORT
US Army Corps of Engineers, Memphis District
March 23, 2010

We appreciate the answers that the Corps provided to the panel on these recommendations and have no further questions on wetland area determination.

While it is beyond the charge of this panel to review the NRCS WETSORT program in detail, the description provide here helps us to understand its role and limitations.

We appreciate knowing the reason for the absence of the U.S. Fish & Wildlife Service in this wetland determination. While it is unfortunate, we are pleased to know that they can be at the table if they wish.

Comment 11:
The assessment of economic impacts of the proposed project may not be valid because the method used to document the future with and without project conditions does not consider trends in real prices and costs.
Significance – High:
Nearly all project benefits relate to agricultural profits for the life of the project, and fundamentally depend on future prices and costs.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. The agricultural crop price indexes from the Economic Research Service should first be carefully evaluated for signals of trends in real (inflation adjusted) crop prices. 2. The economic analysis (the benefit-cost analysis) should be conducted under various scenarios pertaining to future price and cost changes, considering for example, a constant real rate of growth in prices, a zero rate of growth, and perhaps a decline in the real rate of change in prices. Similarly, such scenarios might be done as well, for key agricultural input costs, such as energy.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response: Current economic guidance ER 1105-2-100 states that only Current Normalized Prices can be used to assess the economic viability of Federal water resources development projects. Current Normalized Prices (CNP's) are the calculated by the USDA Economic Research Service and are the values that the Federal government places on the various agricultural commodities. They are calculated by State but they are "national" in scope in that the methodology used is consistent so that they can be used to compare projects in various locations throughout the United States. CNP's are adjusted for inflation and do in fact reflect trends in that they are 5-year lagged averages of actual market prices. *The panel definitely recommends doing a sensitivity analysis as suggested above, and as also suggested in key Federal guidelines for conducting benefit-cost analysis on Federal projects (see OMB, 1992), and in the USACE's own guidelines (see Appendix E of ER1105-2-100). Again, general nationwide or regional "inflation" and "real price" trends in agriculture are potentially two different things, and a sensitivity analysis should focus not on the general rate of inflation in the United States or within the region, but on possible real trends in agricultural prices and costs, so that all benefits and costs are in real, and not nominal terms.* *Note that guidelines within the OMB circular (1992, p. 7) states that "Future inflation is highly uncertain. Analysts should avoid having to make an assumption about the general rate of inflation whenever possible."* *The OMB circular (1992, p. 8) also states "For projects or programs that extend beyond the six-year budget horizon, the inflation assumption can be extended by using the inflation rate*

for the sixth year of the budget forecast." Therefore, the USACE needs to estimate the inflation rate in the sixth year of the project analysis, and use the inflation rate for that sixth year in adjusting all benefits and costs for inflation, for all impacts accruing after six years.

USACE response:
The recommendations contained in comment 11 seem to suggest estimating inflation adjusted trends or changes in commodity prices over the 50 year period of analysis. This type of change in prices could only be used in a type of sensitivity analysis to show the effect of these estimated trends. By regulation, they can not be used in the NED analysis of the proposed water resource improvements. Therefore, USACE can not adopt the recommendation.

Question 11:
Does the panel foresee any agricultural conversions to other land uses in the project area?

The panel does not know the future and USACE guidelines suggest that believing the future is uncertain and that it involves risky outcomes is a standard presumption in such analysis (see Appendix E, section E-4). Prudent analysis would allow for numerous possibilities for uncertainty or risk (again, see section E-4, Appendix E) relating to the future of land use over a 50 year period into the future. If the USACE disagrees, then the analysis of the future should provide clear evidence that the best prediction is for no conversion of agricultural land to another other use. Such evidence might be based on past trends using years that contain extreme weather (high and low precipitation) and flood events. However, if the USACE uses past trends to demonstrate that there have been no changes at all in land uses, including farming practices over the entire past period, then the project's agriculturally related benefits can assumed to be zero because one can expect there to be no changes in agricultural practices by farmers in the future, even when flood risks change.

Comment 12:
The use of two discount rates for the same analysis is confusing and is not warranted in any conventional economic analysis.
Significance – High:
The project's benefit-cost ratio fundamentally depends on the chosen discount rate.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. First, the benefit-cost-analysis should first be conducted in its entirety for a well-defined period beginning with the very first project construction (for which only costs, and no benefits would be expected in the profile), and extending through the life of the project, using a single discount rate of 2.5%. 2. Second, the benefit-cost analysis (i.e., entire accounting exercise) should then be repeated at the single discount rate of 3%, and then repeated again at the single discount rate of 7%, resulting in three benefit-cost ratios, one for each discount rate assumed. 3. Results from each analysis, i.e. for each discount rate, should be clearly presented and contrasted to show the effect of using the range from lower to higher discount rates. This is consistent with doing sensitivity analysis for a long-term project.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response: The recommendation to resolve this comment is to present the results of the economic analysis using 3 different discount rates. This is contrary to established Corps of Engineers economic guidance. To minimize confusion in future studies, the Corps will better explain why more than one discount rate is used. Basically, there are two separate project authorizations, each of which requires different interest rates. The first is the New Madrid Floodway Levee Closure that was authorized as part of the Flood Control Act of 1954. Its authorized discount rate is 2.5%. This rate is confirmed by the Water Resources Development Act of 2007. The second project is the St. Johns Bayou-New Madrid Floodway Project that consists of the two pumping stations and channel improvements. This project was authorized by the Water Resources Development Act of 1986. Future studies will use two discount rates, the authorized rate for the Levee Closure of 2.5 percent and the current discount rate in effect at the time of analysis. All benefits and costs associated with the Levee Closure will be presented at 2.5%. Any recommendations for the Levee Closure will be based on 2.5%. The St. Johns Bayou-New Madrid Floodway Project will use the current discount rate in effect at the time of analysis. The benefits and costs and subsequent recommendations for this project will be based on the current rate. In addition, for sensitivity purposes only, both projects will be combined using the current rate. *A single discount rate is to be used for a single analysis, and using that for both the benefits, and the costs of a project (OMB Circular, 1992). That remains the convention in all economic analysis. The higher the discount rate, the less weight future benefits and costs*

receive in the economic analysis, and the less favorable the benefit-cost analysis for a project with a stream of impacts occurring as far into the future as 50 years.

The above comment recommends that the three above evaluations be done, which can perhaps be deemed as appropriate for sensitivity analysis. Using a single discount rate, and doing sensitivity analysis, are both definitely consistent with conventional economic guidance *(OMB Circular, 1992). No more than one discount rate may be used for a single evaluation under all conventional regulations for benefit-cost analysis. That is contrary to all economic guidance.*

Separate authorizations of a discount rate for the project are a legal issue, however, the use of more than one discount rate in a single evaluation of benefits and costs does not appear in any Federal guidance on benefit-cost analysis that the panel is familiar with.

The discount rate is currently a very controversial topic in economics. As noted above, some economists now believe that individuals have non-constant, declining discount rates over time. Many other economists currently recommend that a near- zero real discount rate be used for very long term projects, such as strategies to cope with climate change. The reason such economists offer for this is that society may indeed care about future generations as much as current ones. However, using a single discount rate equal to zero is still not federal policy (see OMB Circular, 1992). Any discount rate might be used in a sensitivity analysis (OMB Circular, 1992, p. 12).

Question 12:
Based on your opinion, what is the appropriate social discount rate that should be used to evaluate Federal projects, and why?

The panel's opinion on the appropriate social discount rate is to some extent irrelevant because the guidelines on the discount rate used to evaluate Federal projects remains clear. The key OMB Circular recommends that a different discount rate be used for real, versus nominal flows. Discount rates for analysis of a public investment differ from those used to evaluate a lease-purchase of cost-effectiveness analysis (Orszag, 2009).

Federal regulations recommend that the Office of Management and Budget provide the discount rate to be used for analysis (see Appendix B, OMB Circular, 1992). The OMB circular (p. 9) states that for public investments, "Constant-dollar benefit-cost analysis of proposed investments and regulations should report net present value and other outcomes determined using a real discount rate of 7 percent."

However, note that the OMB circular also recommends doing sensitivity analysis (p. 11). OMB states that "In general, sensitivity analysis should be considered for estimates of (i) benefits and costs; (ii) the discount rate…" (p. 12). If the legal team wishes to establish legally that the USACE is allowed to use 2.5% because of authorizations, then the panel recommends doing the entire analysis at the single alternative rate of 2.5%.

The USACE's own planning guidance document (Planning Guidance Notebook, ER 1105-2-100, April 22, 2000, page 2-11) states that "Present Values, at the base year of analysis, shall be calculated using the discount rate established annually for the formulation and

economic evaluation of plans for water and related land resources (published by HQUSACE as an Economic Guidance Memorandum)."

*Note that the USACE's document does not say discount rate**s** (plural), is says discount rate (singular), implying one be used. The USACE should make clear what the Economic Guidance memorandum published by HQUSACE currently states is the single rate to be used, and if this differs from the 7% rate recommended by OMB.*

The panel does not recommend mixing more than one discount rate within a single benefit-cost analysis. It the USACE wishes to do so, it needs to provide documented evidence of a regulation or authorized Federal principle or guideline that recommends this practice. The panel does not know of any.

Comment 13:
The farming survey may not be credible unless a large enough sample size is used, producing a smaller statistical error for the analysis and avoiding many possible sources of bias.
Significance – High:
Agricultural production decisions and behaviors after flood risks have been reduced must be convincingly identified or the project's main economic benefits cannot be calculated. Because this must be done before actual flood risk reductions are realized, a survey of farmers must be implemented to provide a convincing and credible analysis of these decisions and behaviors.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Mention the above details in the scoping the future NEPA document. 2. State that state-of-the-art survey or experimental design will be conducted when the time comes to research behaviors of farmers in the region.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response: The comment points out the shortcomings of relying on survey information. The Corps recognizes these shortcomings and plans to also employ other methods in addition to surveys. The main focus is to estimate how the area's farmers as a whole will respond to a reduction in flood risk. We currently plan to use GIS information of existing flood risk management practices and USDA Farm Services information to validate any survey information that is collected. However, due to the points brought out in this comment we may revisit the wisdom of using survey information. USACE is currently conducting public scoping in regards to NEPA. The above details will be discussed in the future NEPA document. **Question 13:** Should USACE utilize the survey or, given the IEPR comments, utilize secondary information sources? *Adequate funding certainly relates to obtaining credible experimental or survey information, and of course it is USACE's choice to pursue this. The key is to provide adequate evidence to support the key assumption of positive changes on profits from flood risk reduction. However, the panel has virtually little or no faith in the likelihood that secondary information can be used to validate the farmer's response to a reduction in flood risk. The best secondary information would come from exactly this scenario having happened already, perhaps somewhere else in the world. However, the panel is not familiar with any such situation that has occurred and where documentation of the behavior accompanying that situation has been established. Even if this has been done somewhere that the panel is not aware of, an additional requirement for sufficient evidence would be to demonstrate that such behavior in*

another area of the United States (or the world) will be exactly duplicated in the project region, by the local farmers. It would thus appear that the best approach would still be to plan for doing a very well-funded survey, or set of laboratory experiments to provide convincing evidence.

Comment 14:

The cumulative impact approach lacks specific information on how the conceptual matrix will be used to evaluate the incremental impacts of the proposed project or address the unique aspects of the study area.

Significance – High:

An accurate assessment of cumulative effects is essential to avoiding and minimizing adverse consequences, and to developing an adequate compensatory mitigation strategy.

Recommendations for Resolution:

To resolve these concerns, the future NEPA document should address the following:

1. Identify the specific methodology for using the proposed conceptual matrix to address the incremental impacts of the proposed project and the unique aspects of the study area.
2. Identify how the results and findings from this methodology will be used in the decision process for the proposed project.

Draft Evaluator Response in bold

Draft Panel BackCheck in italics

USACE response/Question 14a:

In the Handbook, "Considering Cumulative Effect under the National Environmental Policy Act" January 1997, the third method covered is matrices. We will have historical mapping of habitat and plan to develop a trend analysis (method 6). Other methods that will be investigated are Ecosystem Analysis (method 9) and Economic Impact Analysis (method 10).

It is true that matrices, trend analysis, ecosystem analysis, and economic impact analysis are all generic methods described in the 1997 CEQ handbook on CEA. As stated in our panel comment, these do not constitute methodologies with specific spatial and temporal boundaries, as well as thresholds of significance (e.g., capacity of the resources to accommodate stress).

Question 14b:

Please provide clarification if there is a preferred method that the panel recommends.

The panel prefers a method of ecosystem analysis since this method can best incorporate changes to ecosystem functioning that are critical to providing the ecological services and supporting the natural resources of concern. As stated above, this method needs to be developed in more detail by specifying the spatial and temporal boundaries, as well as thresholds of significance (e.g., capacity of the resources to accommodate stress). The panel recommends that spatial boundary include applicable areas within the lower Mississippi River Basin, such as the remaining batture areas and backwater areas located within adjacent states. The panel recommends that the temporal boundary include historical conditions when most of the floodplain in this region was connected to the Mississippi River.

Question 14c:
Even though the New Madrid Floodway is still connected to the Mississippi River floodplain what are the differences in areas resources (agriculture and other land cover) in terms of thresholds of significance-specifically differences between St. Johns Bayou Basin, the New Madrid Floodway, and other areas in the vicinity of Southeast Missouri?

The panel believes that the New Madrid Floodway is unique because, in context, it is the last remaining connection between the Mississippi River and its floodplain in the State of Missouri. Therefore, it plays a much larger role in providing natural floodplain services than the other areas. If the other originally connected areas had not been disconnected, the Floodway would be playing a proportionally smaller, and less important, role in maintaining the natural ecosystem. The loss of this last remaining connection and its ecosystem functioning would be the "straw that broke the camel's back" in terms of the total cumulative impact. That is, not all incremental impacts are equal and it is the impact that exceeds a threshold that is significant. In this case, the adverse impact of removing the last floodplain connection, once the other connections have already been removed, is disproportionally high.

Question 14d:
Are there any other unique aspects of the study area that have not been discussed during the Phase 2 IEPR process?

As stated above, the panel believes that this last remaining connection to the River is the unique aspect of the study area.

USACE response/Question 14e:
Results from the cumulative impact analysis as well as other project analysis will be used to document agency decisions.

Response noted.

Comment 15:
More precise contour data (i.e. greater than a 1-foot contour interval) are required to estimate wetland availability and mitigation for waterfowl and shorebirds.
Significance – High:
The use of a 1-foot contour interval to determine the availability of shallow water wetlands may lead to underestimating the existing resources and the requirements to replace habitat impacted by the proposed project.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should consider using mapping with a contour interval of 0.25 - 0.50 feet to estimate wetland loss and function and to mitigate estimated habitat losses.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response: Regarding the statement, "Furthermore, waterfowl require water depths less than 12-15 inches for foraging." This statement is incorrect. Optimal foraging depths vary considerably among waterfowl species. Obviously, species that are adapted to dive for food (i.e., Mergini, Aythyini, Oxyurini) can forage in water deeper than 12-15 inches (often up to 10+ feet deep) and some species, conversely, can forage on dry ground (e.g., *Anser, Branta*). Foraging depth also varies by type of food being consumed, habitat type, hydrological event, etc. For example, water depths (mean + SE) where mallards foraged during flood events in southeast Missouri were 48.6 + 6.3 cm during a February flood and 42.3 + 8.9 cm during a January flood (Heitmeyer 2006:105). Foraging depth also varied by habitat, for example water depth in shrub/scrub habitats was 42.6 + 9.4 cm compared to 31.2 + 4.6 in flooded bottomland hardwood forest. *It is the panel's understanding that the intent of the mitigation is to provide for habitat loss of dabbling ducks as stated in the Project Work Plan, thus water depth requirements for diving and sea ducks were not considered. Clearly dabbling ducks can utilize deeper habitat than the 30 cm historically recommended. But, if water levels are going to be greater the 30 cm in the mitigation wetlands, then again, the estimates of resources provided by those wetlands must be decreased because the benthic (where a large proportion of the resource are provided) will not be available. If the USAE now wishes to consider diving and seas ducks in their mitigation plan, more consideration to wetland diversity is needed.* **USACE response/Discussion Item**: During the shorebird model review, the model review panel stated that obtaining elevations less than 1-foot increments in a project area the size of the current project is impractical. Therefore, USACE proposes to interpolate elevations between one-foot contours. Further discussion regarding this recommendation is required during the teleconference.

Comment 16:
The list of significant resources is not complete because it does not include a discussion of the quality of the wetland resource, which is dependent upon the dynamic nature of the ecosystem's function and its connection to the river.
Significance – Medium:
Mitigation of proposed project impacts requires a complete list of site resources. To be complete, the list of resources should include the unique nature of the wetland ecosystem.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should add a discussion to the list of resources that clearly describes the unique nature of the wetlands in the project area, including the features that result from a dynamic water level and periodic flooding by the river.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response/Question 16a*:* Regarding the statement, "The project area includes the only significant remaining section of floodplain where Mississippi River backwater flooding still occurs." Concerning the Lower MAV, this is an incorrect statement. Furthermore, the project area connection is extremely altered. The area is entirely protected by levees with the exception of the 1,500-foot gap at the lower end of the Floodway. This gap has significantly changed the timing, depths, and durations of flood events from what could be considered normal/non-altered conditions. The entire Tennessee side of the Mississippi River floodplain from the confluence of the Old Bed of the Forked Deer and Mississippi rivers at the north Lauderdale County, Tennessee line south to Memphis does not have a mainstem, or frontline, levee and the Mississippi River overtops banks and floods portions of this over 40 mile stretch, covering several hundred thousand acres, annually. Additionally, there are ca. 64,000 acres of batture land are immediately adjacent to the 133,000 acre New Madrid Floodway. *The Panel's intent was to point out that connections with the Mississippi River are rare in the Project Area, not that there are no other areas with remaining connections in the entire River basin, and acknowledges that this was not sufficiently clear in the comment. Since similar areas are rare in the vicinity of the Project Area, their value is higher than if similar habitat was common, and the cumulative impact of loss of connected riverine wetlands is greater.* USACE acknowledges that river-floodplain connection provides wetland function. **Question 16b:** During the Phase 1 IEPR, the panel stated that shorebird habitat is provided by inundated habitat regardless to its source of water (backwater flooding, direct precipitation, groundwater, etc.). Is this still a true statement? *Shorebirds will use sparsely vegetated, shallowly flooded areas wherever the ecological conditions are sufficient to support populations of prey items. The Panel is not aware of any*

literature that would support a direct comparison between the shorebird habitat value of backwater flooded and direct precipitation flooded areas in the Mississippi Alluvial Valley, but would consider any information that USACE may be referring to here. In general, the Panel recommends that questions such as this be addressed with specific studies designed to compare existing conditions and potential with project conditions. General ecological principles suggest that areas subject to river flooding will have different nutrient dynamics and soil conditions than areas where such flooding does not occur, and these differences could result in differences between the resulting invertebrate communities when the areas are flooded.

Hydrologic connection alterations would be assessed by documenting impacts to fish spawning and rearing habitat (confined to the two year floodplain), waterfowl, shorebirds, and wetlands (river connected wetlands are defined as those that are within the five-year floodplain).

Question 16c:
Within the project area, which plays a greater role in providing habitat:
1) river connection or,
2) topography and local drainage?

As noted above, there are likely differences between the nutrient budgets and the resulting invertebrate communities between riverine wetlands and isolated wetlands which affect their value as habitat. It is not clear from the question what species are being referred to here, so the question is difficult to answer. Both types of wetlands could provide shorebird, fish, and waterfowl habitat if appropriate conditions exist, but the relative value depends on the specific conditions in each area, so a generalization about which type of wetland provides greater habitat is not possible without site specific data.

<u>USACE response continued:</u>
Although USACE concurs that the river connection is an important aspect to providing habitat on the floodplain, it appears that local drainage and topography may play a greater role. For example, areas that are frequently flooded (less than elevation 288-foot NGVD) are still mostly agricultural areas. These areas flood almost every year but water is quickly drained from these sites as the river elevation falls due to the extensive drainage system. However, areas that river connections are greatly altered or severed such as Big Oak Tree State Park and Bogle Woods are not farmed because they were likely too wet to clear and farm. These areas are found in the lowest elevations within historic Mississippi River meander belts. Hydrology in these areas is mostly influenced by local drainage and not the Mississippi River.

Question 16d:
What significant roles do wetlands that retain floodwaters after flood waters recede and or capture local rainfall/drainage provide to the floodplain?

Wetlands provide a wide range of functions within the floodplain. The Panel interprets this question as asking how riverine and isolated wetland functions differ. The flooding regime of wetlands is likely to affect nutrient budgets and vegetation patterns. Deeper and longer duration flooding is likely to reduce the amount of persistent vegetation, which can affect the

habitat value of the area for wildlife including shorebirds. In addition, the hydrology is likely to affect the nutrient budget, with riverine wetlands that have regular flooding likely to include additional nutrient inputs from river sedimentation.

USACE response/Question 16e:
The EIS will provide a discussion regarding river connection.

Comment noted.

Question 16f:
Specifically, what are the other resources that need to be discussed in the EIS.

The Panel recommends that USACE include a description of the dynamic nature of the hydroperiod of riverine wetlands as a resource of importance to the floodplain. Replacement of this habitat functions that result from this dynamic hydroperiod should be included in the mitigation plan.

Comment 17:
The water quality analysis in the Project Work Plan does not address water quality conditions in any of the study area water bodies and does not compare nutrient loads to the Mississippi River with and without project conditions.
Significance – Medium:
It will not be possible to draw any conclusions about whether water quality in both basins (St. Johns Bayou and New Madrid Floodway) will remain unchanged because the proposed analysis does not include investigations of local water quality in either basin under actual project conditions.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should address the following: 1. Conduct quantitative assessments of the impacts of the actual proposed project on waterbodies in the St. Johns Bayou and New Madrid Floodway. 2. Conduct a quantitative assessment of the nutrient loads from the project area to the Mississippi River under the actual proposed project.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response: <u>Recommendation 1</u>. Conduct quantitative assessments of the impacts of the actual proposed project on waterbodies in the St. Johns Bayou and New Madrid Floodway. **Question 17a:** Does this comment refer to lack of water quality data for waterbodies within the project area, if so, then a query will be conducted of agencies and academic institutions that would be sources of water quality data in the project area and the water quality assessment conducted in Ashby et al., 2000, will be updated with any new information. It is anticipated that information such as TMDLs in the project area will be identified and additional impact assessments can be made. *This comment does not refer to lack of water quality data for waterbodies within the project area, but to lack of analysis of the impacts of the actual proposed project on these waterbodies. The actual proposed project will change the hydrology of and nutrient mass loadings to these waterbodies and, in turn, these will impact water quality conditions within these waterbodies. This comment refers to the conduct of quantitative assessments of the relationships between altered hydrology and nutrient loadings, and water quality responses. The assessment conducted in Ashby et al. (2000) does not describe water quality responses within any waterbodies in the project area, but only the total amounts of nutrient mass transported or retained, nor does it include scenarios that represent the actual project.* <u>Recommendation 2</u>. Conduct a quantitative assessment of the nutrient loads from the project area to the Mississippi River under the actual proposed project. **USACE Response/Question17b**: Differences in relative load estimates will be used (similar to Ashby, et al, 2000) to compare project alternatives. Although these are not intended to represent actual loads since this

would require a long-term study outside the scope of this project. Mass balances will be calculated utilizing the values presented in the project Work Plan for all project alternatives to determine relative change to project alternatives, including mitigation.

As stated above, the panel believes that nutrient loads from the project area to the Mississippi River under current conditions (without project) should be compared to those with the actual proposed project. Differences in relative load estimates (similar to Ashby, et al. 2000) do not represent differences between current conditions and the actual proposed project.

Comment 18:

The validities of several assumptions for the future without project alternatives are questionable.

Significance – Medium:

The validity of the assumptions used to determine impacts for the without project alternative affects the completeness and understanding of the Project Work Plan and the justification of the project.

Recommendations for Resolution:

To resolve these concerns, the future NEPA document should address the potential for the Wetlands Reserve Program and the likelihood that the State of Missouri will restore hydrology to Big Oak Tree State Park.

Draft Evaluator Response in bold

Draft Panel BackCheck in italics

USACE response:
Since this project is authorized by Congress, abandonment of the project would require Congressional action to de-authorize it or the project would have to meet specific criteria that would automatically de-authorize it.

Based on preliminary numbers, there are a total of 4,526.8 acres of WRP easements in the project area (Kevin Dacey, NRCS, personal communication).

Year	# of easements	Acres
1995	2	2253.3
1998	5	338.6
2001	1	53.0
2003	2	606.1
2005	1	597.3
2006	1	95.1
2007	1	350.9
2010*	3	281.9

*applications not easements

These numbers will be confirmed in the EIS. Some of the existing WRP sites remain in agricultural production (see Phase 1 Consolidated EIS Appendix M page 341-343). Therefore, even if they have a WRP easement, it is appropriate to classify them as agricultural areas to determine appropriate value and function. Future WRP lands are difficult to estimate and likely have more to do with agricultural prices than whether or not the project is authorized. For example, there was not a dramatic increase in WRP enrollment after the Court decision. In fact, the greatest acreage enrolled occurred during the period when USACE was actively preparing for construction, including purchasing project related mitigation sites. Therefore, the panel's comment may not be correct. Regardless, the existing WRP lands found within the project area will be compared to areas outside the project area (including the batture area that remains subject to flooding) to determine if any changes to the future without project land use are necessary.

USACE response/Question18a:
Future WRP lands are difficult to estimate and likely have more to do with agricultural prices than whether or not the project is authorized. For example, there was not a dramatic increase in WRP enrollment after the Court decision. In fact, the greatest acreage enrolled occurred during the period when USACE was actively preparing for construction, including purchasing project related mitigation sites. Therefore, the panel's comment may not be correct. Regardless, the existing WRP lands found within the project area will be compared to areas outside the project area (including the batture area that remains subject to flooding) to determine if any changes to the future without project land use are necessary.

The panel agrees that agricultural prices might have the greatest influence on enrollment of WRP and that predicting the enrollment is difficult. The panel, however, also believes that lack of productivity on specific tracts of property due to an overabundance of soil moisture also plays a large role in determining WRP enrollment and still contends that the potential for this project has influenced WRP enrollment.

USACE response/Question18b:
It is appropriate to assume that existing drainage ditches will be maintained. As seen during the IEPR site visits made in August 2009, the St. Johns Levee and Drainage District has recently completed maintenance activities that involved channel cleanout on all of their ditches. The drainage district has easements to perform necessary channel maintenance regardless if the lands are enrolled in WRP or not.

The panel agrees that primary drainage ditches and channels will remain. If some of the properties were to be enrolled in WRP, however, hydrology would have to be restored so drainage ditches specific to those properties would have to be plugged.

USACE response/Question18c:
The State of Missouri's plan for Big Oak Tree State Park did not include a plan to restore the Mississippi River connection to the park, or increase the size of the park. It only provided funds to use an alternative to Mississippi River (ground water or a pump installed in St. James Bayou). As indicated in Phase 2 IEPR comment 16, "The river connection allows the exchange of nutrients between the wetland systems and the river, which is a unique aspect of riverine wetland function." Therefore, it is reasonable to assume that the connection of Big Oak Tree State Park to the Mississippi will not be restored without this project, or specific modification/authorization of the Mississippi River and Tributaries Project Nonetheless, the State of Missouri will be contacted to determine if they have a plan to restore the park independent of this project.

The assumption is "No plans with funding mechanism have been identified to restore Big Oak Tree State Park. Therefore, the observed progression from hydric vegetation to drier species will continue to occur." Although, the panel agrees that restoring hydrology by providing connectivity to the river would be the most appropriate approach, this is not what is specified in the assumption.

Comment 19:
The potential impact of global climate change on the proposed project and the conceptual mitigation plan should be acknowledged.
Significance – Medium:
Although highly uncertain, the potential effects of climate change have important consequences for the project and mitigation plans, and therefore an assessment of these effects is needed to support a complete evaluation as required by NEPA.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should, at a minimum, address the impacts of potential future climate impacts on the project and proposed mitigation plan on a qualitative basis.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
The comments provided will be used to expand the discussion of global climate change to the EIS. Preliminary analysis indicates that the authorized project would be extremely robust to any changes in future hydrology because pump operations and gate management can be modified as a result of any significant changes in precipitation/Mississippi River water levels. Moreover, the gate management/pump operation (i.e., operating rule curve) has the capability to be flexible and can be modified for environmental/habitat reasons as well.
Draft Panel Response #19
No response required.

Comment 20:
The gate closure and pump operation management alternatives proposed for St. Johns Bayou and New Madrid Floodway require further clarification.
Significance – Low:
For a successful project, it is important to maintain existing fish access and to create and maintain a spawning and rearing habitat in the floodways.
Recommendations for Resolution:
To resolve these concerns, the future NEPA document should include a more detailed description of how gate and pump management will: 1. Achieve project objectives for each of the alternatives (flood frequency elevations and/or inundated acres). 2. Provide fish access during appropriate river stage and water temperature periods.
Draft Evaluator Response in bold ***Draft Panel BackCheck in italics***
USACE response: Preliminary plans call for allowing the river to come up to a certain elevation and closing the gates to provide flood protection. Pumps would be used to evacuate interior drainage. Gates would normally be re-opened once the river recedes to allow for gravity drainage. A rapidly falling river in a highly drained project area will lead to the stranding and desiccation of eggs and larvae. Therefore, operating rules will consider multiple factors including flood damage reduction, maximizing periods when gates are open, and reduce ramping effects that could strand eggs and larvae. The EIS will analyze opportunities that would allow the river to come up to certain elevations but will hold water to create a spawning and rearing pool for fish as well as habitat for other resources (shorebirds, waterfowl, etc.). Although this action would prevent ingress of individual fish when gates are closed constant access is not required for successful spawning and rearing. The spawning and rearing pool will provide optimum habitat for those fish (individuals and species) that have already accessed the site during a rising hydrograph prior to gate closure. Re-opening the gates after successful spawning and rearing period and a gradual drawdown would allow adult fish that had previously accessed the site and young of the year to egress into the Mississippi River. The EIS will discuss the overall timing of gate operation and the events that would trigger holding water or releasing water such as time of the year, temperatures, dissolved oxygen concentrations, river forecasts, precipitation forecasts, etc. Opportunities will be explored that maximize the exchange of water (and fish) from the Mississippi River and the spawning and rearing pool. In addition to fish benefits, the EIS will analyze management opportunities for other significant resource categories provided by the spawning and rearing pool. **Question 20:** Please provide examples and operating criteria on how management of the spawning and rearing pool could be improved.

The Panel supports the integration of the listed environmental variables associated with fish access in the development of gate operations. In addition, the EIS should utilize the fish access studies being conducted to evaluate potential access restrictions for each of the spawning/rearing periods (early, mid, and late). For example, if late spawning species are unable to access the river due to gate closure then this component of the fish community would have different mitigation needs than early or mid season species that may involve gate operation changes and/or batture land mitigation.

Appendix C
Final Preliminary Evaluator Responses

for the

St. Johns Bayou and New Madrid Floodway, Missouri
Project Work Plan, Phase 2
Environmental, Economic, and Hydrologic and Hydraulic Review

Comment 1:
There are significant gaps regarding the application of the Shorebird Model, and the major concerns raised in the Phase 1 IEPR of the Consolidated NEPA Document have not been addressed.
USACE Final Preliminary Evaluator Response 1 **This comment is unresolved.**
Question 1a The project work plan states that the goal of mitigation is to compensate for unavoidable significant impact to the extent justified. Significance of impacts will be determined in the EIS. Although reforesting areas such as what is conducted in the WRP Program may show an impact to shorebirds according to the model because the area is no longer sparsely vegetated, restoring bottomland hardwoods will not be considered a significant impact that would require mitigation. Additionally, USACE does not consider a mitigation measure that restores bottomland hardwoods on farmland a significant impact to shorebird habitat because bottomland hardwoods better represent historical/unaltered conditions of the project area. Question 1b The comment and literature cited will be used to determine significance of project impacts in the EIS. Question 1c The comment and literature cited will be used to determine significance of project impacts in the EIS. Question 1d See response to Question 1a. Question 1e **This is unresolved**. What information would an additional round of peer review resolve that has not been resolved by this panel, or would not be resolved by subsequent IEPR review of this project (Phase 3 and Phase 4)?

Question 1f

Although the panel recommended expanding the period to 15 March to 15 June in the spring and 1 July to 30 October in the fall, after reviewing small and medium shorebird graphs for latitude 35-40 degree North, the recommended shorebird dates are 15 March to 30 May in spring and 1 July to 15 October in fall (Dan Twedt, personal communication).

Question 1g

This is unresolved. The alternate methodology provided the proposed HSI values. A separate HSI value will be proposed for Mud Flats. Please place a habitat value to the following sparsely vegetated shorebird habitat types found in the project area and provide justification:

1. Shallow Water (less than 4 inches)
2. Mud Flat (areas recently inundated during the preceding two days)
3. Deep Water (greater than 4 inches but less than 8 inches).

Question 1h

No response necessary.

Question 1i

This is unresolved. See Question 1g and 1e.

Response regarding moist soil management

Moist soil management remains one technique to compensate for potential impacts to shorebirds. Compensating for shorebird impacts by means of moist soil management may also provide additional benefits to other resource categories (wetlands, fish, waterfowl, etc.). Therefore, appropriate gains to these other resource categories will also be quantified. USACE understands the Panel's comments and will only take credit for other resource categories if it is appropriate.

Question 1k

The comment provides an accurate representation on likely mitigation. However, in a mitigation context, a smaller (acreage) managed area that provides optimal habitat could provide equal habitat to a larger (acreage) un-managed area that provides sub-optimal habitat.

See Question 1a regarding the goal of mitigation.

USACE will provide a conceptual management plan that describes duration of inundation, durations of exposed mudflats, and rotating management through all of the units. The site specific management plan would be developed as lands are purchased and site specific details are developed.

USACE does not agree with a 1:1 replacement of acreage. Conceptual mitigation will be based on unavoidable significant impacts to habitat, not on a certain number of acres. The number of acres needed will be determined during the EIS after impacts have been defined, and avoid and minimize measures explored.

The goal of mitigation is not to provide at least the same number of hectare-days of shallowly flooded habitat as occur on the project area under existing conditions. Mitigation is based on replacing significant impacted habitat that is defined as the difference between future with the recommended alternative and the future without the project, not existing hectare days that are flooded with no regard whether the flooded area is optimal or sub-optimal.

Question 1l

See response regarding moist soil management. Once conceptual management is determined during the EIS, benefits to waterfowl will be quantified by providing moist soil management to shorebirds if it is determined appropriate to do so.

For example, shorebird management will focus on providing shallowly flooded (less than 4 inches) and mud flat habitat during the spring migration. Portions of the shorebird migration coincide with the spring waterfowl migration. Obviously this management technique would provide habitat to both waterfowl and shorebirds. Additionally, management for shorebirds would likely entail flooding the sites prior to shorebird arrival. This pre-arrival time span also coincides with spring waterfowl migration. Therefore, it is appropriate to quantify benefits to waterfowl as well. Moreover, it may be practical to manage the sites in a similar fashion that MDC's Eagles Bluff Conservation Area manages their sites that would provide benefits to waterfowl, shorebirds, and fish. Mitigation benefits would be determined for each resource that management is intended to compensate.

Question 1m

This comment is unresolved. Please see response to Question 1l. The WAM has undergone a review by a panel of regional waterfowl experts as well as an independent panel during the model certification review. Please provide information that contradicts the existing peer review that the model has undergone that would support the panel's belief so USACE can make informed decisions.

Question 1n

Management of moist soil units is not known at this time because impacts have not been determined. **Therefore, this comment can not be resolved until the EIS is formulated**. The purpose of the Phase 2 IEPR is to ensure that the proposed USACE methodology is scientifically valid. Once formulated, the EIS will undergo additional reviews (*i.e.,* public, interagency, USACE review, IEPR)

Question 1o

Comment noted. However, the EIS needs to make an accurate prediction regarding waterfowl use of moist soil units to determine if the project is feasible. Therefore, expected

use of waterfowl in moist soil units will be quantified. Mitigation will be adjusted through adaptive management and monitoring.

Question 1p

See response to 1a regarding the mitigation goal. Although USACE believes that it would be a practical trade-off to replace spring habitat by providing fall habitat (that is the limiting factor regarding the overall shorebird population in the region), USACE acknowledges the panel's comment and will only intend to compensate for shorebird habitat by respective seasons.

Question 1q.

No response required.

Comment 2:
The Project Work Plan does not respond to the concerns raised during the Phase 1 IEPR regarding the method to analyze the project's impact on shorebird habitat.
USACE Final Preliminary Evaluator Response 2 **This comment is unresolved.**
Question 2a Based on the 13 and 17 May teleconferences, it is appropriate to interpolate elevations between the 1-foot increments. **The overall question still remains unresolved**: *Is the alternate methodology appropriate to use to determine the "value" of shorebird habitat, compare project alternatives, and determine appropriate mitigation?* Question 2b See response to Question 1e. How would an additional peer review be different from this peer review? USACE is interested in knowing the conclusions of this peer review prior to determining whether an additional review is warranted. Question 2c Comments noted. USACE will investigate the possible impacts to plovers on project area grasslands. Additional USACE Comments Based on the 13 and 17 May teleconference, proximity to other wetlands should not be an issue regarding suitable shorebird habitat nor should any incubation time for macroinvertebrates should be used. The assumption that any sparsely vegetated area that is inundated at appropriate depths provides shorebird habitat (optimal and sub-optimal).

Comment 3:

Information is not provided to support the importance of flood pulses (different from 2-year frequencies) in wetland ecosystems and for wetland-dependent organisms.

USACE Final Preliminary Evaluator Response 3

This comment remains unresolved

Recommendation 1

Flood pulses will be discussed in the EIS.

Question 3a

USACE concurs that an ecosystem that is only flooded, on average, once every other year and with a similar flood intensity each time, will not mimic the natural world. That is precisely one of the reasons why USACE is conducting a study to determine natural/historic conditions. The importance of a variety of flooding frequencies for waterfowl and bird use, for fish habitat and spawning, for introduction of plant and animal propagules, for movement of large-scale detritus (thereby forming new habitat structures for example), for scouring effects and export of large woody debris to the river, and so on played a critical role in the broad natural floodplain ecosystem. However, the role that these rarer flood events play on the existing floodplain may be largely absent or significantly reduced to what occurred historically due to the intense modifications for agricultural purposes.

Habitat provided for these less frequent floods are considered in the shorebird and waterfowl models. However, it was determined during the Phase 1 review that the two-year frequency was appropriate to limit fish habitat. Based on the 13 and 17 May teleconferences, this is no longer the case. **Therefore, this comment remains unresolved.**

> Please provide rational for the change of opinion regarding the concurrence of Phase 1 IEPR Comment/Response 6 and discussions during the 12 November teleconference related to distances fish will swim from the main channel to access spawning sites. In your response, consider the existing network of drainage ditches, many with flap gates that offer the primary means of dispersal for fish moving from the Mississippi River onto the floodplain and the predominance of agricultural lands at higher elevation on spawning preferences of fish.
>
> What flood frequency should be used as the upper limit to quantify habitat value to fish spawning and rearing habitat and why?

Question 3b

USACE will consider a wide variety of techniques including more imaginative solutions to restore ecosystems and welcomes any ideas that the panel, the interagency team, or the

public may formulate.

The comments regarding mitigation in the batture area is noted and the effects of groundwater connections are noted.

Comment 4:
A more complete discussion of fish access in St. Johns Bayou and New Madrid Floodway is needed, and the potential quantification of losses and potential mitigation due to access restrictions must be addressed.
USACE Final Preliminary Evaluator Response 4 **This comment remains unresolved**
<u>Recommendation 1</u> The telemetry study was designed to strategically monitor fish movement at all possible locations that a fish would travel in the two basins: one mile above St. Johns structure, immediately above St. Johns structure, immediately below St. Johns structure, approximately ¼ mile above the mouth of Mud Ditch as it flows into St. Johns Bayou, and at the mouth of St. Johns/Mud Ditch as it flows into the Mississippi River. <u>Question 4a</u> T**his comment is unresolved**. The goal of the telemetry study is to determine if fish can access the St. Johns Bayou basin through the gravity outlet culverts, not actively tracking fish to spawning and rearing habitat. Is the existing telemetry study suitable to make reasonable conclusions for the purpose of the EIS regarding fish access? For the purpose of the EIS, what additional data are required to make a determination on whether fish are moving through the St. Johns Bayou gravity outlet structure? For the purpose of the EIS, how can impacts to fish access be quantified? Although the additional study regarding tracking fish to spawning/rearing habitat sounds interesting and likely beyond the scope of this effort, it does not necessarily answer the question regarding fish access. See response to Question/Comment 5. <u>Question 4b</u> Comments noted, adaptive management and monitoring will be discussed in the EIS. <u>Question 4c</u> Comments noted, batture land is suitable for compensatory mitigation. In addition, based on the 13 and 17 May teleconferences, restoring hydrology to Big Oak Tree State Park as well as restoring a backwater connection to the St. Johns Bayou Basin is also suitable to compensate impacts to fish.

restricted.

In addition to batture land mitigation, restoring hydrology to Big Oak Tree State Park, as well as restoring a backwater connection to the St. Johns Bayou Basin, it is also suitable to compensate for impacts to fish on the floodplain by the methods discussed in the Project Work Plan (*e.g.,* borrow pits, floodplain lakes, reforestation, spawning and rearing pool, etc.).

Comment 5:

The fisheries methodology is not adequate to quantify actual spawning and rearing habitat based on Habitat Suitability Index (HSI) values.

USACE Final Preliminary Evaluator Response 5

This comment remains unresolved.

Question 5a

Based on the 13 and 17 May teleconferences, the panel agrees with the habitat ranking in the Project Work Plan. **This comment remains unresolved**. Please clarify why the panel does not support the habitat values provided in the Work Plan. USACE's justification for the habitat values are contained in the Work Plan.

> Based on discussions during the teleconference on 13 and 17 May, the panel is of the opinion that impacts should be assessed up to the five-year floodplain. However, habitat value (HSI value) above the two-year floodplain should be reduced for a variety of reasons such as distances fish will move away from the channel to find suitable mitigation sites, rising/falling hydrographs that strand fishes (both adults and larvae) making them susceptible to high predation rates, and the fact that over 90% of the land use in the 3-5 year floodplain is cultivated agricultural land. USACE is of the opinion that agricultural lands do not provide habitat value (HSI=0) beyond the two year floodplain and the HSI value of other habitats (e.g., BLH) would be sub-optimal for the reasons stated above compared to the two-year frequency.
>
> Do you agree with the opinion that agricultural lands do not provide habitat to fish above the two year floodplain, and how much should the value other habitat types (BLH and waterbodies) be reduced above the two year floodplain? Please keep in mind that EnviroFish already considers the frequency of flooding, so this question is directed towards HSI values.

Note: For clarification, the proposed HSI value for agricultural areas is 0.2 (see USACE Work Plan page 70), not 0.1 in the panel response.

Question 5b

Field studies to document differences among habitat types would be difficult and likely beyond the scope of this NEPA effort. Therefore, USACE proposes to utilize the HSI values found in the Work Plan. See Question 5a, please clarify why the panel does not support the habitat values provided in the Work Plan and would a Delphi Process be suitable in lieu of field investigations?

Question 5c

No comments required.

Question 5d

See Comment Response to Question 5a.

Question 5e

As stated in the Work Plan (page 71) HSI values have been developed that combine spawning and rearing into one life stage. These values evolved from numerous applications of the model in the lower Mississippi River Valley and were initially developed by consensus of an interagency team of biologists (e.g., Delphi technique, Crance 1987), supplemented by published field data on fish reproduction in floodplains (Baker et al., 1991; Hoover et al., 1995; Killgore and Baker, 1996; Hoover and Killgore, 1998), and best professional judgment.

USACE also proposes to conduct a Delphi process again with the interagency team, if determined necessary.

Based on the 13 and 17 May teleconferences, if the panel concurs that the Delphi Process is appropriate, why are the values presented in the work plan not acceptable?

> Please confirm the panel's position regarding the Delphi Process.
>
> Prior to the Delphi Process, what are the values the panel recommends tp the various land cover types (agriculture, fallow, bottomland hardwoods, and waterbodies) and why (see Question 5a)?
>
> Are the same values applicable to batture areas, or are different values recommended? If so, please provide recommended values and why?

Question 5f

No comments required.

Question 5g

As noted in the Work Plan, the HSI values are community based and not species specific. Regardless, USACE will quantify the benefits of agricultural areas to fish spawning and rearing habitat using Habitat Suitability Indices. In this regard, what is the appropriate HSI value for agricultural areas (see Question 5a)?

Recommendation 2

This comment remains unresolved. Please clarify - Should USACE utilize underlying land use HSI values for a spawning and rearing pool, or is a different HSI value

warranted and why? Please keep in mind that pooling water after the floods recede mimics a semi-permanent waterbody allowing larval fish to grow and survive at greater rates than if they were flushed back into the river prematurely. Consequently, the Corps considers this management action a justification to change the designation of underlying land use (e.g. agricultural land) to a semi-permanent waterbody.

Recommendation 3

No response required.

Comment 6:
The Waterfowl Assessment Method (WAM) appears to be appropriate; however, the parameter estimates for the model are based on fall migratory and wintering ducks and do not appear to consider spring migrants.
USACE Final Preliminary Evaluator Response 6 **This comment is not resolved.**
Based on discussions during the 13 and 17 May teleconference, the IEPR panel stated that they will provide additional documentation regarding the response so it can be forwarded to the WAM model developer. **Therefore, this comment is not resolved at this time**. However, the EIS will include a discussion whether or not the documentation submitted was used in any modifications, or if it was determined not to be applicable to the analysis. and Fredrickson 1996) or location (Gruenhagen and Fredrickson 1990). In fact, few deposition for many waterfowl begins in late winter including during flood events (e.g., Heitmeyer 1988, 2006) and is not confined to spring. The WAM clearly indicates how the DEE estimates for all waterfowl species using the Upper MAV were calculated. The actual estimate of 4x RMR is higher than earlier published estimates and it is acknowledged that the estimate may be conservative. However, until new validated information becomes available for DEE in the Upper MAV and SJNM, the WAM estimates represent the state-of-the-art understanding of DEE for the SJNM and are appropriate for the SJNM project analyses.

Comment 7:
It is unclear if the application of the Hydrogeomorphic (HGM) approach to evaluate project impacts and develop proposed mitigation will yield scientifically credible results.
USACE Final Preliminary Evaluator Response 7 **This comment remains unresolved.**
The panel's comments related to HGM "success" are noted. <u>Question 7a</u> USACE is not too far along in using the HGM technique on this project. This is one of the main objectives of the Phase 2 IPER process. USACE would like to know if the methodologies described in the Work Plan, including HGM, are a reasonable approach to support agency decisions. Although it sounds practical for USACE to take a "generous" mitigation ratio, the mitigation must be based on scientifically justified data. Likewise it would not be prudent for USACE to take a "generous" benefit regarding agricultural benefits of the project. <u>Question 7b</u> USACE is tasked with quantifying the existing wetland conditions, develop future without a project conditions, and compare a range of alternatives to determine potential impacts to wetlands. This requires a tool/mechanism that has the ability to classify wetlands in the project area, map wetland subclasses, and identify impacts. Based on past project analysis, USACE is of the opinion that the majority of wetland impacts will be partial in nature (i.e., wetlands will still retain jurisdictional status but due to hydrologic modifications will no longer be inundated as often or will change subclass). Therefore, an assessment tool needs the ability to capture these types of impacts. Based on the IEPR teleconference, there are no other readily available tools that have the ability to provide this information. **Therefore, to resolve this issue**, should USACE abandon the HGM approach for this project and base impacts/mitigation on the other resource categories (shorebirds, terrestrial wildlife, fisheries, and waterfowl)? <u>Question 7c</u> See response to 7a. <u>Question 7d</u> Comment noted.

Question 7e

Comment noted.

Comment 8:
There is an insufficient level of detail in the Project Work Plan to evaluate the validity of the proposed compensatory mitigation plan.
USACE Final Preliminary Evaluator Response 8 **This comment is unresolved.**
Question 8a See responses to comments 1 and 2. Question 8b The panel did not provide a response. However, based upon the response to Question 1p, it is not an appropriate trade off to provide fall habitat for spring impacts. Question 8c Comment noted. Question 8d The project work plan only describes the methodologies that will be used to describe impacts and formulate alternatives. Additional detail will be provided in the EIS. **This comment is unresolv**ed. USACE is not asking whether or not mitigation is adequate because this will be determined in the EIS. USACE is asking if the methodology described in the work plan is appropriate to base mitigation on to satisfy the requirements of NEPA and the Clean Water Act. Recommendation 2 See Question 8d.

Comment 9:
The adaptive management plan requires a detailed analysis of the ongoing mitigation management costs and a clear funding source adequate to support those activities.
USACE Final Preliminary Evaluator Response 9 <u>Question 9a</u> Comments noted. <u>Question 9b</u> Comments noted.

Comment 10:
The methodology to determine the extent of the wetlands in the project area requires further detail to determine if it is valid.
USACE Final Preliminary Evaluator Response 10 Comments noted.

Comment 11:
The assessment of economic impacts of the proposed project may not be valid because the method used to document the future with and without project conditions does not consider trends in real prices and costs.
USACE Final Preliminary Evaluator Response 11 **This comment is unresolved.** **This comment is not resolved**. During the 13 and 17 May teleconference the panel was asked to provide peer reviewed references addressing the panel's concern on increasing commodity prices. These articles have been received. Would using the agricultural prices in these articles in a sensitivity analysis address the panel's concerns outlined in the comment? It should be noted here that Current Normalized Prices will still be used in the project's sizing and optimization. However, the effects of the alternative prices will be shown in the sensitivity analysis to better inform the appropriate decision makers. Please clarify the last sentence in the Panel Response regarding changes in land use and economic benefits. The panel may have been referring to intensification benefits in this section since direct flood damage reduction benefits can still accrue on lands where the use does not change.

Comment 12:
The use of two discount rates for the same analysis is confusing and is not warranted in any conventional economic analysis.
Final USACE PRELIMINARY Response Comment 12 **This comment is unresolved.** During the 13 and 17 May teleconference, the panel noted that using more than one interest rate in the analysis can be confusing. Further the panel noted that the economic justification is highly dependent on the rate used. Corps guidelines are very specific regarding the interest rate used for project optimization. As discussed in the teleconference, there are two distinct authorizations for this project that warrant two distinct interest rates. It is currently planned to optimize the individual projects included in the overall EIS using their appropriate rate(s). It is also planned to present the selected alternatives using an array of interest rates in a sensitivity analysis as the panel suggests. Will utilizing three interest rates in the sensitivity analysis satisfy the panel's concern? The planned rates are 2.5%, current rate (4.375%), and 7%. If the above approach is not acceptable, does the panel recommend preparing two separate EIS documents for each of the two project authorizations (i.e., Mississippi River Levees Project and St. Johns Bayou and New Madrid Floodway Project) to satisfy the interest rate concern?

Comment 13:
The farming survey may not be credible unless a large enough sample size is used, producing a smaller statistical error for the analysis and avoiding many possible sources of bias.
Final USACE PRELIMINARY Response 13 **This comment is unresolved.**
Based on the 13 and 17 May teleconference, it appears that there was a basic miscommunication regarding the proposed process to estimate future with-project effects on farming practices and land use during the written comment/response process. During the teleconference the proposed process was discussed and clarified. The proposed process is to use present (existing) land use by flood zone as a proxy for with-project land use. For example, assume that present land use for the 5 year flood zone is 50% corn and 50% soybeans and the present 3 year flood zone land use is 100% soybeans. Under a potential scenario (with-project conditions) flooding will be reduced. Let's assume the existing 3 year flood zone now becomes the with-project 5 year flood zone. This will cause a change in land use from 100% soybeans to 50% corn and 50% soybeans for this particular flood frequency zone. This process can be further supported using surveys of the area's farmers regarding how they would react and change their farming practices in response to a reduction in flood risk if the panel feels that surveys will be valuable. Will the discussed changes satisfy the panel's concerns regarding future with-project farming practices and land use?

Comment 14:
The cumulative impact approach lacks specific information on how the conceptual matrix will be used to evaluate the incremental impacts of the proposed project or address the unique aspects of the study area.

USACE Final PRELIMINARY Response Comment 14

Question 14a:

Comments noted.

Question 14b:

Comments noted, USACE will further develop a method of ecosystem analysis as recommend by the panel including spatial and temporal boundaries. As previously stated, we currently have a contract to obtain historical mapping that will show pre-settlement conditions within the project area. Per conversations with our contactor, historic maps are being reviewed. The historical mapping will include the entire St. Johns Basin and the New Madrid Floodway as well as the adjacent batture areas.

Question 14c:

As pointed out in our draft response to comment #16, the project area connection is extremely altered. The area is entirely protected by levees with the exception of the 1,500-foot gap at the lower end of the Floodway. This gap has significantly changed the timing, depths, and durations of flood events from what could be considered normal/non-altered conditions. Simply stating that this is the last remaining connection between the Mississippi River and its floodplain in the State of Missouri does not provide an accurate assessment of current conditions.

The cumulative impact assessment will assess widescale drainage of the project area's historic bottomland hardwood ecosystem (previously occurred), the clearing of vast tracts of forested areas (previously occurred), leveling of farm fields (previously occurred), construction of private levees (previously occurred), closing off the St. Johns Bayou Basin (previously occurred), on-going Mississippi River Levee and Mississippi River and Tributaries construction (this project), and likely future projects. Previous work in the project area could have already "broken the camel's back". In fact, the panel stated that remaining wetlands in the project area were "sad". To reverse this trend, this project, with its conceptual mitigation, has the potential to restore significant habitat types that are no longer found in the project area and would likely never be replaced.

As discussed during the teleconference, we will look for opportunities to restore river connections and restore historic ecological communities. The cumulative assessment will include both the project's impacts as well as the benefits of compensatory mitigation to the entire floodplain ecosystem.

Question 14d:

Please see Panel Comment 16 regarding the "last remaining connection to the River". This is not the last remaining connection to the river.

Question 14e:

No response required.

Comment 15:
More precise contour data (i.e. greater than a 1-foot contour interval) are required to estimate wetland availability and mitigation for waterfowl and shorebirds.
USACE Final PRELIMINARY Response 15: Based on the 13and 17 May teleconferences, it is appropriate to interpolate elevations within the one-foot contours.

Comment 16:
The list of significant resources is not complete because it does not include a discussion of the quality of the wetland resource, which is dependent upon the dynamic nature of the ecosystem's function and its connection to the river.
USACE Final PRELIMINARY Response 16 <u>Question 16a</u> Comments noted. Likewise, cumulative benefits to Big Oak Tree State Park or other areas where river connections are restored would be greater. <u>Question 16b</u> Comments noted. <u>Question 16c</u> Comments noted. Based on discussions during the 13 and 17 May teleconferences, factors independent of backwater flooding appear to play a significant role in the remaining vegetated habitat found in the project area. <u>Question 16d</u> Comments noted. <u>Question 16e</u> No response required. <u>Question 16f</u> Comments noted.

Comment 17:
The water quality analysis in the Project Work Plan does not address water quality conditions in any of the study area water bodies and does not compare nutrient loads to the Mississippi River with and without project conditions.
USACE Final PRELIMINARY Response 17 <u>Question 17a</u> Based on discussions during the 13 and 17 May teleconference, USACE will conduct a qualitative water quality assessment to project area waterbodies for each project alternative and compensatory mitigation. <u>Question 17b</u> Comments noted. USACE will conduct the assessment with the future without project conditions and for each of the project alternatives including compensatory mitigation.

Comment 18:
The validities of several assumptions for the future without project alternatives are questionable.
USACE Final PRELIMINARY Response 18 **This comment remains unresolved.** <u>Question 18a</u> **Based on the 13 and 17 May teleconference a methodology that sufficiently predicts future without project conditions related to WRP is unresolved because the panel believes this project plays a role in WRP enrollment**. Please provide a methodology to estimate future WRP enrollment in the project area considering Comment 11 (Real price and cost changes may be a reality for agricultural producers in this and other regions of the United States). <u>Question 18b</u> Comments noted. Property specific drains may be modified under WRP; however, ditches that drain multiple fields would be maintained with routine maintenance. <u>Question 18c</u> Based on the 13 and 17 May teleconferences, USACE will defer to the State of Missouri regarding Big Oak Tree State Park. Additionally the assumption will be changed to clarify that restoration that involves the restoration of the Mississippi River connection as opposed to groundwater/surface water pumps.

Comment 19:
The potential impact of global climate change on the proposed project and the conceptual mitigation plan should be acknowledged.
USACE Final PRELIMINARY Response No response required.

Comment 20:
The gate closure and pump operation management alternatives proposed for St. Johns Bayou and New Madrid Floodway require further clarification.
USACE Final PRELIMINARY Response Comments noted.

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Appendix D
Final Evaluator Responses and Final BackCheck Responses

for the

St. Johns Bayou and New Madrid Floodway, Missouri
Project Work Plan, Phase 2
Environmental, Economic, and Hydrologic and Hydraulic Review

Comment 1:
There are significant gaps regarding the application of the Shorebird Model, and the major concerns raised in the Phase 1 IEPR of the Consolidated NEPA Document have not been addressed.
USACE Final Evaluator Response

Recommendation 1

Although the project area historically did not provide suitable shorebird habitat because it was a bottomland hardwood forest, the significant anthropogenic alterations (large-scale drainage and canals, laser leveling, forest clearing, and intense agricultural production) that have occurred result in providing suitable habitat for shorebirds. Therefore, to determine significant unavoidable impacts to shorebirds the following methodology is proposed: follows:

Study Objectives:

1. Develop a methodology to quantify the area of potential shorebird habitat relative to Mississippi River stage within the New Madrid Basin and relative to a synthetic derivation of river stage (i.e., headwater flooding or pooling) within the St. Johns Basin.
2. Estimate the area of potential shorebird habitat within the St. Johns and New Madrid Basins that is associated with each relevant 0.1 foot increment of Mississippi River stage.
3. Quantify the historical availability of shorebird habitat within the St. Johns and New Madrid Basins (based on Period of Record data for Mississippi River stage, estimated areas of potential shorebird habitat, and duration of inundation) during periods of northward and southward migration of shorebirds.
4. Predict future availability of shorebird habitat during periods of northward and southward migration of shorebirds within the St. Johns and New Madrid Basins based on presumed post-project simulations of Mississippi River stages upon completion of the St. Johns-New Madrid project.

Approach:

Available Data **-** The Memphis District Office of the U.S. Army Corps of Engineers will provide USGS Patuxent Wildlife Research Center with:

1. Period of Record data for Mississippi River stage from the gauging station associated with the New Madrid floodway, and
2. Digital (GIS) data for the project area within the St. Johns and New Madrid Basins depicting:
    1. The area of inundation associated with 1-foot river stages (i.e., 1-ft contour lines).
    2. Land cover classes.
        a. National Land Cover classes as amended by USACE field evaluations.
    3. LIDAR based elevations.
        a. Available only for a portion of the study area (New Madrid Basin).
    4. Bare earth digital terrain model (DTM) derived from LIDAR data.

a. Available only for a portion of the study area (New Madrid Basin).

Assumptions and Rationale –

1. The contour lines developed by USACE, Memphis District that are associated with 1-foot increments in Mississippi River stage, as recorded at the New Madrid gauge, provide a reasonably accurate representation of the floodwater extent associated with each of these river stages.

2. Use Geographic Information System (GIS) to derive interpolated elevations between 1-foot contour lines at <1-foot intervals (e.g., at 2 inch [5 cm], 4 inch [10 cm], or 0.1 foot [3 cm] intervals) so as to depict the theoretical distribution of floodwater extent associated with Mississippi River stages between the 1 foot river stages.

    a. Where possible, interpolation will be aided by LIDAR and DTM data. Elsewhere, interpolations will be based only on distance between contour lines.

    b. Although distance interpolation may be imprecise, the assumption is that variation in flood area is averaged thereby providing a reasonable approximation of the flooded area. Thus, this representation may not depict the exact geographic distribution of flooding but the total area inundated is presumed accurate.

3. Few shorebird species breed within the study area (Missouri Breeding Bird Atlas 1986 – 1992 <http://mdc.mo.gov/nathis/birds/birdatlas/index.htm>): only Killdeer commonly breed in the study area. Similarly, few individuals and species of shorebirds are found within the study area during winter. For example, during the past 2 decades, Christmas Bird Counts conducted at Big Oak Tree State Park [MOBO; a 15-mile diameter circle within the study area] detected only 5 species of shorebird, with only Killdeer, Common Snipe, and Least Sandpiper detected in more than 1 year. The greatest abundance and species diversity of shorebirds within the study area occur during spring and fall, as en-route migrant shorebirds make "rest and refueling" stops during their northbound (spring) and southbound (fall) passages (Elliott and McKnight 2000). Therefore, the period of interest for this assessment of habitat will be limited to 15 March – 30 May during spring and 15 July – 30 October during fall (Skagen et al. 1999). These two time intervals encompass nearly the entirety of shorebird passage through the study area (Fig. 2).

4. Review of shorebird abundances within the Mississippi Alluvial Valley (Table 1), suggest that small and medium size shorebirds represent the preponderance of shorebirds likely found in the St. John's and New Madrid Basins during migration.

5. Most of these small and medium size shorebirds forage primarily in water depths from 0 – 6 cm (Table 1). Even so, some of these shorebirds, and other less abundant shorebirds, also forage in exposed mudflat habitats and in floodwater of depth from 6-12 cm, with a few species foraging at greater water depth (Fig. 3, Table 1). More than 70% of shorebirds species require water depths <10 cm and many are restricted to water depths of <5 cm (Helmers 1992, Skagen et al. 1998, Dinsmore et al. 1999). Indeed, water depth (shallow being better) was the most important predictor of shorebird abundance within the Rainwater Basin (Webb et al. 2010).

    a. Because of preferential habitat use by shorebirds, I will assume that shallow flooded habitats (circa 0-6 cm) provide optimal foraging conditions. Habitats flooded to moderate depth (circa 6-16 cm), and mudflat habitats, are assumed to be used by shorebirds but are less than optimal habitats.

    b. Justification for optimizing shallowly flooded areas is based on observed shorebird abundances as reported to Lower Mississippi Valley Joint Venture Shorebird

Monitoring Program (http://www.lmvjv.org/shorebird/default.asp), Loesch et al. (1999), and Elliott and McKnight (2000). As further confirmation, in an assessment of foraging habitat use by 8 species in the Playa Lakes Region of Texas during spring, Davis (1996; Table 2.3) reported shallow (<4 cm depth) flooded habitats were used by 46% of foraging flocks whereas moderately flooded (4-16 cm depth) habitats were used by 29% of foraging flocks. Mudflats were used by 19% of foraging flocks but only 5% of flocks used habitats flooded deeper that 16 cm. Based on habitat used reported by Davis (1996):

i. Suitability of shallowly flooded (≤6 cm depth) habitat will be considered optimal habitat (HSI score = 1.0)

ii. Suitability of moderately flooded (6 - 16 cm depth) habitat will be considered 60% of optimal (HSI score = 0.6).

iii. Suitability of mudflat habitat will be considered 40% of optimal (HSI score = 0.4). Reduce suitability of mudflat is based on fewer species and individuals using these areas and anticipated heterogeneity of conditions within areas of presumed mudflat habitat. That is, due to mircro-topography and temporal variation in rates of evapo-transpiration within areas of presumed mudflat habitat, not all predicted mudflat habitat will likely be suitable as foraging habitat for shorebirds.

6. Shorebirds forage within a variety of substrates that range from bare ground to >75% vegetative cover, but most species use sites with sparse (<25%) vegetative cover (Dinsmore et al. 1999). Additionally, many species exhibit a preference for sites with vegetation height less than half of their body height. Davis (1996) reported 95% of foraging flocks used sites with <33% vegetation. Therefore, all landcover types assumed to have tall or dense vegetation (e.g., forest or shrubs) will be considered unsuitable for shorebirds. Conversely, I will assume that agricultural fields and grasslands constitute suitable shorebird habitat when appropriately flooded.

   a. During spring, cropped fields subject to flooding will likely not have been planted or only recently emerged. Flooding during fall is far less likely than during spring, but if floods occur, crops nearing maturity may remain in field. Even so, prolonged flooding during fall will likely lead to "lodging" of crops, resulting in relatively sparse vegetation within at least portions of mature crop fields that are flooded.

   b. Grassland vegetation may range from very short to relatively tall and rank. Grazed or hayed grasslands likely have vegetation structure during fall or spring that when flooded constitutes suitable habitat for shorebird foraging. On the other hand, the dense vegetation structure associated with conservation grasslands (e.g., CRP, or "set-aside" lands) likely restricts their suitability for shorebirds even when flooded. If conservation grasslands can be identified, these areas will be assumed to be of reduced suitability for shorebirds.

7. Because prolonged duration of flooding stimulates production of aquatic invertebrates within artificial wetland (i.e., impoundments) being managed for shorebird habitat, water is often retained for long periods (weeks or months). However, natural wetlands and rivers harbor myriad aquatic invertebrates upon which shorebirds forage. In addition, terrestrial insects and other invertebrates found in cultivated fields in the Mississippi Alluvial Valley provide food for shorebirds when these fields are flooded. Thus, flooded lands with sparse or short vegetation (e.g., agricultural fields or grazed grasslands) provide productive foraging sites for migrating shorebirds regardless of flood duration.

Methods:

The area of sparsely vegetated landcover (discounted by landcover type if warranted) between each interpolated flood contour will be summed. Using these area estimates as potentially suitable habitat, Period of Record river stage data will be used to evaluate the status of flood extent on each day within the shorebird migration periods. Based on interpolated flood contours (Fig. 3), a maximum flood extent will be associated with each 0.1 foot increment of Mississippi River stage (Table 2) [rounded up to nearest interpolated contour if rising river or rounded down if falling river stage] . This maximum extent represents the presumed water-land interface (i.e. flood depth = 0). The area between this leading edge and the interpolated contour presumed to represent flooding at or near 6 cm will be the optimal flood zone. Thus, the area of potential habitat within these contours will be summed to provide an estimate of realized optimally flooded habitat for each day. Similarly, the area between the interpolated contour presumed to represent 6 cm flood depth and that representing a presumed 16 cm flood depth will be summed to represent the realized sub-optimally (moderately) flooded habitat for each day.

During each daily evaluation, the river stage for each of the previous 2 days will be examined (Table 2). If the river stage during either of the previous 2 days was greater than on the day under consideration, mudflat habitat will be presumed to be present between the current river stage water-land interface and the maximum flood extent during the previous 2 day period. The area between the current water-land interface contour (0 depth) and the contour representing the maximum 2-day flood extent will be summed to represent the realized mudflat habitat for each day.

To estimate total daily shorebird habitat within the St. Johns and New Madrid Basins, for those areas with suitable vegetation structure (i.e., grasslands and croplands), I will combine the area of realized optimally flooded (circa 0-6 cm depth) habitat with the realized areas of mudflat habitat and deeper, sub-optimally flooded (circa 6-16 cm depth) habitat, after appropriately discounting the areas of mudflats and moderate flooding by multiplying by their respective HSI score. These summed estimates will provide the total area (ha) of shorebird habitat present during each day of the spring and fall migration periods. The area of daily realized shorebird habitat will be summed over the spring and fall migration periods to provide estimates of seasonal availability of shorebird habitat expressed in terms of total "ha-days" of shorebird habitat. Each ha-day of shorebird habitat represents 1 ha of sparsely vegetated habitat under optimal flood conditions for a period of 1 day. [However, as noted above, because areas in mudflats and more deeply flooded areas are considered sub-optimal habitats, the area of these habitats will be appropriately reduced relative to optimally flooded areas. Thus, >1 ha of each of these habitats will be required to achieve 1 ha-day of shorebird habitat.] Separate estimates of shorebird habitat availability will be made for each migration period and each year for which Mississippi River stage data are available.

Landscape Considerations - Proximity among wetlands has been deemed important for "resident" shorebirds (i.e., birds spending extended periods within a local landscape during breeding or while over-wintering [Taft and Haig 2006]). Similarly, during migration shorebirds are more likely to occur in areas with higher density of wetlands (Jorgensen et al. 2007). Webb et al. (2010) found shorebird abundance was positively associated with both wetland area and the number of wetlands within a 10-km^2 landscape. Based on these findings, I assume that more shorebirds are attracted to landscapes with increased area of floodwater. I will assess the area of floodwater extent (i.e., total area of floodwater) within the study area associated with each 1-foot river stage. "Attraction to habitat" will be assumed to be maximized if >10 km^2 (1000 ha) of floodwater (regardless of depth) are present within the study area. When <1000 flooded ha exist

within the study area, the daily area (ha) of shorebird habitat will be proportionally reduced. The degree of reduction has not yet been established, but will be based partially on the proportion of days within the study area with maximum "attraction to habitat" condition.

Future Predictions:

To provide an estimate of post-project shorebird habitat, U.S. Army Corps of Engineers will provide an estimate(s) of daily river stages that are likely to occur (or deemed possible to occur) under post-project conditions. These projected estimates of river stage will be substituted for historical river stage data. Thus, via simple substitution of river stage data, I will quantify future shorebird habitat using an identical method to historical shorebird habitat predictions.

Verification and validation:

A methodology for verification and validation of this assessment of shorebird habitat is provided below but verification and validation are beyond the scope of this study plan. Additional time and funding will be required to undertake model verification and validation.

Verification – Verification of the predictive ability of this assessment of shorebird habitat within the St. Johns and New Madrid Basins will be based on comparison of the area of predicted shorebird habitat with the area associated with the water-land interface identified on binary classified Landsat TM imagery. Satellite imagery of the study area with known date of origin, will be obtained from in-hand images within the archives of USACE, USFWS, and Ducks Unlimited. These images will be classified into a binary depiction of water versus land (non-water or dry). A linear contour will be established at all water-land interfaces. Interior (water-side) buffer distances will be generated from these linear contours that represent optimal (shallow) flooding and sub-optimal (moderate) flooding. Similarly, an exterior (land-side) buffer will be established (if appropriate for the date of the imagery as indicated by a falling river stage) at a distance representative of the maximum 2-day previous floodwater extent. The areas of presumed shorebird habitat (sparsely vegetated landcover classes) within these buffers will be extracted and quantified (with HSI appropriate reduction for moderate flooding and mudflat habitats). Correlation between the area of predicted shorebird habitat (as determined from the shorebird habitat assessment procedure described above) and that derived from satellite imagery will provide a measure of the reliability of habitat predictions associated with river stage data. Model verification based on ≥10 satellite images from different dates will likely be needed to provide reliable verification of predictions associated with different river stages.

Validation – Stage 1: For each day a TM image of the study area is available, the spatial depictions of predicted shorebird habitat associated with the appropriate, day-specific, river stage will be generated. This spatial representation will be compared with the area of presumed shorebird habitat associated with the water-land interface on TM images. Areas of estimated shorebird habitat that coincide or are in reasonable proximity (distance yet to be determined) between these 2 depictions of shorebird habitat will be assumed to be validated. The proportion of estimated shorebird habitat that is validated versus the proportion that is not validated provides an estimate of overall confidence in the validation. Model validation using ≥10 satellite images from different dates will likely be needed to provide a reliable validation for different river stages.

Stage 2: Field validation of the predictive ability of the shorebird assessment will require on the ground assessment of water depths and soil saturation. This validation should be based on a random selection of evaluation units (e.g., fields, ha, geographic coordinates) that can be sampled within the areas associated with predicted shorebird habitat

associated within each river stage. These random locations should be selected a priori and entered into a database or a global positioning unit. Thereafter, upon obtaining the 8 am river stage reading, field personnel would visit each random location and assess shorebird habitat at that location (e.g., measure water depth, soil saturation, distance to nearest water edge, etc.). The proportion of random locations where the estimated shorebird habitat was validated as present at or near the evaluation point versus the proportion of random locations that were not validated (i.e., no shorebird habitat at or near the location) will provide an estimate of overall validation of predicted shorebird habitat based on river stage data.

Notably, although the presence of shorebirds can and should be concurrently recorded during field validation, the validation is NOT dependent upon the shorebird use of the habitat – only that suitable habitat is present at (or within close proximity to) the validation location.

The alternate methodology stated above will undergo peer review.

Note: USACE does not consider measures that restore vegetation to an area, including compensatory mitigation measures, as a significant impact to shorebirds and therefore, does not intend to mitigate for shorebird impacts that the model may show by restoring bottomland hardwoods.

Recommendation 2

Moist soil units are proposed to compensate for shorebird impacts. The vast majority of impacts are likely to occur during the spring because this is the period that coincides with Mississippi River flooding. Managing for spring shorebird habitat likely compliments spring waterfowl. Therefore, waterfowl are likely going to utilize the moist soil units and USACE intends to take the appropriate credit. Nonetheless, the panel's comments are noted regarding the reduction of habitat value for waterfowl. During the formulation of the EIS and once impacts and mitigation are determined including management, the appropriate value for shorebirds and waterfowl will be determined that moist soil units provide.

Additionally, although fall habitat is likely the limiting factor for many shorebird species in the project area, USACE intends to follow the panel's recommendations and only compensate for impacts during the specific period (*i.e.,* spring or fall). Therefore, USACE will not provide fall habitat for shorebirds to compensate for spring impacts.

Recommendation 3

A conceptual management plan will be developed in the EIS once impacts are determined. A permanent management plan will be developed during the completion of the site specific mitigation plan.

Final Panel BackCheck Response 1
Non-concur: 1a – 1l
Concur with Comment: 1m

Question 1a. The USACE response states: "The project work plan states that the goal of mitigation is to compensate for unavoidable significant impact to the extent justified. Significance of impacts will be determined in the EIS."

The Panel understands that the specific impacts of the project cannot be determined precisely until the proposed design is finalized in the upcoming EIS. However, the Panel believes that the loss of large areas of seasonally flooded, sparsely vegetated habitats for shorebirds are a significant impact of the proposed project, and that USACE should clearly state in the Work Plan its intention to fully mitigate for the specific impacts to shorebird habitats that will be determined during the EIS analyses. The Panel will concur if USACE states its intent to fully mitigate for impacts to shorebird habitats.

Question 1a, continued. The USACE response states: "Additionally, USACE does not consider a mitigation measure that restores bottomland hardwoods on farmland a significant impact to shorebird habitat because bottomland hardwoods better represent historical/unaltered conditions of the project area." The response reiterates this point on page 19 where it states that: "Note: USACE does not consider measures that restore vegetation to an area, including compensatory mitigation measures, as a significant impact to shorebirds and therefore, does not intend to mitigate for shorebird impacts that the model may show by restoring bottomland hardwoods."

The Panel understands that the project area is highly modified from its historic conditions. These conditions notwithstanding, the goal of the mitigation plan is to compensate for losses in ecological function measured by comparing current without- project conditions to future with-project conditions. Importantly, this mitigation becomes part of the project and, therefore, all wildlife habitat losses that would result from the project, including those directly attributable to mitigation activities for other resource types, should be mitigated. The Panel will concur if USACE states that all wildlife habitat impacts, including those resulting from mitigation of other project impacts, will be mitigated.

Question 1e. The USACE response states: "**This is unresolved**. What information would an additional round of peer review resolve that has not been resolved by this panel, or would not be resolved by subsequent IEPR review of this project (Phase 3 and Phase 4)?"

The Panel has explained its rationale for requesting peer review on all major models to be used to measure habitat impacts and determine mitigation requirements. USACE apparently accepted this rationale, and states in the second to last line under Recommendation 1, on p. 19, that "The alternate methodology stated above will undergo peer review." If USACE intends to conduct a peer review on the alternate methodology, then it is unclear to the panel why this issue is listed as unresolved. The Panel will concur if USACE states that the shorebird habitat model will undergo peer review.

Question 1f
The USACE response states: "Although the panel recommended expanding the period to 15 March to 15 June in the spring and 1 July to 30 October in the fall, after reviewing small and medium shorebird graphs for latitude 35-40 degree North, the recommended shorebird dates are

15 March to 30 May in spring and 1 July to 15 October in fall (Dan Twedt, personal communication)."

The Panel recommends using the entire period of shorebird migration to calculate impacts to shorebirds, as proposed earlier. Because the comment says only what dates USACE recommends, it is not clear what rationale was applied to remove portions of the migration window when shorebirds are present in the study area. The Panel recommends the conservative rationale of calculating impacts to shorebird habitats during the entire periods when migrating shorebirds are present in the study area. Skagen et al. (1999, p. 17, 31, 33) supports shorebirds being present during spring migration through June 15th for both small shorebirds and all shorebirds, and supports shorebirds being present during fall migration through October 30th for all small, all medium, and all shorebirds. Particularly because migration phenology may change in response to climate change on the arctic breeding grounds, the panel recommends using the entire migration window to calculate impacts to shorebird habitats. The panel will concur if USACE uses the recommended migration windows to calculate shorebird habitat impacts.

Question 1g. The USACE response states: "**This is unresolved**. The alternate methodology provided the proposed HSI values. A separate HSI value will be proposed for Mud Flats. Please place a habitat value to the following sparsely vegetated shorebird habitat types found in the project area and provide justification:"

The Panel believes that the development of HSI values and other specifics related to model parameterization are beyond the scope of its review. The Panel believes its role is to comment on the process used to generate models and their output, the results of the peer review of those models, and their application. The Panel will review the models, parameter values, and application of the models during the next phase of the project, but cannot generate the model or parameter values to be used in the limited time available for working on this process. The Panel believes that the recommended peer review will resolve this issue.

Question 1k. The USACE response states in the last line of the response to this question, on page 9, that "The goal of mitigation is not to provide at least the same number of hectare-days of shallowly flooded habitat as occur on the project area under existing conditions. Mitigation is based on replacing significant impacted habitat that is defined as the difference between future with the recommended alternative and the future without the project, not existing hectare days that are flooded with no regard whether the flooded area is optimal or sub-optimal."

The Panel agrees that it is appropriate to consider the relative value of habitat types in currently existing conditions, and discount acreage affected by the project according to its relative value. This is the basis of the HSI approach. However, the Panel also believes that it is appropriate to compensate for all of the impacts to existing habitats, using the appropriate HSI value as a discounting factor. The Panel has always supported measuring the relative value of different habitat types, and is unclear why this is being raised as an issue at this point, but also continues to believe that the total impacted area, with appropriate discounting for habitat value, should be compensated for in a mitigation plan that replaces lost ecological function.

One significant issue relates to the value of a slow drawdown over time for shorebird habitat. Although some areas may be flooded to a depth that shorebirds do not use when deeply flooded, over time as flood waters recede, those areas will be exposed, and will become optimal foraging habitat while they are shallowly flooded or recently exposed. This is important when assigning habitat values as proposed in the alternate methodology, for example under section 5b, where different water depths are given different HSI values. The calculation of impacts now appears to

include all areas of shallowly flooded and sparsely vegetated habitat that would be flooded under current conditions but then exposed during the migration window, as the panel recommended. The Panel concurs with the approach outlined in the alternate methodology (Methods, p. 16), where total daily hectares of habitat are rated with respect to their habitat value, and then summed across the migration window. If USACE intends to include all appropriate shorebird habitats in its calculation of impacts, and assign them appropriate habitat values when they are exposed by drawdown during the migration window as outlined in the alternate methodology, the panel concurs with this general approach. The Panel still recommends that the alternate methodology be fully developed in a model document with all equations and parameter values specified, and subjected to peer review.

Question 1m

Concur

In theory, productivity levels used in the parameters of the WAM model can be reached, however, in practice, this rarely happens across large spatially divers areas (e.g., Kross et al. 2008). Equipment fails, levies break or leak, water control structures get clogged, etc., delaying or preventing flooding and draw-downs. If these problems occur, they will no doubt impact the ability of the moist soil units to produce foods for waterfowl. USACE has indicated they will monitor waterfowl food productivity on mitigation wetlands with an adaptive management approach to ensure mitigation wetlands produce food at levels assumed by the model. This approach appears to be an appropriate way to ensure waterfowl are properly mitigated. The Panel is concerned, however, this approach of additional mitigation after the completion of the project, during the adaptive management phase will lead to an artificially decrease in the cost of the project. The Panel believes the estimate of 556 kg/ha of seed production suggested by Kross et al. (2008) as an estimate for planning purposes represents a more realistic value for managed moist soil habitat and would be more appropriate for estimating project costs. Based on the September 8, 2010 conference call, USACE has agreed to use 556kg/ha as an estimate of seed production for managed moist soil habitat for planning purposes.

Kross, J., R.M. Kaminski, K.J. Reinecke, E.J. Penny and A.T. Pearse. 2008. Moist-soil seed abundance in managed wetlands in the Mississippi Alluvial Valley. Journal of Wildlife Management 72:707-714.

Comment 2:
The Project Work Plan does not respond to the concerns raised during the Phase 1 IEPR regarding the method to analyze the project's impact on shorebird habitat.
USACE Final Evaluator Response 2
<u>Recommendation 1</u> The alternate methodology described in Comment 1 will undergo peer review. <u>Recommendation 2</u> See Comment 1 – Alternate Methodology <u>Recommendation 3</u> See Comment 1 – Alternate Methodology.
Final Panel BackCheck Response 2
Concur with comment. The Panel believes that the methodology outlined proposes appropriate scientifically defensible methods to describe existing shorebird habitats that may be impacted by proposed project alternatives. However, the Panel also believes that the methodology needs to be fully developed in a proposed model document as was done with all of the other models, including specification of parameter values and how calculations are to be carried out, and then subjected to peer review. If USACE plans to fully develop this model and conduct a peer review, the Panel concurs with this approach.

Comment 3:
Information is not provided to support the importance of flood pulses (different from 2-year frequencies) in wetland ecosystems and for wetland-dependent organisms.
USACE Final Evaluator Response 3
Recommendation 1 The Corps recognizes the importance of the flood pulse concept, originally proposed by Junk et al., and has incorporated the importance of pulsed hydrographs in the project. For example, Big Oak Tree State Park will be a critical component of the project. Daily stage elevations reflect pulses in the hydrograph. In fact the EnviroFish review (Battelle, 2010) stated: > "It is based on habitat suitability theory, which has a long history, and EnviroFish appropriately accommodates the systems theory ideas that evaluation of fish reproduction involves the explicit linkage between the river and its associated floodplain (I.e., the Flood Pulse Concept, Junk et al. 1989)." Additional information on the flood pulse concept will be included in future NEPA documentation. Recommendation 2 As stated in the project work plan, impacts to waterfowl and shorebirds are not dependent on a particular flood frequency. Although the definition of a riverine wetland is dependent on it being located within the 5-year floodplain, wetlands are being assessed within the entire project area. For wetland discussions, see response to comment 10. With the exception of the batture land, it is reasonable to state that there is no natural habitat that remains in either the St. Johns Basin or the New Madrid Floodway. The St. Johns Bayou Basin is no longer connected to the Mississippi River (management of the gates do not allow for Mississippi River water to back up into the basin). All hydrologic influences are due to the fact that closing the gates artificially traps rainwater in the basin. With the exception of the 1,500-foot gap the entire New Madrid Floodway is protected by levees. Hydrologic regimes are extremely modified as a result of travelling through an un-natural 1,500-foot gap. All natural watercourses have been replaced with unnatural channelized drainage ditches, new ditches have been dug in areas to drain natural depressions, and water control structures are found throughout the project area. Landscapes have been leveled and farm drains are prevalent in virtually every agricultural field. Even Big Oak Tree State Park, which is arguably the best remaining habitat found within the project area and possibly the region, no longer can be considered natural given the present trend in the park's vegetation due to its altered hydrologic regime. USACE concurs that an ecosystem that is only flooded, on average, once every other year and with a similar flood intensity each time, will not mimic the natural world. That is precisely one of the reasons why USACE is conducting a study to determine natural/historic conditions. The importance of a variety of flooding frequencies for waterfowl and bird use, for fish habitat and spawning, for introduction of plant and animal propagules, for movement of large-scale detritus (thereby forming new habitat structures for example), for scouring effects and export of large

woody debris to the river, and so on played a critical role in the broad natural floodplain ecosystem. However, the role that these rarer flood events play on the existing floodplain in the project area may be largely absent or significantly reduced to what occurred historically due to the intense modifications for agricultural purposes.

Habitat provided for these less frequent floods are considered in the shorebird and waterfowl models. Although the Phase 1 review concluded that the two-year frequency was appropriate to limit fish habitat to, this has been expanded to the 5-year frequency based on subsequent conference calls and the panel's recommendation. The independent panel stated that the five year flood frequency is the appropriate upper limit to for the fish model utilized to determine impacts and quantify mitigation. The following revisions have been made to the spawning and rearing assessment as it relates to fish and flood frequencies.

The boundaries for the functional floodplain available for spawning and rearing habitat will be confined to the 5-year flood frequency due the reasons previously stated regarding the use of the two-year floodplain. The EnviroFish Manual states the following in regard to the two year flood frequency.

- Most fish species reach sexual maturity by age 1 or 2 indicating that a 2-year flood is necessary to maintain reproductive populations. 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 in species with short life spans.[1] Larger-sized species can live up to 10 years, and in riverine floodplains, experience high and low stages on an annual basis. The more extreme hydrologic events may result in higher fish abundance, but do not represent flooding regimes that maintain baseline population levels of long-lived species over the life of most projects (i.e., 50 year project life).

- In agricultural landscapes, floods greater than a 2-year frequency typically inundates cleared lands mostly unsuitable as reproductive habitat for two reasons. First, the floodplain closest to the river provides immediate access to reproductive fishes undergoing spawning migrations. Fish may have to travel miles from the mainstem river to reach lands corresponding to a 3-year or greater flood frequency. Second, even if adults do move great distances to spawn, eggs deposited in cleared lands far removed from the mainstem river have a greater risk of becoming trapped in isolated pools during receding stage elevations.

Therefore, by expanding the analysis to the 5-year flood frequency results in a conservative estimate regarding fish spawning and rearing habitat.

Based on the panel recommendations, fishery analysis will be split into two different zones regarding flood frequencies. Zone 1 will be within the two-year flood frequency. Analysis will be conducted as previously described in the Project Work Plan for fallow, bottomland hardwoods, and waterbodies. Habitat value will be quantified in these particular land cover types as long as they are inundated (no depth requirement) for at least one day. Spawning criteria (*i.e.,* water depth is ≥1.0 ft with duration of at least 8 days) will be applied to agricultural areas in Zone 1 to

[1] Although this text is provided in the EnviroFish Manual the following is provided for further clarification. Many small-sized in the Mississippi River only live 2-3 years and may only reproduce once during their life cycle. Therefore floods with a greater magnitude than the 2-year event (*i.e.,* flood frequency less than two years) such as the 10-year flood may result in successive reproductive failures.

quantify spawning and rearing habitat. The justification for this is due to mortality and stranding factors on agricultural areas. Agricultural areas provide sub-optimal habitat and quickly drain as Mississippi River stages fall due to the vast network of drainage ditches and structures. Therefore, agricultural areas need to be inundated for 8-day duration to be suitable spawning and rearing habitat.

Zone 2 (*i.e.,* areas that fall between the two-year and five-year frequencies) analysis will only be confined to "optimal habitat" (*i.e.,* waterbodies and bottomland hardwoods). Sub-optimum habitat (*i.e.,* fallow and agricultural areas will be excluded from the analysis) will be excluded from the analysis. The justification for this is fish are less likely to use the sub-optimal areas at greater distances from the river due to mortality factors and stranding issues. However, this is not the case in "optimal" areas.

An additional independent review conducted by the EnviroFish Model developers also shared the same views regarding optimal and sub-optimal habitat. Battelle (2010) stated the following:

> …In reality, a small area of high-quality habitat is likely to outperform a large number of low-quality habitat areas, even if they both have equal HU values. This assumption allows the potential for rationally choosing a project alternative that provides a lot of corn field stubble and not bottomland hardwood forest over one where bottomland hardwood forest is present in moderate amounts. This assumption precludes the model from an organizing the output to maximize the highest quality habitat type.
>
> …EnviroFish should not allow the opportunity to increase lots of acreage of really poor habitat for an alternative or future situation without regard for the absolute acreage of very high quality habitat. It might be more appropriate to calculate total Hus using only habitats with HSIs greater than soime minimum value, for example 0.4. The planning decisions would be based on changes from what is known to be fair/good habitat to other fair/good habitat because the value of Hus would be much more comparable. Other avenues to correct for very poor or very good habitat (e.g., weighting) should also be considered.

Therefore, USACE is of the opinion that calculating HUs on optimal habitat only in Zone 2 is appropriate and sub-optimal habitat (*i.e.,* agricultural and fallow areas) would not be considered.

Final Panel BackChecks Response 3

Concur with comment.

Recommendation 1: No additional comment.

Recommendation 2: Although the Panel agrees that both the St. Johns Basin and New Madrid Floodway are altered ecosystems due to a variety of anthropogenic impacts, wetland ecosystem function still exists and provides habitat for diverse plant and animal communities. In addition, annual variability in flood events, although altered from "natural" conditions, helps maintain ecosystem function in the remaining wetlands of the St. Johns Basin and New Madrid Floodway.

Comment 4:
A more complete discussion of fish access in St. Johns Bayou and New Madrid Floodway is needed, and the potential quantification of losses and potential mitigation due to access restrictions must be addressed.
USACE Final Evaluator Response 4
Recommendation 1 The Corps has actively studied fish passage through the St. Johns structure for two years. During the first year, we tagged over 1500 fish encompassing 38 different species both upstream and downstream of the structure. Although we did re-capture multiple individuals, none that were captured were located on the opposite side of the structure from the tagged location. Therefore, in Year 2 of the study, we implemented a sonic telemetry study. Remote receivers were placed in the channel at five locations: one mile above the structure in St. Johns Bayou, immediately above the structure, immediately below the structure, Mud Ditch near the site of the proposed New Madrid levee closing (within the New Madrid Floodway), and near the mouth of Mud Ditch/St. Johns where it flows into the Mississippi River. Fish are being captured using various collecting gears, internal sonic transmitters are surgically implanted, and all fish are released where Mud Ditch and St. Johns intersect. Therefore, fish have the choice to go through the structure into St. Johns Bayou, up into Mud Ditch in the New Madrid Basin, or leave the system into the Mississippi River. To date, almost 80 fish representing multiple species that spawn or rear in the basins, have been implanted with transmitters. Fish are being incrementally tagged to evaluate rising and falling stages through the reproductive season. Fish passage through the structure has been documented with telemetry, but data are still being collected and analyzed The telemetry study was designed to strategically monitor fish movement at all possible locations that a fish would travel in the two basins: one mile above St. Johns structure, immediately above St. Johns structure, immediately below St. Johns structure, approximately ¼ mile above the mouth of Mud Ditch as it flows into St. Johns Bayou, and at the mouth of St. Johns/Mud Ditch as it flows into the Mississippi River. Results from the study and gate operating rule curves developed for the EIS will be used to determine if access is restricted for early, mid, or late spawning species. Project monitoring will be conducted to determine if access is limited and if fish are utilizing established mitigation sites. Based on panel recommendations, the project will be adaptively managed and mitigation will be adjusted in the event that access is impacted. Recommendation 2 The telemetry study is designed to evaluate influence of seasonal parameters on fish passage. Fish are being tagged at different water temperatures, river stages, and months. The remote receivers provide a constant monitoring capability throughout the reproductive season. The Corps will use information collected at St. Johns structure to develop operating rules for the New Madrid structure to maximize fish passage opportunities. The Corps can determine the percentage of fish passing through the structure compared to those moving up Mud Ditch or downstream into the Mississippi River. Mitigation for the New Madrid structure will be based partly on the results of the telemetry study, as well as consideration of operating rules.

On-going research appears to indicate fish are passing through the structure on St. Johns Bayou (from interior to the exterior, and vice versa). This research will continue to be conducted throughout the reproductive season.

There are opportunities to increase fish access in the St. Johns Bayou basin by keeping the gates open longer during rising river conditions because the pumps would offer assurances that would prevent economic damages. Additionally, fish access is being considered in the Big Oak Tree State Park hydrologic restoration plan. Both of these measures have the potential to significantly increase fish access to areas where it is extremely limited or does not occur.

Although the Fish and Wildlife Service has repeatedly indicated that batture land mitigation is not suitable to mitigate for project impacts because it does not provide habitat (in-kind) that is similar to that found in the Floodway, based on teleconferences with the panel, the panel stated that batture land would be suitable for mitigation.

Compensatory mitigation sites as well as fish access in newly constructed culverts will be monitored and adaptively managed. Overall mitigation needs would be adjusted in the event that project monitoring determines that access has been significantly restricted.

In addition to batture land mitigation, restoring hydrology to Big Oak Tree State Park, as well as restoring a backwater connection to the St. Johns Bayou Basin, it is also suitable to compensate for impacts to fish on the floodplain by the methods discussed in the Project Work Plan (*e.g.,* borrow pits, floodplain lakes, reforestation, spawning and rearing pool, etc.).

Final Panel BackCheck Response 4

Concur with comment.

Recommendation 1: No additional comment.

Recommendation 2: Concur with comment.
"Although the Fish and Wildlife Service has repeatedly indicated that batture land mitigation is not suitable to mitigate for project impacts because it does not provide habitat (in-kind) that is similar to that found in the floodway, based on teleconferences with the Panel, the Panel stated that batture land would be suitable for mitigation."

This statement from USACE response pertains primarily to the Panel's opinion for mitigation that may be needed due to loss from fish access restrictions. The Panel supports "within" floodway mitigation as the primary location for losses from the project as calculated through the use of Enviro-Fish. However, the Panel does support batture land mitigation as a secondary alternative.

Comment 5:
The fisheries methodology is not adequate to quantify actual spawning and rearing habitat based on Habitat Suitability Index (HSI) values.
USACE Final Evaluator Response Comment 5
Recommendation 1 Compensatory mitigation can occur from converting habitat to a higher HSI value such as conversion of agricultural land to fallow, increasing duration of flooding (increases ADFA), or both. Mitigation measures that compensate for spawning and rearing impacts to inundated floodplain habitat will likely recommend measures that maximize HSI values such as borrow pit creation and bottomland hardwoods restoration. Long-term field studies may not necessarily answer key questions and cause-effect mechanisms required to fully evaluate impacts and mitigation of flood control in large basins. The Corps needs a methodology that incorporates all of the various scenarios, both biologically and structurally, to evaluate large-scale projects. It should be noted that the Corps did fund Dr. Bob Sheehan (Southern Illinois University) to conduct a field study of spring-time fish distribution in the New Madrid and St. Johns Basins in the early 2000s. Although larval fish were not collected, this study identified those species found in the project area, and these data in turn were used to develop the habitat guild for species selection in the Habitat Evaluation Procedure. Preferences of spawning and rearing fishes to specific land use categories (i.e., HSI values) were based on field studies in the lower Mississippi River basin and professional opinion. Based on the 13 and 17 May teleconferences, the panel agrees with the habitat ranking in the Project Work Plan. USACE's justification for the habitat values are contained in the Work Plan. Based on teleconferences with the panel, the panel supports a Delphi Process to establish HSI values since existing data in the Lower Mississippi River Valley is limited. Therefore, USACE intends to conduct the Delphi Process with the interagency team with the values stated in the Work Plan serving as a "starting point". Based on the panel recommendations made during teleconferences, USACE will monitor mitigation sites to test/validate the HSI values utilized in the impact analysis. The project will be adaptively managed and compensatory mitigation will be adjusted in the event that monitoring reveals a need. Based on discussions during the teleconference on 13 and 17 May, the panel is of the opinion that impacts should be assessed up to the five-year floodplain (see Comment 3). However, only "optimal habitat" would be assessed in the 3-5 year floodplain and agricultural areas within the two-year floodplain would be limited to those areas that meet a minimum duration standard (*i.e.,* 8 days). Note: For clarification, the proposed HSI value for agricultural areas is 0.2 (see USACE Work Plan page 70), not 0.1 in the panel response. Recommendation 2 By pooling water with the control structure, acres of habitat remain relatively constant. The

primary purpose of managing water levels is to maximize duration and habitat quality of the waterbody. Therefore, USACE assumes that the habitat value remains constant during the time the pool is maintained. The panel comments suggest that habitat value is constantly changing during this period and therefore, it is not appropriate to utilize a different HSI value. However, the panel did state that habitat units will still increase due to longer durations reflected in ADFAs.

Based on teleconferences and recommendations from the panel, HSI values for the spawning and rearing pool will utilize the values associated for the underlying land use (*i.e.,* HSI values will not change to a waterbody value).

Recommendation 3

Monitoring of mitigation sites and adaptive management will be discussed in the EIS after impacts are quantified.

Final Panel BackChecks Response

Concur with comment.

Recommendation 1: "Although larval fish were not collected, this study identified those species found in the project area, and these data in turn were used to develop the habitat guild for species selection in the Habitat Evaluation Procedure. Preferences of spawning and rearing fishes to specific land use categories (i.e., HSI values) were based on field studies in the lower Mississippi River basin and professional opinion."

Although this statement from USACE final Response is correct, the guild approach was abandoned for a habitat based HSI approach in the Work Plan. The Panel supports the use of the Sheehan study results in a Delphi process for setting HSI habitat based values used in future modeling.

Recommendation 2: "The Panel comments suggest that habitat value is constantly changing during this period and therefore, it is not appropriate to utilize a different HSI value."

The Panel did not suggest that the habitat value (HSI) is constantly changing during this period (as stated in the above sentence from the USACE response), but that the underlying physical habitat structure remains the same. Therefore, the Panel supports the use of the "underlying" habitat HSI value with the potential of habitat unit increases due to changes in ADFA's as stated in the USACE final Response. The Panel will support an HSI increase (i.e. habitat classification change) due to maintaining the rearing pool for extended periods of time if an increase is supported by monitoring studies

Recommendation 3: No additional comment.

Comment 6:
The Waterfowl Assessment Method (WAM) appears to be appropriate; however, the parameter estimates for the model are based on fall migratory and wintering ducks and do not appear to consider spring migrants.
USACE Final Evaluator Response 6
Nonbreeding migrant waterfowl are present in the SJNM from September through March. This is the time frame used in the WAM. Numbers of waterfowl in the SJNM gradually increase through fall to peaks in December and January and then decline through March (Bellrose 1980, www.mdc.mo.gov). This chronology of occurrence includes the sequential annual cycle events of waterfowl of fall migration, prealternate molt, pair formation, prebasic molt, reserve deposition, and spring migration (Heitmeyer 1988, 2002). Consequently, a continuum of annual cycle events is occurring among species and individuals within the SJNM and the SJNM is not a region or complex of habitats that is used solely or primarily for spring migration. Weekly waterfowl counts in the SJNM have been made by the Missouri Department of Conservation from ca. October through January, and often through March since the early 1980s. U.S. Fish and Wildlife Service coordinated mid-winter inventories of the SJNM and surrounding Upper Mississippi Alluvial Valley (MAV) region have been made since the 1960s. Biweekly surveys throughout the year were made for 15 randomly selected four-square mile blocks in the SJNM region from 2000 through mid 2004 (Heitmeyer, unpublished data). All of these data indicate peak waterfowl presence in the SJNM is in December and January. Numbers of waterfowl in the SJNM regional area often are 70% less in March (when most waterfowl species are in spring migration in the Upper MAV – Bellrose 1980) than during mid-winter peaks. Peak numbers of waterfowl (combined ducks and geese) at the Ten Mile Pond Conservation Area (CA) in the SJNM are regularly > 100,000 birds in December and January. Surveys in 2009-10 indicated over 3 million waterfowl use days occurred from November through January. In 1997-2000 over 9 million waterfowl use days occurred each year from November through January at Ten Mile Pond CA. In addition to Ten Mile Pond CA, the SJNM region includes many other important public and private wetlands in western Kentucky (e.g., Ballard County CA), northwest Tennessee (e.g., Reelfoot Lake), and southeast Missouri and northeast Arkansas (e.g., Big Lake National Wildlife Refuge) that support large numbers of waterfowl from fall through spring. For example, waterfowl numbers at Reelfoot Lake alone often exceed 300,000 during December and January and many of these birds move between the SJNM and the Reelfoot Lake area daily. Consequently, the SJNM provides resources to more birds than are present on Ten Mile Pond CA or other regional areas on any given day. Conservative average estimates of total waterfowl within a 30 mile radius of Ten Mile Pond in early January are > 500,000 birds (http://www.fws.gov/birddata/databases/mwi/mwidb.html). Clearly, the SJNM is heavily used by waterfowl from fall through spring periods, and is not primarily a spring migration region. Regarding the statement "… the parameter estimates for the (WAM) model are based on fall migratory and wintering ducks and do not appear to consider spring migrants." This statement is incorrect and appears to be based on the false assumption that the SJNM is most important for spring migration (see above) and does not understand the data, timeframe, energetic basis, and habitat and food production analyses in the WAM. First, the WAM includes estimates of food abundance and energetic requirements of all waterfowl species using the SJNM from September through March. As stated above, this timeframe accurately represents the entire suite of nonbreeding events, species, and times for the SJNM from September through March.

Consequently, the WAM does provide quantitative methods to determine food abundance and energetic requirements for the late winter and spring period through March.

Annual food production, and subsequent availability to waterfowl species, is a function of when specific foods are produced and how the standing crop changes over time. For most plant foods (excepting some above-ground browse), the actual production is during the growing season and usually peaks in late summer or fall. Consequently, estimating potential food abundance must start with understanding the standing crop in summer or fall and then determine changes thereafter through spring. For invertebrates, the chronology of production and turnover rates vary by taxa and habitat. For some benthic crustaceans (e.g., *Cranonyx*) in the Upper MAV the peak production is in spring (e.g., White 1985). In contrast, many aquatic insects (e.g., Chironomidae) reach peak levels in late summer. Throughout the WAM, food production estimates are based on the life history characteristics of the plants/invertebrates involved and state-of-the-art understanding of availability dynamics. Consequently, the parameter estimates are founded on basic plant/invertebrate ecology and reflect their potential abundance and use by waterfowl in the SJNM regardless of when, or which species, uses them. This includes all time periods and events from fall through spring migration.

The comments seem to imply that invertebrates are the primary food consumed by spring migrant waterfowl in the SJNM and that the WAM should be based primarily on invertebrates. First, the WAM does provide estimates of invertebrates in all habitats and times. It also provides estimates of all other foods potentially consumed by waterfowl species. Consequently, the WAM provides appropriate estimates of potential carrying capacity of a region (such as the SJNM) regardless of species, time, or annual cycle event the bird is engaged in.

The assertion that spring migrant waterfowl eat mostly invertebrates is not true for all species or areas. Knowledge that some duck species seek habitats that have, and eat, a higher proportion of invertebrates in late winter and spring compared to fall and early winter periods is well documented and not new (e.g., Heitmeyer and Vohs 1984, Heitmeyer 1985, LaGrange 1985, LaGrange and Dinsmore 1988, Heitmeyer and Fredrickson 1990, Gammonley and Heitmeyer 1990, Heitmeyer 2006 and many others). However, not all species consume large quantities of invertebrates in spring (e.g., wigeon, geese, etc., Heitmeyer and Raveling 1988, Heitmeyer 2002) nor do individuals of a species, such as mallards, always eat large amounts of invertebrates by sex (Combs and Fredrickson 1996) or location (Gruenhagen and Fredrickson 1990). In fact, few invertebrates may be eaten in some locations. Consequently, it is inappropriate for the WAM to speculate on which species will eat what amounts of specific food types by time period.

No doubt, the studies provided by the panel were well conducted, however the locations of the study sites used in these references are not stated, but appear to have been in central Wisconsin, Saginaw Bay in Michigan, Lake Erie, the Scotio River in central Ohio, the central Illinois River Valley in central Illinois, and the Cache River area in southern Illinois (Yerkes 2010). The only study site near the project area is the Cache River location. Using data from sites in the Great Lakes region, and even the central part of the Illinois River Valley, to indicate and project resource use, energetic requirements, habitat food type and abundance, and inclusion in WAM models is scientifically inappropriate. Regardless, the additional literature provided by the panel will be reviewed and the EIS will include a discussion whether or not the literature provided was used to make any modifications to the waterfowl analysis or if it was determined not to be applicable in the analysis.

The WAM clearly states that the model parameter estimates may be refined as new information becomes available from sites that represent the area of coverage, i.e. within the MAV.

Consequently, if new studies can convincingly validate and suggest changes to the parameter estimates, based on equivalent MAV habitats and locations, then food estimate changes can easily be made in the WAM tables. New production information will not change the form of the DUD equations, however. The response further suggests that the DEE used in the WAM may underestimate "true" DEE during spring. The reviewer offers no data to support this assertion and the comments appear to have been based on non-MAV locations mostly from the Great Lakes region (see above). The review comments imply that because waterfowl are storing reserves during spring migration a different DEE estimate should be used than during winter. Nutrient reserve deposition for many waterfowl begins in late winter including during flood events (e.g., Heitmeyer 1988, 2006) and is not confined to spring. The WAM clearly indicates how the DEE estimates for all waterfowl species using the Upper MAV were calculated. The actual estimate of 4x RMR is higher than earlier published estimates and it is acknowledged that the estimate may be conservative. However, until new validated information becomes available for DEE in the Upper MAV and SJNM, the WAM estimates represent the state-of-the-art understanding of DEE for the SJNM and are appropriate for the SJNM project analyses.
Final Panel BackChecks Response 6
Concur with comment. The Panel has provided the documents requested by the USACE and looks forward to the information being integrated into the model.

Comment 7:
It is unclear if the application of the Hydrogeomorphic (HGM) approach to evaluate project impacts and develop proposed mitigation will yield scientifically credible results.
USACE Final Evaluator Response 7
We agree with the panel's assessment that HGM has a long record of development and application in the estimation of functional losses and gains of wetland resources for Corps planning projects. More importantly, the specific Guidebook in question has been used successfully in similar Corps projects in Arkansas, where multiple wetland types and proposed mitigation types were employed, and changes in flood frequency and duration were components in the wetland impact. HGM reviewers concluded that the guidebook has been in use for approximately five years and could potentially be used with the same level of accuracy under the condition that existing users will be the ones who continue to use the method. One or more members from team of experts who developed the regional HGM guidebook will perform the assessments for all wetland sites to ensure the models are used as intended and that there is consistency in the results. The minimum requirements of the review team will be met during the SJNM application of the Delta Region of Arkansas Hydrogeomorphic Methodology (HGM) Guidebook. The panel's assertion that calling an approach a "model" automatically implies that it is a specific type of model is not founded. There are many models that have been developed over the years for ecological assessment purposes; one of the most famous and oldest of these is the Habitat Evaluation Procedure, first developed in 1980. HEP models, as they are called, are clearly models: mathematical aggregations of factors to determine a single metric. They do not involve differential equations or other techniques that might be used in dynamic hydrologic modeling. HGM was originally conceived as a way of extrapolating the techniques and methods used in HEP to address the multiple functions that needed to be addressed for wetlands. The model development is quite comparable to that used in HEP. Unlike HEP, however, HGM models are calibrated using reference data specific to the wetland subclass and a specific reference domain, such as an ecoregion. This makes it actually more scientifically defensible than many models, which are calibrated using literature review data that are aggregated across the entire country. The data collected for the Guidebook in question is from the same EPA Level III ecoregion as the project site, and the models are proven sound by previous use. The EIS will include a discussion on the limitations of the HGM model. However, based upon discussions with the panel, there are no other models that are superior to HGM and it would be suitable to use the model if the same person or persons conducted all of the studies. The HGM model will be conducted by the model developers (*i.e.,* scientists from ERDC). The HGM guidebook calibration process employed direct measurements of thousands of tree diameters, counts of shrub stems, snags, and logs, and similar specific data, and application of the guidebook uses similar direct measures. Variable values that are estimated (such as litter cover) should be consistent in the way that they are applied, as long as the field team is consistent. Since functional loss and gain are calculated as differences between before and after states, the absolute value isn't as important as the consistent application of the variable. An overestimate of 5% across all the sites will yield the same results once the difference between before and after states are compared.

HGM separates wetlands into classes and subclasses using hydrology and landscape position, which directly affect function. A riverine wetland functions differently than a wet flat or an unconnected lacustrine fringe. To lump these wetland types together and then try to determine changes in function is precisely the sort of illogical analysis that HGM was designed to avoid. It's true that splitting the project site into multiple types will increase the amount of data required for analysis, but that is justified if it is required to develop a defensible analysis. The keys provided in the Guidebook are sufficient for splitting out the types, and since the project will lead to changes in flood frequency and duration that will not only affect function within types, but also lead to type conversion, the idea that these functional changes can be assessed in any scientifically defensible way without splitting the wetlands into classes is not supportable.

Any errors in the calculators will be addressed, but as for the issues with the models, they were ultimately certified for use on this project. The form and component variables in the assessment models and the format of the guidebook were constructed to be consistent with previously published guidebooks (specifically, the Yazoo Basin guidebook) and were reviewed and approved by a team of regional experts and the USACE - ERDC. Calibrations were based on actual field data from within the same EPA Level III ecoregion as the project site, which makes them scientifically defensible. They are the best available tools for use in this application, and have been extensively tested in the region, as noted by the panel in their opening comments above.

In order to be classified as riverine, a wetland must be within the 5-year floodplain of a river, according to HGM convention. If a site is not subject to flooding at least 1 year in 5, then the river is not the "main forcing function of the system," and is certainly not the principal hydrologic factor maintaining wetland character. The statement that fringe wetlands are not usually associated with floodplain landscapes is curious, as the cypress fringe communities associated with oxbow lakes are among the most iconic and widely occurring of the remaining wetlands in the Lower Mississippi Valley. Other non-riverine wetlands, such as hardwood flats, sand pond depressions, valley train ponds, and various other communities discussed in detail in the guidebook, have been seriously impacted by historic land use in the study area, and merit more, not less, attention.

Based on discussions with the panel, limitations to the HGM model are based on absolute, not relative terms. Therefore, the EIS will state the uncertainty of the model.

<u>Recommendation 1</u>

It is not clear where the panel has obtained the number 4 as a multiplier for any mitigation ratio determined using HGM. HGM analyses in the region have previously tended to produce mitigation ratios in the range of 2:1 to 4:1, depending on the condition of the impacted wetland, and the type of mitigation proposed. Preservation has been calculated as high as 10:1 due to the lack of functional lift over the course of the project lifetime. In all cases, the rationale and supporting data for calculating these ratios, including developmental trajectory analyses, are presented and discussed clearly, and can be specifically criticized as appropriate if logic or data errors are identified.

The Memphis District Regulatory Branch stated that the following ratios have been developed by the Missouri Department of Natural Resources (MDNR) with cooperation from the Missouri Department of Conservation (MDC), the U.S. Fish and Wildlife Service (USFWS), the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (COE), the Natural

Resources Conservation Service (NRCS) and the Missouri Department of Transportation (MoDOT) for wetland creation/restoration. The ratios are intended for use by projects for which the sequencing requirements have been completed and it has been determined at that point that compensatory mitigation is appropriate. The ratios are not intended for enforcement purposes; however, the high end of the range may be an appropriate place to begin negotiations for enforcement cases.

Farmed Wetlands	1.0-1.5
Emergent	1.0-3.0
Shrub-Scrub Wetlands	1.5-3.0
Wooded Wetlands	2.0-4.0
Open Water	1.0

In subsequent teleconferences, the panel stated that the 4x multiplier was only an example to be used as a safety factor and not necessarily a recommendation. Based on recommendations from the panel and to ensure an adequate safety factor for mitigation planning, USACE will develop a monitoring and adaptive management plan that defines success criteria for mitigation sites. Compensatory mitigation will be adjusted as a safety factor in the event that monitoring reveals a deficiency.

Recommendation 2

During subsequent teleconferences, USACE asked if there were any other wetland models that would be superior to use instead of the HGM Model described in the Work Plan. The panel stated that there were no other readily available superior models. Although not necessarily applicable to this project, USACE scientists, regulators, and engineers will continue to investigate wetland models to assess impacts to function and structure and determine appropriate mitigation for other Civil Works projects as well as Section 404 permits.

Final Panel BackCheck Response 7

Concur with comment.

This discussion has focused on both the reliability and repeatability of the HGM method in providing scientifically defensible results for estimating impact on wetlands and mitigation of those impacts and the use of mitigation ratios to reflect the uncertainty in the mitigation attempted on this project. The mitigation concerns impacts of this water project on waters of the United States, including wetlands. So if the mitigation of impacts is not certain, the Panel believes that a higher mitigation ratio is warranted.

Our principal concerns remain that the uncertainty of the mitigation needs to be reflected in the mitigation ratios, which could be as high as 4:1, and that the field parameters used in the HGM approach be appropriate for identifying the most important functions lost from the impacted wetlands.

The Panel believes that the HGM method should be retained for wetland assessment, mostly because there is no other acceptable method that emphasizes the hydrology and landscape position of the wetlands. For evaluating wetland function unrelated to the support of fish and wildlife, it is more effective than investigating by individual resources, e.g. waterfowl or fisheries by themselves. The Panel is pleased that USACE is open to the idea of "to investigate wetland models to assess impacts to function and structure and determine appropriate mitigation for other Civil Works projects as well as Section 404 permits."

Comment 8:
There is an insufficient level of detail in the Project Work Plan to evaluate the validity of the proposed compensatory mitigation plan.
USACE Final Evaluator Response 8
USACE agrees that project success is dependent on determining the appropriate level of mitigation. However, a specific sequence needs to be employed which first describes the impact, determines its significance, seeks to avoid and minimize the impact, and lastly compensates the impact. Obviously mitigation cannot be determined without first determining what the significant unavoidable impacts of the project are. Therefore, the project work plan only contains conceptual mitigation. Although USACE assumes impacts are likely, USACE does not know if impacts are greater or less than past project recommendations. Therefore, mitigation specifics would be discussed in detail in the EIS. If determined necessary, moist soil units will be primarily managed to compensate for impacts to spring shorebirds. Therefore, moist soil sites would likely have to be inundated prior to spring shorebird arrival for several months to maximize invertebrate productivity. This would likely coincide with spring waterfowl migration. Therefore, waterfowl will likely utilize the sites. Please refer to response to comment 1 for further discussion of waterfowl/shorebird use of moist soil habitats. USACE acknowledges that the discussion on reforestation is brief. This is primarily due to the fact that site specific location needs to be known (elevation, soils, topography, hydrologic regime, etc.) prior to determining the species of trees to be planted, spacing, direct seeding vs. seedlings, etc. The EIS will include a more thorough description of "typical" mitigation sites that would be found throughout the project area. At a minimum the following conceptual sites will be described: • Lands adjacent to Big Oak Tree State Park • Lands that are within the project's sump elevation • Lands that are outside the project's sump elevation • Adjacent batture sites • Moist Soil Unit • Lands within a spawning and rearing pool The Project Work Plan includes transition periods that discount mitigation based on the amount of time necessary for mitigation sites to reach maturity or reach full habitat potential (*i.e.,* forested areas for fish). The EIS will contain additional information regarding the plan to restore Big Oak Tree State Park. Please refer to response to comment 9 on funding issues. Based on subsequent teleconferences, the panel stated that the approach outlined in the Work Plan regarding mitigation is good as long as impacts are well defined and the mitigation plan is adequate. Based on the panel recommendations, the EIS will contain assurances regarding mitigation to ensure that commitments are kept.

Final Panel BackCheck Response 8
Concur with comment. USACE appears to be under the impression the Panel is requesting adequate detail in the modeling approach to determine if the mitigation is appropriate. This is not the case; the Panel is only attempting to determine if each modeling approach is appropriate. Substantial detail in the models, however, is required to do this with any degree of confidence. Areas of concern are as follows: At this point, the philosophical outline of the shorebird model appears to be appropriate. Without knowing the details of this model, however, the Panel cannot make a recommendation on the appropriateness of the final model. The assurance by USACE of an appropriate peer review of the final model would help alleviate this concern. Based on the September 8, 2010 conference call, USACE has assured the Panel the final shorebird model would go through an appropriate peer review process. The Panel agrees that a Delphi method is an appropriate approach for determining HSI values for the fish model. Furthermore, the panel supports HSI values that are determined to be appropriate by the entire interagency team (EPA, USFWS, MDNR, MDOC, and USACE). USACE has agreed to conduct a qualitative assessment of water bodies within the basin. While the Panel agrees that this type of assessment is appropriate for addressing water quality issues, USACE has provided no detailed methodology as to how this assessment would be conducted, so the panel has no way of determining if this assessment would be appropriate. The Panel concurs that the current HGM model is the only tool currently available to assess functional loss and gains of wetlands unrelated to the support of fish and wildlife. The Panel is concerned, however, that although this is the only tool currently available for this type of analysis, the accuracy and precision of this tool is inadequate to estimate the degree of impacts with an appropriate level of confidence; thus, a mitigation ratio of lost wetland function greater than 1:1 should be used for mitigation.

Comment 9:
The adaptive management plan requires a detailed analysis of the ongoing mitigation management costs and a clear funding source adequate to support those activities.
USACE Final Evaluator Response 9
Recommendations regarding adaptive management were included in the Project Work Plan (see Section 8.6). The cost of this management and monitoring will be determined in the EIS. Applicable funding (Federal funds from the Mississippi River and Levees Program, Federal funds from the St. Johns Bayou and New Madrid Floodway project, and non-federal funds from the project sponsor) will be required to implement the plan. The amount of required funding from each source will be described in the EIS. Conditions that would "trigger" adaptive management have not been discussed with the interagency team to date because project impacts, and avoid and minimize measures have not been formulated. However, these conditions will be described in the EIS. Mitigation will increase and or site specific adjustments made in the event that they are not functioning as desired. Conversely, adaptive management may reveal that mitigation sites are functioning at greater rates than modeled, or impacts were not as significant as modeled. If this is the case, overall mitigation may be reduced. Based on panel recommendations made during subsequent teleconferences, adjustments would be made to adaptive management when the level of function falls below expected levels. Therefore, the adaptive management plan will include specific, measurable success criteria that can be used to determine when additional mitigation is required. Specifically, the adaptive management plan will provide the following information: • An on-going monitoring plan sufficient to detect insufficient levels of function for all resources. • A clear statement that mitigation shortfalls will be addressed for each resource • Proposed responses to improve levels of function.
Final Panel BackCheck Response 9
Concur with comment. The Panel concurs with the approach outlined in the response to this Comment.

Comment 10:
The methodology to determine the extent of the wetlands in the project area requires further detail to determine if it is valid.
USACE Final Evaluator Response 10
Wetland ecosystems and their community functions will be analyzed utilizing HGM in accordance with the SJNM Interagency Wetland Team recommendations. USACE will utilize WETSORT, which is based on a 1997 USDA, NRCS method and uses daily water surface elevation readings to determine wetland elevations. The program can be used to determine the median elevation of specified flood durations during the period of record. The flood duration will be fourteen days (according to the supplement to the 1987 Wetlands Delineation Manual). Wetlands above the flooding elevation will also be classified. The team has reviewed available maps and discussed the different approaches (abundance, distribution, and qualitative condition of wetlands as well as FCU's and HGM analyses). The team agreed to use HGM to assess project related wetland impacts, while the probabilistic sampling based on EMAP will provide wetland acreage and a qualitative wetland condition. The team discussed using hydric soil and land use cover maps (and potentially WETSORT data) to help assess farm land (particularly if NRCS cannot provide FW/PC data). The team agreed to use the same proportion of agricultural land on hydric soils that meets wetland parameters (as determined by on-site wetland data collection) within the field- and remote-sampled portions of the project area. Hydric soils will be overlain on the identified agricultural project area landcover GIS layer within the project impact area. Members from the interagency team will assess these probabilistic determined sampling points. After sampling these ~50 points, the same individuals will derive remotely sensed assessments on 50 probabilistic sample points outside of the impact area. These sample points will be determined in the same fashion as the impact sites, except these sites will be outside the impact zone. Aerial imagery will be used in making these assessments. Concerning lack of involvement by USFWS on the interagency wetland team, the Service was asked to participate; however, they decided they would not be a member on the wetland team. USFWS is free to attend any sub-team meeting and is advised of all sub-team meetings and decisions. The full interagency team (including wetland team participants and the Service) are kept apprised of decisions made at the sub-team level, including Memos for Records and updates at interagency team meetings. A detailed description of the WETSORT program was provided to the interagency team and is attached to these responses. Briefly, WETSORT is a utility program written in FORTRAN 77 that uses methods published by the USDA Natural Resources Conservation Service (1997) to determine wetland elevation using daily water surface elevation data and user supplied input. User supplied input to the computer program are: growing season length (begin and end dates) and a percent duration (typically a 5, 12.5 or 15-day duration). WETSORT does not evaluate moist soil conditions, does not evaluate conditions based on shallow groundwater, and does not identify wetlands. WETSORT does identify a median wetland elevation determined by multi-year analysis and requires field verification by experienced professionals. The wetland team will determine the appropriate classification for agricultural areas (wetlands, farmed wetlands, prior converted cropland). Preliminary estimates suggest that the vast majority of lands in the project area are prior converted cropland. Although these areas may not be subject

to Section 404 of the Clean Water Act, the functional floodplain (including agricultural land) value they provide will be assessed with the fish, waterfowl, wetland, and shorebird models. It is possible that areas that are currently in agricultural production could convert to wetlands if farm practices are abandoned and no channel maintenance is conducted on the vast network of drainage ditches. The vast majority of agricultural areas are expected to remain in agricultural production (see response to comment 18). Project mitigation will seek to purchase agricultural areas and restore wetland status to these areas.

Shallowly flooded agricultural land (regardless of wetland jurisdictional status) that provides shorebird habitat will be assessed in the Shorebird impact analysis (See response to comment 1).

Recommendation 1

Based on the teleconferences, the panel has no additional comments regarding wetland area determinations.

Recommendation 2

Additional details regarding WETSORT were provided to the panel.

Note: The EIS will include an expanded discussion on wetland area determinations as well as the WETSORT Program.

Final Panel BackCheck Response 10

Concur

Comment 11:
The assessment of economic impacts of the proposed project may not be valid because the method used to document the future with and without project conditions does not consider trends in real prices and costs.
USACE Final Evaluator Response 11
Current economic guidance ER 1105-2-100 states that only Current Normalized Prices can be used to assess the economic viability of Federal water resources development projects. Current Normalized Prices (CNP's) are calculated by the USDA Economic Research Service and are the values that the Federal government places on the various agricultural commodities. They are calculated by State but they are "national" in scope in that the methodology used is consistent so that they can be used to compare projects in various locations throughout the United States. CNP's are adjusted for inflation and do in fact reflect trends in that they are 5-year lagged averages of actual market prices. The recommendations contained in comment 11 seem to suggest estimating inflation adjusted trends or changes in commodity prices over the 50 year period of analysis. This type of change in prices could only be used in a type of sensitivity analysis to show the effect of these estimated trends. By regulation, they can not be used in the NED analysis of the proposed water resource improvements. Therefore, USACE can not adopt the recommendation. Based on the teleconference, the panel suggested that real process will be likely be significantly higher in the future than today due to a variety of reasons including global climate change. Although USACE can not use the panel's recommendations to calculate the project's benefit to cost ratio, the recommendations would be conducted in the sensitivity analysis. Based on the panel's recommendations the sensitivity analysis will remove the effects of inflation and use real terms not nominal rates. In addition, based on the teleconference, future without project conditions regarding land use will change. The Project Work Plan stated that no changes to land use are expected. This comment referenced that agricultural areas will remain in agricultural production and no clearing of forested areas is anticipated. However, the EIS will be clarified stating that changes to agricultural areas are expected with the project. The expected changes are agricultural practices will likely intensify and there will likely be a shift to more economically valued crops as flood risks are minimized.
Final Panel BackCheck Response 11
Concur with comment. Concur that sensitivity analysis as suggested above will take care of the issues. The main point is that USACE cannot know how *relative* prices change in the future and this is the key point: the price of agricultural goods relative to other goods may change drastically in the future. For example, suppose that home-entertainment related goods prices are currently twice as high as prices of agricultural goods. Over time, this ratio may change substantially, i.e., the situation could be the reverse. An overall price index generally used for inflation may not capture this relative price change adequately. If food becomes more

scarce, its relative price would rise, and the agricultural sector may thus become a larger share of Gross Domestic Product (GDP).

Thus, incorporating unusual future prices in a sensitivity analysis may be worthwhile.

See related argument in Sterner, Thomas and U. Martin Persson. 2008. "An Even Sterner Review: Introducing Relative Prices into the Discounting Debate." *Review of Environmental Economics and Policy* **2** (1/Winter): 61-76.

Comment 12:
The use of two discount rates for the same analysis is confusing and is not warranted in any conventional economic analysis.
USACE Final Evaluator Response 12
During the teleconferences, the panel stated that they have no objection to the use of the 2.5% interest rate and deferred to USACE on what the appropriate/legal rate is based on law and policy. Although construction has previously occurred, the panel recommended not to use past costs in calculating the benefit:cost ratio. These are sunk costs and should be excluded from the economic analysis and can be assumed that they have not happened. The panel clarified that they have a concern with the use of two different interest rates and recommended utilizing one rate. USACE stated that the use of two different rates is necessary due to the two distinct authorizations for the project. The St. Johns Bayou and New Madrid Floodway Project and the Mississippi River Levees (closure levee) projects were combined for NEPA purposes following the completion of the Limited Reevaluation conducted in the late 1990's. The panel recommended not conducting two separate NEPA analyses for these separate projects. Therefore, one EIS will be formulated. To overcome the panel's concerns and to comply with appropriate policy, the economic analysis used to determine the project's benefit to cost ratio would be determined for each of the project's separate elements utilizing the appropriate interest rate for the respective element. Therefore, two separate benefit:cost ratios would be calculated with two separate interest rates. For the sensitivity analysis, the project elements would be combined and treated as one project utilizing one consistent interest rate.
Final Panel BackCheck Response 12
Concur with comment. Concur with final approach suggested. Because of the uncertainties raised by the Panel, it will be especially important to examine benefit-cost ratios at a 7% rate, which is a high rate often used in the presence of risky outcomes. See: Bazelon, Coleman and Kent Smetters. 1999. Discounting Inside the Washington D.C. Beltway. J. of Economic Perspectives 13 (4/Fall): 213-28. Howarth, Richard B. 2009. "Discounting, Uncertainty, and Revealed Time Preference." Land Economics 85 (1/Feb): 24-40.

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Final Panel Evaluator Response #12
Concur with comment. Concur with final approach suggested. Because of the uncertainties raised by the Panel, it will be especially important to examine benefit-cost ratios at a 7% rate, which is a high rate often used in the presence of risky outcomes. See: Bazelon, Coleman and Kent Smetters. 1999. Discounting Inside the Washington D.C. Beltway. J. of Economic Perspectives 13 (4/Fall): 213-28. Howarth, Richard B. 2009. "Discounting, Uncertainty, and Revealed Time Preference." Land Economics 85 (1/Feb): 24-40.

Comment 13:
The farming survey may not be credible unless a large enough sample size is used, producing a smaller statistical error for the analysis and avoiding many possible sources of bias.
USACE Final Response Comment 1
Based on the 13 and 17 May teleconference, it appears that there was a basic miscommunication regarding the proposed process to estimate future with-project effects on farming practices and land use during the written comment/response process. During the teleconference the proposed process was discussed and clarified. The proposed process is to use present (existing) land use by flood zone as a proxy for with-project land use. For example, assume that present land use for the 5 year flood zone is 50% corn and 50% soybeans and the present 3 year flood zone land use is 100% soybeans. Under a potential scenario (with-project conditions) flooding will be reduced. Let's assume the existing 3 year flood zone now becomes the with-project 5 year flood zone. This will cause a change in land use from 100% soybeans to 50% corn and 50% soybeans for this particular flood frequency zone. This process can be further supported using surveys of the area's farmers regarding how they would react and change their farming practices in response to a reduction in flood risk if the panel feels that surveys will be valuable. The panel suggested that this process seems logical. The only criticism pointed out by the panel is the assumption that past behavior will dictate future behavior. USACE asked the panel if formal surveys to area producers would be value added. The panel did not think so because surveys could be biased to a small percentage of large producers in the area and thereby increase risk. Therefore, based on the panel's recommendations a survey will not be conducted. In lieu of the survey, the process stated above will be utilized.
Final Panel Response #13
Concur with this suggested approach.

Comment 14:
The cumulative impact approach lacks specific information on how the conceptual matrix will be used to evaluate the incremental impacts of the proposed project or address the unique aspects of the study area.
USACE FINAL Evaluator Response 14
In the Handbook, "Considering Cumulative Effect under the National Environmental Policy Act" January 1997, the third method covered is matrices. We will have historical mapping of habitat and plan to develop a trend analysis (method 6). Other methods that will be investigated are Ecosystem Analysis (method 9) and Economic Impact Analysis (method 10). As pointed out in our draft response to comment #16, the project area connection is extremely altered and is not the last remaining connection. The area is entirely protected by levees with the exception of the 1,500-foot gap at the lower end of the Floodway. This gap has significantly changed the timing, depths, and durations of flood events from what could be considered normal/non-altered conditions. Simply stating that this is the last remaining connection between the Mississippi River and its floodplain in the State of Missouri does not provide an accurate assessment of current conditions. Based on the panel's recommendations, the cumulative impact assessment will assess wide scale drainage of the project area's historic bottomland hardwood ecosystem (previously occurred), the clearing of vast tracts of forested areas (previously occurred), leveling of farm fields (previously occurred), construction of private levees (previously occurred), closing off the St. Johns Bayou Basin (previously occurred), on-going Mississippi River Levee and Mississippi River and Tributaries construction (this project), and likely future projects. The spatial boundary for the analysis will include applicable areas within the Lower Mississippi River basin such as the batture areas as well as other backwater areas within adjacent states. The historic land cover survey will be used to start the temporal boundary of the analysis and will extend to reasonable future actions. The cumulative impact is assessment will determine if cumulative impacts are significant (*i.e.,* straw that broke the camel's back as discussed during the teleconferences). It is important to note that previous work/modifications in the project area could have already "broken the camel's back". In fact, the panel stated that remaining wetlands in the project area are "sad". To reverse this trend, this project, with its conceptual mitigation, has the potential to restore significant habitat types that are no longer found in the project area and would likely never be replaced, most notably Big Oak Tree State Park. This trend to restore these habitat types will also be included in the cumulative impact assessment to determine if compensatory mitigation results in significant gains to Lower Mississippi River habitat. As discussed during the teleconference, the EIS will seek additional opportunities that restore river connections and restore historic ecological communities. The cumulative assessment will include both the project's impacts as well as the benefits of compensatory mitigation to the entire floodplain ecosystem.

Final Panel BackCheck Response 14
Concur with comment. Recommendation 1: Concur, if clarification is made. USACE has responded to the Panel request for additional details on their proposed methodologies for determining cumulative impacts. However, they introduced the new issue that the project area connection is extremely altered and is not the last remaining connection (to the Mississippi River). As a point of clarification, the Panel stated that the project area is the last connection in the State of Missouri, not in the entire Mississippi River. USACE went on to state that previous work/modifications in the project area could have already caused impacts that exceeded a significant threshold. Although the panel is concerned that these statements appear to be "lowering expectations," we take note that USACE affirms that they will still evaluate cumulative impacts, including historical trends, and determine whether they are significant. While NEPA cases have not required projects to mitigate for past impacts of previous actions, they generally do expect that projects mitigate for any additional significant impacts, even if these past impacts have exceeded a significant threshold. USACE should clarify that they will mitigate for any additional significant impacts of the proposed project. Recommendation 2: Concur

Comment 15:
More precise contour data (i.e. greater than a 1-foot contour interval) are required to estimate wetland availability and mitigation for waterfowl and shorebirds.
USACE FINAL Evaluator Response 15
Regarding the statement, "Furthermore, waterfowl require water depths less than 12-15 inches for foraging." This statement is incorrect. Optimal foraging depths vary considerably among waterfowl species. Obviously, species that are adapted to dive for food (i.e., Mergini, Aythyini, Oxyurini) can forage in water deeper than 12-15 inches (often up to 10+ feet deep) and some species, conversely, can forage on dry ground (e.g., *Anser, Branta*). Foraging depth also varies by type of food being consumed, habitat type, hydrological event, etc. For example, water depths (mean $\pm$ SE) where mallards foraged during flood events in southeast Missouri were 48.6 $\pm$ 6.3 cm during a February flood and 42.3 $\pm$ 8.9 cm during a January flood (Heitmeyer 2006:105). Foraging depth also varied by habitat, for example water depth in shrub/scrub habitats was 42.6 $\pm$ 9.4 cm compared to 31.2 $\pm$ 4.6 in flooded bottomland hardwood forest. During the shorebird model review, the model review panel stated that obtaining elevations less than 1-foot increments in a project area the size of the current project is impractical. Therefore, USACE proposes to interpolate elevations between one-foot contours. <u>Recommendation</u> Based on discussions with the panel, USACE intends to interpolate elevations between established one-foot contours where necessary.
Final Panel BackCheck Response 15
Concur

Comment 16:
The list of significant resources is not complete because it does not include a discussion of the quality of the wetland resource, which is dependent upon the dynamic nature of the ecosystem's function and its connection to the river.
USACE Final Evaluator Response 16
Regarding the statement, "The project area includes the only significant remaining section of floodplain where Mississippi River backwater flooding still occurs." Concerning the Lower MAV, this is an incorrect statement. Furthermore, the project area connection is extremely altered. The area is entirely protected by levees with the exception of the 1,500-foot gap at the lower end of the Floodway. This gap has significantly changed the timing, depths, and durations of flood events from what could be considered normal/non-altered conditions. The entire Tennessee side of the Mississippi River floodplain from the confluence of the Old Bed of the Forked Deer and Mississippi rivers at the north Lauderdale County, Tennessee line south to Memphis does not have a mainstem, or frontline, levee and the Mississippi River overtops banks and floods portions of this over 40 mile stretch, covering several hundred thousand acres, annually. Additionally, there are approximately 64,000 acres of batture land are immediately adjacent to the 133,000 acre New Madrid Floodway. USACE acknowledges that river-floodplain connection provides wetland function. Hydrologic connection alterations would be assessed in the EIS by documenting impacts to fish spawning and rearing habitat (confined to the five year floodplain), waterfowl, shorebirds, and wetlands (river connected wetlands are defined as those that are within the five-year floodplain). Although USACE concurs that the river connection is an important aspect to providing habitat on the floodplain, it appears that local drainage and topography may play a greater role. For example, areas that are frequently flooded (less than elevation 288-foot NGVD) are still mostly agricultural areas. These areas flood almost every year but water is quickly drained from these sites as the river elevation falls due to the extensive drainage system. However, areas that river connections are greatly altered or severed such as Big Oak Tree State Park and Bogle Woods are not farmed because they were likely too wet to clear and farm. These areas are in there own sub-watersheds and make up the lowest elevations in them because they are found within historic Mississippi River meander belts. Hydrology in these areas is mostly influenced by local drainage and topography, not the Mississippi River. Therefore, the Mississippi River may not play as a significant role as it appears. Nonetheless, based on the panel's recommendation, the EIS will provide a discussion regarding the nature of the wetlands (and functional floodplain) in the project area, including features that may result from the dynamic water level and periodic flooding by the river. The analysis will also include the role that local drainage/topography provides as well. This discussion will include nutrient budgets, vegetative patterns, fish, and wildlife including shorebirds. The nature of the hydroperiod will also be described as it relates to the importance of floodplain habitat as well as the economic and social impacts. Floodplain habitat will be assessed and compensatory mitigation will be determined by utilizing the methodologies outlined in the Work Plan and revisions to the methodologies recommended by the panel.

Final Panel BackCheck Response 16
Concur with comment. The USACE Response reiterates some of the text provided above in the draft Response to this comment, which should not be necessary following the clarification provided by the panel in both written text and discussion. As the Panel clarified in our reply, our intent was to request that USACE highlight the unique ecological functions of the riverine wetlands in the project area resulting from current flooding conditions. USACE agrees in their final Response to do this in the EIS, so the Panel concurs with this approach. USACE suggests that it will pay more attention to the wetland hydroperiods defining the wetlands of the study area. There is still the debate on whether river or local flooding is more important. Since the former has been all but eliminated, of course the latter is more important now. The only place where a natural flood frequency might occur now is at the state park. It appears from the response that USACE will pay more attention in the document to the quality of the wetland resources as the Panel recommended.

Comment 17:
The water quality analysis in the Project Work Plan does not address water quality conditions in any of the study area water bodies and does not compare nutrient loads to the Mississippi River with and without project conditions.
USACE FINAL Evaluator Response 17
Based on discussions with the panel, USACE will conduct qualitative water quality assessments on waterbodies in the St. Johns Bayou and New Madrid Floodway project area as well as conduct an assessment that compares each alternative studied in to future without project conditions.
Final Panel BackCheck Response 17
Concur with comment and/or clarification. Recommendation 1: Concur with comment. The Panel recommended that USACE conduct quantitative assessments of the impacts of the actual proposed project on waterbodies in the St. Johns Bayou/New Madrid Floodway. Based on discussions during the May 13, 2010 and May 17, 2010 teleconferences, USACE responded that they will conduct qualitative water quality assessments of project area waterbodies for each project alternative and compensatory mitigation. However, they provided no details on their methodologies. Lacking any details, it is not possible to determine whether their proposal is an appropriate basis for determination of mitigation of project impacts. The Panel believes there should be three objectives for conducting the recommended water quality assessments: (1) establish baseline conditions without the project; (2) determine whether existing water quality conditions support the intended uses of these habitats with the proposed project; and (3) determine potential impacts of the actual project and compensatory mitigation. The first two objectives can be met by analyzing baseline monitoring data without the project. The third objective can only be met by conducting routine monitoring after the project and compensatory mitigation are initiated. USACE stated they will conduct a query of agencies and academic institutions that would be sources of water quality data in the project area. A possible outcome of this query is that existing water quality data are not adequate to accomplish the first two of the above three objectives. In this case, USACE should conduct baseline monitoring to acquire these data before the project and any compensatory mitigation are initiated. In the event that the project goes forward, USACE should conduct follow-up monitoring of these same waterbodies to determine potential impacts of the actual project and compensatory mitigation. Recommendation 2: Concur with clarification. USACE stated they will use differences in relative load estimates (similar to Ashby et al. 2000) to compare project alternatives. The differences in relative load estimates in Ashby et al. 2000 do not represent differences between current conditions and the actual proposed project. Instead, they compare nitrogen removal efficiencies at an assumed water surface elevation of 290 feet

NGVD between current conditions (without project) and with mitigation associated with restored acreage. None of the hydrologic scenarios in the Consolidated NEPA report was the actual project because each of them involved the same flooded acres at 290 feet NGVD, whereas the proposed project involves blocking the water level beyond 284.2 feet NGVD in the New Madrid Floodway.

As stated previously, the Panel believes that nutrient loads from the project area to the Mississippi River under current conditions (without project) should be compared to those with the actual proposed project. USACE took note of this comment and responded that they will conduct the assessment with the future without project conditions and for each of the project alternatives including compensatory mitigation. USACE should clarify that their proposed assessment will involve actual flooded acres for each project alternative and compensatory mitigation, and not the same flooded acres at 290 feet NGVD.

Comment 18:

The validities of several assumptions for the future without project alternatives are questionable.

USACE Final Evaluator Response 18

Based on preliminary numbers, there are a total of 4,526.8 acres of WRP easements in the project area (Kevin Dacey, NRCS, personal communication).

Year	# of easements	Acres
1995	2	2253.3
1998	5	338.6
2001	1	53.0
2003	2	606.1
2005	1	597.3
2006	1	95.1
2007	1	350.9
2010*	3	281.9

*applications not easements

These numbers will be confirmed in the EIS. Some of the existing WRP sites remain in agricultural production (see Phase 1 Consolidated EIS Appendix M page 341-343). Therefore, even if they have a WRP easement, it is appropriate to classify them as agricultural areas to determine appropriate value and function. Future WRP lands are difficult to estimate and likely have more to do with agricultural prices than whether or not the project is authorized. For example, there was not a dramatic increase in WRP enrollment after the Court decision. In fact, the greatest acreage enrolled occurred during the period when USACE was actively preparing for construction, including purchasing project related mitigation sites. Therefore, the panel's comment may not be correct. Regardless, the existing WRP lands found within the project area will be compared to areas outside the project area (including the batture area that remains subject to flooding) to determine if any changes to the future without project land use are necessary. USACE will coordinate with the NRCS as well as the interagency team to determine the appropriate amount of future without project WRP sites.

It is appropriate to assume that existing drainage ditches will be maintained. As seen during the IEPR site visits made in August 2009, the St. Johns Levee and Drainage District has recently completed maintenance activities that involved channel cleanout on all of their ditches. The drainage district has easements to perform necessary channel maintenance regardless if the lands are enrolled in WRP or not. However, USACE concurs with the panel that smaller ditches that drain specific fields would likely be blocked/removed to restore hydrologic function. USACE intends to conduct this practice as well on compensatory mitigation sites and take the appropriate credit.

The State of Missouri's plan for Big Oak Tree State Park did not include a plan to restore the Mississippi River connection to the park, or increase the size of the park. It only provided funds to use an alternative to Mississippi River (ground water or a pump installed in St. James Bayou). As indicated in Phase 2 IEPR comment 16, "The river connection allows the exchange of nutrients between the wetland systems and the river, which is a unique aspect of riverine wetland

function." Therefore, it is reasonable to assume that the connection of Big Oak Tree State Park to the Mississippi will not be restored without this project, or specific modification/authorization of the Mississippi River and Tributaries Project. Nonetheless, the State of Missouri will be contacted to determine if they have a plan to restore the park independent of this project.

Final Panel BackCheck Response 18

Concur with comment.

As part of the response to 18a the USACE states "*Regardless, the existing WRP lands found within the project area will be compared to areas outside the project area (including the batture area that remains subject to flooding) to determine if any changes to the future without project land use are necessary*." The Panel agrees this approach is adequate to address the potential impact of future without project on WRP easements.

USACE appears to be asserting that because MDNR plans to restore hydrology to the Big Tree State Park did not include a plan to directly connect it to the Mississippi River, it is equivalent to no change without the project; the panel does not agree with this assertion. While connectivity to the river is the preferred method of improving the hydrology to the park, improving hydrology through other methods would certainly be beneficial and should be considered a change without the project. Based on the September 8, 2010 conference call, USACE has agreed to meet with the MDNR to determine level of hydrologic restoration to the Big Tree State Park the MDNR could realistically achieve if the proposed USACE St. Johns Bayou and New Madrid Floodway, Missouri Project was to not go forward. USACE will then determine credit for mitigation conducted at Big Tree State Park based on increased ecological function above and beyond what would have been achieved under the MDNR planned hydrologic restoration.

Comment 19:
The potential impact of global climate change on the proposed project and the conceptual mitigation plan should be acknowledged.
USACE Final Evaluator Response 19
The comments provided will be used to expand the discussion of global climate change to the EIS. Preliminary analysis indicates that the authorized project would be extremely robust to any changes in future hydrology because pump operations and gate management can be modified as a result of any significant changes in precipitation/Mississippi River water levels. Moreover, the gate management/pump operation (*i.e.,* operating rule curve) has the capability to be flexible and can be modified for environmental/habitat reasons as well.
Final Panel BackCheck Response 19
Concur

Comment 20:
The gate closure and pump operation management alternatives proposed for St. Johns Bayou and New Madrid Floodway require further clarification.
USACE FINAL Evaluator Response 20
Preliminary plans call for allowing the river to come up to a certain elevation and closing the gates to provide flood protection. Pumps would be used to evacuate interior drainage. Gates would normally be re-opened once the Mississippi River recedes to allow for gravity drainage. A rapidly falling river in a highly drained project area will lead to the stranding and desiccation of eggs and larvae. Therefore, operating rules will consider multiple factors including flood damage reduction, maximization of periods when gates are open, and reduction of ramping effects that could strand eggs and larvae. The EIS will analyze opportunities that would allow the river to come up to certain elevations but will hold water to create a spawning and rearing pool for fish as well as habitat for other resources (shorebirds, waterfowl, etc.). Although this action would prevent ingress of individual fish when gates are closed constant access is not required for successful spawning and rearing. The spawning and rearing pool will provide habitat for those fish (individuals and species) that have already accessed the site during a rising hydrograph prior to gate closure. Re-opening the gates after a successful spawning and rearing period and a gradual drawdown would allow adult fish that had previously accessed the site and young of the year to egress into the Mississippi River. The EIS will discuss the overall timing of gate operation and the events that would trigger holding water or releasing water such as time of the year, temperatures, dissolved oxygen concentrations, river forecasts, precipitation forecasts, etc. Opportunities will be explored that maximize the exchange of water (and fish) from the Mississippi River and the spawning and rearing pool. In addition to fish benefits, the EIS will analyze management opportunities for other significant resource categories provided by the spawning and rearing pool. Based on panel recommendations made during the teleconferences, the fish access study will also be used to determine access restriction. If access is determined to be impacted through project monitoring the gate will be adaptively managed or mitigation in the batture area may be appropriate.
Final Panel BackCheck Response 20
Concur