



**US Army Corps
of Engineers**



Lower Missouri River Jefferson City L-142 Flood Risk Management Feasibility Study

Final Feasibility Report and Integrated Environmental Assessment

Appendix C1 Environmental

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DEPARTMENT OF
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SECTION 404(B)(1) EVALUATION

1. Introduction

This Section 404(b)(1) Evaluation is for the Lower Missouri River Jefferson City L-142 Flood Risk Management Study (hereafter referred to as the “Study”). This evaluation meets the requirements found in 40 CFR 230, Section 404(b)(1): Guidelines for Specification of Disposal Sites for Dredged and Fill Material. This supplemental evaluation is being conducted to assess effects of the federal interest plan, which is the only structural alternative included in the final array.

2. Project Description

- a. **Location:** The Jefferson City levee study area is at the southern edge of Callaway County, Missouri, along the left bank of the Missouri River from Turkey Creek (river mile 144.5) on the west to the approximate area of Nieman's Creek (river mile 140.5) on the east. Much of the area has been incorporated into the city limits of Jefferson City and is known informally as north Jefferson City. The study area is comprised of the area covered by the non-federal Capital View levee, which is essentially the floodplain between Turkey Creek and Nieman's Creek.
- b. **General Description:** The U.S. Army Corps of Engineers, Kansas City District (USACE) has partnered with the Missouri Department of Natural Resources for a flood risk management study. Flooding has frequently damaged the area on the left bank of the Missouri River near Jefferson City near Missouri River Mile 142 in central Missouri. This area has seen repeated flood events that overtop and breach the existing non-federal Capital View levee.

There is a need to identify flood risk management measures that could address these concerns. Although life loss has not been recorded to date, there is still life loss potential. While overtopping events of the levee generally have days of warning time, breaches prior to overtopping can happen suddenly. Once the Capital View Levee overtops (or breaches), those in the immediate vicinity of the airport have only about 2 hours to safely complete any evacuations. In addition to property and structures in the leveed area, U.S. Highway 54 is a major thoroughfare for the region. The highway closes when the water surface reaches an elevation of approximately 558 feet above sea level. The existing Capital View levee protects important local infrastructure, including a large manufacturing facility, a regional airport, a Missouri Air National Guard facility, a wastewater treatment plant, and other businesses and public enterprises. The purpose of the proposed federal action is to achieve reduction to the potential risk of loss of life as well as reduce economic damages due to flooding.

USACE has formulated a number of alternatives in order to achieve the purpose and need of this study. After screening and evaluating these alternatives, USACE has identified Combined Alternative 13 (CA13) as the federal interest plan because it is the most comprehensively beneficial plan to address the study's purpose and need. The federal interest plan is described in greater detail in the main body of the feasibility report and is summarized here:

- Construction of an approximately 6-mile-long federal levee landward of the alignment of the existing Capital View levee.
- Removal of the existing Capital View levee west of U.S. Highway 54. The remaining levee would be left in place.
- Regenerate floodplain forest habitat on 45.4 acres of publicly owned land for mitigation. This land would have its floodplain hydrology restored by the removal of the Capital View levee.

Two additional alternatives are fully evaluated in the environmental assessment (EA). First, the No Action Alternative (CA0) in which no federal action would be undertaken. Second, the nonstructural alternative (CA11) in which a collection of nonstructural measures would be used to reduce the impacts of flooding. These include structure floodproofing, structure elevation, and buyouts of properties that are prone to flood damage. Neither of these two alternatives would have any impacts on water resources.

USACE has identified the federal interest plan as the most comprehensively beneficial plan of all alternatives in the final array. The federal interest plan would be expected to have the greatest economic benefit at the national and regional scales.

The federal interest plan would be expected to cause adverse environmental impacts in the short term but cause beneficial effects in the long-term. In the short term, the construction of the new levee would require the loss of some currently existing habitat. Habitat is scattered throughout the study area, though due to the area's development for agriculture and industry, this habitat is of generally low value. Some forested areas would need to be cleared, and some wetland areas would need to be filled in under the federal interest plan. Other short-term impacts would include minor impacts to noise, air quality, recreation, and traffic. However, the federal interest plan benefits habitat over the long-term in two ways. First, the removal of the western part of the Capital View levee would expand floodplain access for both the Missouri River and Turkey Creek, which is a small tributary to the Missouri River. Habitat within this hydrologically reconnected area would benefit from more flooding patterns, which the native wetland and riparian species are adapted for. Second, the federal interest plan would regenerate approximately 45.4 acres of floodplain forest habitat within the hydrologically reconnected part of the floodplain for mitigation. This area is mostly maintained as farmland under existing conditions but would be converted to riparian habitat after borrow collection activities.

- c. Authority:** Section 216 of the Water Resources Development Act (WRDA) of 2020 authorizes modifications to projects in Iowa, Kansas, Nebraska, and Missouri authorized under the Pick-Sloan Missouri River Basin Program and the Missouri River Bank Stabilization and Navigation project, including modifications to the authorized purposes of such projects to further flood risk management and resiliency. The L-142 Levee System in Jefferson City is within the authorized scope of WRDA 2020. Additionally, Jefferson City was identified within the Memorandum for Commanding General, U.S. Army Corps of Engineers (USACE) Subject: Implementation Guidance for Section 216 of the Water Resources Development Act 2020, Lower and Upper Missouri River Comprehensive Flood Protection as a spin-off study that was coordinated with the non-federal sponsor for consideration for implementation.

3. Review of Compliance (40 C.F.R. § 230.10)

- a. No practicable alternative to the federal interest plan would have a less adverse impact on the aquatic ecosystem. The full array of alternatives evaluated is provided in **Section 3.4** of the feasibility report. While CA11 would not cause any adverse impacts to the aquatic ecosystem, it would not cause any beneficial effects either. The Missouri River's floodplain would remain in its artificially constrained existing condition under CA11. In contrast, the federal interest plan would set levee coverage landward, hydrologically reconnecting approximately 250 acres of floodplain to the Missouri River and its tributary Turkey Creek. In addition, the federal interest plan includes the conversion of approximately 45 acres to riparian forest habitat for mitigation. The Study's environmental appendix includes a habitat modeling and evaluation sub-appendix (see Habitat Modeling and Evaluation), which concludes that these benefits would result in a net long-term increase in the ecological value of floodplain habitat overall. However, the presence of wetlands throughout the project area makes impacts to these features unavoidable. Wetland impacts would be mitigated through the purchase of credits from a mitigation credit service (e.g., mitigation bank) within the watershed. **Section 4.1** of the feasibility report provides additional information on the impacts and benefits of CA11 and the federal interest plan.
- b. Based on current data and resources, the federal interest plan would not violate any applicable state water quality standards, nor applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act. The federal interest plan is not likely to jeopardize the continued existence of species listed as endangered or threatened under the Endangered Species Act of 1973, as amended, and would have no effect on federally designated critical habitat. Furthermore, the federal interest plan would not violate the requirements of any federally designated marine sanctuary.
- c. The federal interest plan would not cause or contribute to significant degradation of waters of the U.S. This includes no significant adverse effects on human health, life stages of organisms' dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values. While the federal interest plan would hydrologically reconnect approximately 250 acres of floodplain and convert approximately 45 acres to floodplain habitat, there would be unavoidable impacts to wetlands that would be mitigated through the purchase of credits from a mitigation credit service within the watershed. Thus, the implementation of the federal interest plan, including the riparian and wetland habitat mitigation, would not result in any significant impacts.
- d. Appropriate and practical steps have been taken which would minimize potential adverse impacts on the aquatic ecosystem. The proposed alignment of the levee avoids wetland areas to the extent practicable. Best management practices, such as silt fencing, would be used to minimize impacts to water resources outside of the construction footprint.

4. Technical Evaluation Factors (Subparts C-F)

a. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C)

- 1) **Substrate:** The federal interest plan would not have a significant adverse effect on substrate. No construction activities would be conducted in the Missouri River or Turkey Creek, and best management practices such as silt fencing would be used to minimize runoff from areas of ground disturbance. Thus, streams in the study area would not be anticipated to have an increase in substrate siltation. The conversion of farmland to riparian habitat may provide some benefit to substrate by filtering runoff, but any effect would be small and difficult to quantify.

Wetland areas within the construction footprint would be filled in with sediment to the point that wetland ecology could not be maintained. This material would be taken from other nearby parts of the Missouri River floodplain, making it qualitatively very similar to the substrate currently present in the affected wetlands.

In the Church Farm Conservation Area borrow site, wetlands would be excavated for levee construction material but would otherwise maintain their status as wetlands. The substrate within these impacted areas would consist of the lower laying soils and any excavated soils that were deemed unsuitable for levee construction and replaced. Because this substrate would already be characterized by saturated conditions (e.g., hyporheic water from the adjacent Missouri River) and because the wetland hydrology would not be altered by borrow collection, USACE anticipates the substrate in this location would continue to support wetland ecology. In the Capital View Area borrow site, wetlands would be removed to reduce potential wildlife-related air hazards for the nearby airport, so the substrate at this location would no longer be able to support wetland ecology.

Best management practices (e.g., silt fencing) would minimize runoff to wetlands outside of the construction footprint and borrow sites. This runoff would be physically and chemically very similar to the currently existing substrate present there anyway.

- 2) **Suspended particulates/turbidity:** Due to the use of best management practices such as silt fencing, runoff into the study area's streams and wetlands would be minimized. None of the waterbodies potentially affected by the federal interest plan are currently listed as impaired for sedimentation or turbidity by the Missouri Department of Natural Resources, nor are these waterbodies subject to any Total Maximum Daily Loads (TMDLs) for sedimentation or turbidity. USACE does not anticipate that the implementation of the federal interest plan would change that.
- 3) **Water:** Other impacts to water quality beyond those already discussed for turbidity are not anticipated. The levee setback in the federal interest plan would be constructed using soils that are already present in the Missouri River floodplain. Thus, new substances that could potentially alter the quality of the

water would not be introduced to the streams or wetlands. The Missouri River has TMDLs for chlordane and polychlorinated biphenyls (PCBs). The federal interest plan would not discharge either substance into any of the study area's water resources.

- 4) **Current patterns and water circulation:** USACE does not anticipate any meaningful impact to current patterns or water circulation as a consequence of the federal interest plan.
- 5) **Normal water fluctuations:** The federal interest plan would have beneficial effects to normal water fluctuations. The federal interest plan would not alter the amount of water in and around the study area, as this is generally determined by precipitation and other processes further upstream in the watershed. However, the federal interest plan would hydrologically reconnect approximately 250 acres in the study area by setting the levee back. During flood events, flood waters would be spread over a larger area which would more closely approximate natural conditions than the existing condition does. Analysis of the hydrologic and hydraulic impacts of the federal interest plan do not indicate that the alternative would cause adverse backwater impacts for the area's Missouri River tributaries, such as Wears Creek.
- 6) **Salinity Gradients:** The action alternatives would not impact any salinity gradients. The Missouri River, its tributaries, and its floodplain wetlands are a freshwater system, and this would not change as a result of implementing the federal interest plan.

b. Potential Impacts to the Biological Characteristics of the Aquatic Ecosystem (Subpart D)

- 1) **Threatened and endangered species:** An official list of federally protected species was generated using the U.S. Fish and Wildlife Service (USFWS) automated Information for Planning and Consultation (IPaC) website. This list of species potentially affected by activities within the study area includes pallid sturgeon (*Scaphirhynchus albus*; endangered), western regal fritillary (*Argynnis idalia occidentalis*; proposed threatened), monarch butterfly (*Danaus plexippus*; proposed threatened), gray bat (*Myotis grisescens*; endangered), northern long-eared bat (*Myotis septentrionalis*; endangered), Indiana bat (*Myotis sodalis*; endangered), and tricolored bat (*Perimyotis subflavus*; proposed endangered).

Best management practices would be used during construction, such as silt fences to minimize runoff of disturbed soils into the Missouri River or other waters. Disturbed areas would be reseeded to restabilize them. Thus, potential adverse impacts to pallid sturgeon would be negligible.

Tree clearing would be necessary under the federal interest plan, and site surveys have indicated that many trees in the study area offer suitable roosting for northern long-eared bats, Indiana bats, and tricolored bats. However, all tree clearing activities would occur during the winter hibernation period for these species, during which time they would not be using the study area's trees for roosting. Milkweed (*Asclepias* spp.) may be present within the project area. While

construction activities may result in some incidental removal of milkweed plants, USACE does not anticipate this would occur on a large scale and disturbed areas would be reseeded with native species, including appropriate milkweed species. Gray bats roost in caves year-round and, because caves are not known within the study area, no impacts to this species would be anticipated. Western regal fritillary inhabits large intact prairie tracts that are not present within the study area. Thus, no impact to this species would be expected.

For these reasons, USACE is making a “may affect, but not likely to adversely affect” determination for northern long-eared bat and Indiana bat. USACE concurred with this determination in an email dated 4 June 2025. USACE and USFWS agree that a determination of “not likely to jeopardize the continued existence of the species” is appropriate for the proposed listed species tricolored bat and monarch butterfly. In the event that the final listing of these species happens before the completion of this project, USACE would reinstate consultation. USACE is making a “no effect” determination for pallid sturgeon, gray bat, and western regal fritillary.

2) Fish, crustaceans, mollusks, and other aquatic organisms in the food web:

The wetlands that would be impacted by the implementation of the federal interest plan are highly disturbed by human development and activity and are fragmented from other aquatic resources, such as the Missouri River. Thus, the aquatic organisms that currently use these habitats would necessarily be tolerant of human disturbance. These wetlands do not generally exhibit pools or standing water, so fish and mussels would not be present. Any aquatic organisms present would very likely be amphibious (e.g., frogs) or capable of flight (e.g., waterfowl) because the fragmented distribution of these habitats requires traversal over dryer habitats in order to move from one wetland to another.

Habitat modeling has determined the federal interest plan would result in no net impact to wetlands and a net benefit to non-hydric habitat (see **Habitat Modeling and Evaluation**). The no net loss in wetland habitat value would be accomplished by purchasing mitigation credits, so there would still be a local disruption of habitat. However, these wetlands are relatively low quality and largely inhabited by disturbance-tolerant species for the reasons described in the previous paragraph. These wetlands are also scattered throughout the project area, and many would be unaffected by the implementation of the federal interest plan. For these reasons, the federal interest plan would not be expected to extirpate any aquatic organisms from the project area. It is unlikely that aquatic organisms would directly benefit from the regeneration of non-wetland habitat, though the expansion of floodplain forest could indirectly benefit aquatic organisms by filtering pollutants. However, because the federal interest plan would convert approximately 45 acres to floodplain forest at the project site, any indirect benefits to water quality would likely be small and difficult to quantify.

3) Other wildlife: The wetlands that would be impacted by the federal interest plan are not used exclusively by aquatic organisms. A variety of mammals, birds, and reptiles likely use these wetlands as habitat in addition to dryer habitats in the surrounding area. This wildlife would be comprised of edge and urban adaptive

species that are able to tolerate the substantial habitat disturbances that human activity has caused in the study area. While there would be a short-term impact to this wildlife resulting from the loss of wetlands, this impact would be minor since the affected habitat is of relatively low value and because the proposed levee alignment avoids this habitat to the extent practicable.

In the long-term, floodplain forest habitat would be regenerated at the Capital View Area, though this would only include non-wetland riparian habitat. The habitat modeling and evaluation provided in the feasibility report's environmental appendix concluded that there would be a net long-term increase of 16.1 average annual habitat units for floodplain habitat. Thus, the wildlife that uses this habitat would be expected to benefit from the federal interest plan in the long-term.

c. Potential Impacts on Special Aquatic Sites (Subpart E)

- 1) **Sanctuaries and Refuges:** No sanctuaries or refuges were identified in or adjacent to the area impacted by the Study.
- 2) **Wetlands:** As discussed throughout this evaluation, the federal interest plan would fill in or otherwise disturb wetlands. Wetlands are present throughout the study area in a variety of conditions. Some wetlands are dominated by emergent, herbaceous vegetation. Other wetlands are characterized by woody vegetation. This includes forested wetlands and scrub wetlands that are in an earlier stage of ecological succession that would eventually transition into forested wetlands. A large portion of the study area's wetlands have been developed for agriculture. These areas have their hydrologic and hydraulic conditions managed via ditching and other methods in order to support the growth of row crops. These farmed wetlands have soil conditions that are capable of supporting wetland hydrology and ecology, but this potential habitat is largely unrealized.

USACE assumes that all wetlands within the levee's construction footprint would be filled in and lost during the implementation of the federal interest plan. USACE assumes that all wetlands within the Capital View Area's borrow site would be removed to avoid wildlife-related air hazards for the nearby airport. USACE assumes that wetlands would be maintained at the Church Farm Conservation Area borrow site, which is much further away from the airport, but wetlands would still be impacted by excavation and vegetation clearing. USACE assumes that, by using best management practices such as silt fences, wetlands outside of the construction footprint and borrow sites would be generally unaffected.

Table 1. Summary of Affected Wetland Areas

Wetland Types	Acres Lost by Fill in the Capital View Area	Acres Lost by Borrow Excavation in the Capital View Area	Acres Impacted in the Church Farm Conservation Area	Total Affected Acres
Farmed Wetlands	20.5	0.3	161.8	182.6
Other Emergent Wetlands	0.5	0	0	0.5
Wooded Wetlands	1.1	0.2	27.1	28.4

The construction of the levee would impact wetlands along the alignment by filling them in and removing vegetation. USACE assumes that any potential utility relocation work would occur within this construction footprint. This would result in the permanent removal of approximately 1.1 acres of wooded wetland, 20.5 acres of farmed wetland, and 0.5 acres of other emergent wetlands. In addition, borrow activities in the Capital View Area would result in the permanent loss of an additional 0.2 acres of wooded wetland and 0.3 acres of farmed wetland. Wetlands are not present in the areas affected by removal of the existing levee, staging, or site access.

27.1 acres of wooded wetlands and 161.8 acres of farmed wetlands would be impacted by borrow excavation activities in the Church Farm Conservation Area. While this would include vegetation removal and the disruption of habitat, this area would be allowed to gradually recover its habitat by ecological succession after construction. USACE anticipates this area would continue to support wetland ecology in the long-term, but the temporary impacts associated with borrow collection would still require mitigation.

There are some wetlands within the Capital View Area that would benefit from the federal interest plan reconnecting part of the floodplain to the Missouri River due to the levee setback. However, the majority of these wetlands are located riverward of the currently existing Capital View Levee. For that reason, benefits to these wetlands would be minor and would not be enough to offset the impacts associated with construction and borrow collection. Cost-Effectiveness and Incremental Cost Analysis (CE/ICA) has determined that the most cost-effective way of mitigating these wetland impacts would be to purchase credits from a mitigation service within the watershed, such as a mitigation bank or in-lieu fee program (see **Habitat Modeling and Evaluation**).

- 3) **Mud flats:** No mud flats would be impacted by the federal interest plan.
- 4) **Vegetated shallows:** No vegetated shallows would be impacted by The federal interest plan.
- 5) **Coral reefs:** The area impacted by the federal interest plan does not provide the necessary environmental conditions to support corals.
- 6) **Riffle and pool complexes:** Riffle and pool complexes may be present in some of the Missouri River tributaries, such as Turkey Creek. However, the federal

interest plan would not directly impact these tributaries and would use best management practices to minimize potential indirect impacts. Thus, the federal interest plan would have no meaningful adverse effect on riffle and pool complexes.

d. Potential Effects on Human Use Characteristics (Subpart F):

- 1) Municipal and private water supplies:** None of the wetlands that would be impacted by the implementation of the federal interest plan provide water to municipal or private water supplies. Adverse impacts to the Missouri River and other streams would be negligible.
- 2) Recreational and commercial fisheries:** None of the wetlands that would be impacted by the implementation of the federal interest plan are used as recreational or commercial fisheries. Adverse impacts to the Missouri River and other streams would be negligible.
- 3) Water-related recreation:** The wetlands that would be lost under the federal interest plan do not provide any meaningful recreational value. The federal interest plan's impact to water-related recreation would therefore be negligible.
- 4) Aesthetics:** Short-term aesthetic impacts under the federal interest plan would be highly similar to other levee construction projects. Vegetation would be cleared for earthwork activities which would temporarily degrade the area's aesthetic qualities. Approximately 1.3 acres of wooded wetlands and 12.9 acres of non-wetland riparian wooded habitat would be lost during construction within the Capital View Area. In addition, approximately 0.5 acres of non-farmland emergent wetlands would also be lost, though these areas are generally represented by ditches alongside roads or agricultural fields and have little aesthetic value. Approximately 27.1 acres of wetland scrub habitat would be removed at the Church Farm Conservation Area for borrow collection, though this area would be allowed to recover over time. The federal interest plan includes the conversion of approximately 45.4 acres to floodplain forest habitat at the Capital View Area borrow site for mitigation. Overall, while there would be some minor short-term impacts, the habitat recovery and mitigation at the two borrow sites would result in long-term benefits to aesthetics.
- 5) Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves:** There are no known historic properties within the study area that would be adversely impacted by the federal interest plan. There would be no impacts to national seashores, wilderness areas, research sites, or other similar preserves.

5. Evaluation of Dredged or Fill Material (Subpart G)

- a. General evaluation of dredged or fill material:** Fill material consists of soils taken from the Missouri River floodplain in the Capital View Area and the Church Farm Conservation Area. These soils are comprised of alluvial material and are currently used for row crop agriculture. An analysis of hazardous, toxic, and radioactive waste (HTRW) records for the study area did not indicate any meaningful risk of HTRW contamination

of these soils. It is possible that these soils have elevated concentrations of potassium or nitrogen due to potential fertilizer application.

USACE would not anticipate the potentially elevated concentrations of nutrients in the fill material to cause meaningful adverse impacts because these nutrients would very likely be present in the affected wetlands anyway in similar concentrations. Of the approximately 22.1 acres of wetlands that would be filled in, 20.5 acres are farmed wetlands that would be fertilized for crop growth. The remaining 1.6 acres are wetlands adjacent to farmlands and would likely receive nutrients via runoff. By being filled in for levee construction, there would be no standing pools of water in the new levee alignment that would be at risk of eutrophication. Due to best management practices such as silt fencing, USACE does not anticipate that runoff from construction areas would cause any substantially increased nutrient concentrations in areas outside of the construction footprint.

- b. Chemical, biological, and physical evaluation and testing:** USACE does not anticipate that chemical, biological, or physical testing of fill material would be needed if the federal interest plan were to be carried forward for implementation. The borrow material that would be used to fill in wetlands does not appear to have any particular risk of contamination from HTRW substances. USACE does not anticipate that nutrients within the fill material would pose a substantial risk of adverse impacts.

6. Disposal Site Determination (40 C.F.R. § 230.11(f))

USACE anticipates that the construction footprint for the new levee alignment under the federal interest plan would cover approximately 223 acres. USACE expects that all wetlands within this footprint would be filled during construction. The affected wetlands do not generally exhibit standing or flowing water. Instead, these areas feature saturated soils that have the ability to support hydrophytic vegetation. These wetland areas include 1.1 acres of wooded wetlands, 20.5 acres of farmed wetlands, and 0.5 acres of other kinds of non-farmed emergent wetlands. These wetland areas are primarily concentrated in the eastern part of the Capital View Area.

An additional 266 acres would be affected by borrow excavation under the federal interest plan. An estimated maximum of 204,235 and 1,728,755 cubic yards of borrow material would be excavated from the Capital View Area and Church Farm Conservation Area borrow sites, respectively. While USACE anticipates removing wetlands in the Capital View Area to prevent standing water near the Jefferson City Memorial Airport, USACE anticipates the wetlands within the Church Farm Conservation Area would be maintained. Based on data provided by the Natural Resource Conservation Service Web Soil Survey, the soils excavated at these sites are considered primarily silt loam, clay loam, and silty clay. Thus, this material includes a mixture of silt, clay, and sand. Because the land within the construction footprint and both borrow sites is generally used for row crop agriculture, the soils in these areas are likely subject to the same kinds of pollutants (e.g., fertilizers). Thus, the placement of borrow material into the construction footprint would not likely introduce new pollutants to areas where they are not already present.

USACE has prioritized avoiding wetlands to the extent practicable. USACE prioritized avoiding wooded and non-farmland emergent wetlands to a higher degree than farmed

wetlands because these farmed areas currently offer very little value as habitat. Because best management practices such as silt fences would be used during construction, USACE expects that disposal of material outside the construction footprint and borrow areas would be minimal.

7. Actions To Minimize Adverse Effects (Subpart H)

USACE has minimized adverse impacts by designing the proposed levee alignment to avoid wetland areas to the extent practicable. Complete avoidance of wetlands is not practical for any levee alignment in this area because wetland areas are scattered throughout the floodplain, which is typical for this environment. USACE has sought to avoid non-agricultural wetlands to a higher degree than farmed wetlands. This is because the non-agricultural wetlands offer a comparatively higher value as habitat compared to the farmland areas, which have lost most of their habitat value.

USACE would also implement best management practices to further minimize adverse effects. These practices would include things like silt fences, which would minimize runoff from the construction silt that might otherwise cause siltation in wetlands and other waterbodies. Because the federal interest plan would disturb more than one acre of soil, a National Pollutant Discharge Elimination System (NPDES) stormwater permit issued by the Missouri Department of Natural Resources would be obtained prior to construction activities. USACE would implement all best management practices required by that permit, as appropriate.

8. Factual Determinations (§230.11)

A review of the information in items 4 through 7 of this report indicates that there is minimal potential for short-term or long-term adverse environmental effects due to the implementation of the federal interest plan. USACE anticipates that the long-term environmental effect would be beneficial due to the expanded hydrological connection between the Missouri River and Turkey Creek with the floodplain and the conversion of approximately 45 acres to natural riparian habitat.

Cumulative impacts are impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (RFFAs), regardless of what agency or person undertakes these other actions. Analysis of these actions include their direct effects and their indirect, secondary effects. Secondary effects are effects associated with a discharge of dredged or fill material but do not result from the actual placement of this material. For example, the habitat benefits resulting from habitat mitigation under the federal interest plan would be considered a secondary effect of that alternative. The study area has been impacted by a variety of past, present, and RFFAs. Past and present actions that have contributed to the existing conditions of resources of interest include:

- **Crop Production** – The conversion of land from native habitat to crop production. Extensive acreage of floodplain habitat within the study area has been removed for agriculture. While some habitat is still present, it is generally disturbed and fragmented.
- **Floodplain Development** – The development of land for residential, commercial, and industrial purposes. Bridges, highways, local roadways, and utility lines have

all been constructed in the study area as well. This has further contributed to the loss and fragmentation of native habitat.

- Levees – The placement, design, and management of structures intended to prevent or control floodplain inundation. In addition to removing habitat during construction, levees also degrade habitat on the landward side by interfering with natural floodplain hydrology that many floodplain species are adapted to. By constricting floodplain flows during high water events, these levees also have the effect of increasing water surface elevation on the riverward side.
- Missouri River Bank Stabilization and Navigation Project (BSNP) – The BSNP consists mainly of rock pile structures and revetments along the outsides of bends and transverse dikes along the insides of bends to force the river into a single active channel that is self-maintaining. As authorized, the BSNP provides a 9-foot-deep channel with a minimum width of 300 feet during the navigation season from April 1 to November 30 between Sioux City, Iowa, and the mouth near St. Louis, Missouri. The need for maintenance dredging dropped sharply in the early 1970s as a result of the structures' confining features. The navigation project is maintained by placing river training structures to confine and direct the channel.
- River Transition Overlay Annexation – Jefferson City, MO has designated the study area as the River Transition Overlay Annexation in response to the flood risk that the area is subject to. According to this designation, this area needs "additional scrutiny in regard to development in and around the floodplain, flood prone areas, or environmentally sensitive features." This regulates development within the study area.

USACE assumes that the River Transition Overlay Annexation would be maintained throughout the period of analysis. USACE assumes currently existing infrastructure within the study area would be maintained. USACE is unaware of any current or planned proposals that would substantially alter the presence or operation of businesses and other facilities within the study area. Regardless, USACE has identified several reasonably foreseeable future actions that may cause impacts in or around the study area.

- Lower Missouri River Flood Risk and Resiliency System Plan (System Plan) – The System Plan is a USACE study that seeks to improve resiliency to flood risk across the entire Missouri River floodplain from Sioux City, Iowa to St. Louis, Missouri. The System Plan identifies potential spin off studies that would have the objective to reduce public safety risk and economic damages due to flooding impacts along the Missouri River. The study documented in this FR/EA is one such spin-off study, and USACE is currently in progress with two other spin-off studies. The System Plan itself does not contain any construction recommendations, though it does identify potential themes for future spin-off studies, such as increasing conveyance through levee setbacks. The goal of the System Plan is to identify potential future spin-off studies and unify the studies undertaken so that their recommendations are compatible and work

synergistically to address flood risk across the entire lower Missouri River floodplain.

- Jefferson City Memorial Airport Master Plan – The Jefferson City Memorial Airport Master Plan makes a number of recommendations regarding the facility. These recommendations include the partial relocation of one runway; the extension and widening of another runway; the expansion of the terminal area with box/corporate hangars; improvements to perimeter fencing, the gate, and overall security; and a new location for the air traffic control tower. USACE assumes that these recommendations would be carried forward for implementation of which alternative is recommended in this FR/EA.
- Highway and Roadway Projects – MODOT has a number of planned or ongoing projects in and around the project area, such as pavement resurfacing, guardrail replacement, bridge maintenance and rehabilitation, and highway widening. Such actions are typical for roadway maintenance, and USACE assumes that activities such as these would occur throughout the period of analysis.

Past actions have substantially altered the surface water and other aquatic resources in and around the study area. The BSNP has engineered the Missouri River into a single-threaded channel, and the levees constructed along most of its floodplain have hydraulically constricted the river. By preventing floodwaters from spreading over the entire floodplain and by constructing hydraulic pinch points, water surface elevations during flood events have been restricted in footprint and made vertically more severe when compared to natural conditions. Developments that have altered the land use of the Missouri River floodplain have also resulted in the widespread loss of wetland habitat that was otherwise common historically. Present and ongoing actions are not substantially altering these aquatic resources further and instead have the effect of largely maintaining these disturbed conditions. However, soil disturbing activities and the use of fertilizers for agricultural and residential land do have adverse impacts on water quality. Jefferson City's adoption of a River Transition Overlay Annexation has had the beneficial effect of adding scrutiny for developments around environmentally sensitive features.

The levee constructed under the federal interest plan would be one of many within the Missouri River floodplain. In order to evaluate the cumulative effect that the federal interest plan's levee would have with these other currently existing levees, USACE's hydraulic modeling evaluated the reach from Boonville, MO near Missouri River Mile 197 to Hermann, MO near Missouri River Mile 98, extending roughly 50 Missouri River miles upstream and downstream of the study area.

Of the RFFAs, the System Plan is perhaps the most noteworthy for aquatic resources. Actions proposed under the Jefferson City Memorial Airport Master Plan and the various planned highway and roadway projects are expected to have negligible hydraulic impacts. Under the System Plan, USACE anticipates that a variety of flood risk studies similar to the report this evaluation is a part of would be undertaken throughout the Missouri River floodplain between Sioux City, Iowa and St. Louis, Missouri. USACE anticipates that these future studies would formulate potential measures to address flood risk similar to measures formulated in this study. At this early stage, it cannot be fully

determined how many of these studies would be undertaken, where precisely they would be located, what recommendations they would make, or how many recommendations would be carried forward for implementation. However, it can be assumed that these other studies would have the objective to reduce public safety risk and economic damages due to flooding impacts along the Missouri River.

The two other ongoing studies under the System Plan are located around Brunswick, Missouri and Holt and Doniphan Counties in Missouri and Kansas, respectively. These locations are beyond the hydraulic modeling extent of this study. Modeling done for the federal interest plan indicates that this alternative would not meaningfully impact hydraulics at the locations of these other studies, as the federal interest plan's hydraulic effects attenuate into negligibility within the modeled extent. USACE assumes that any recommendations made at these locations, if implemented, would be far enough removed from the area modeled in this study to have a negligible potential for adverse cumulative effects with the federal interest plan. Any ongoing or future studies conducted under the System Plan would also be evaluated for their potential to have hydraulic impacts, on both an individual scale and cumulatively with other past, present, and reasonably foreseeable future actions. Thus, based on the modeling results for the federal interest plan and the assumptions that can be safely made about the System Plan and the studies that are and will be conducted under it, USACE does not anticipate substantial adverse cumulative impacts. The intent of the System Plan is to organize these various studies and promote recommendations that are compatible such that they would have a cumulatively beneficial effect on flood risk resiliency.

The federal interest plan would result in some disturbed wetlands being lost due to levee construction and borrow excavation. While this would cause adverse effects in the short-term, the federal interest plan would also allow floodplain wetland habitat to regenerate and recover at the Church Farm Conservation Area borrow site. Based on the habitat modeling provided in this appendix (see **Habitat Modeling and Evaluation**), the overall impact of the federal interest plan on wetlands would be a net loss of 1.6 average annual habitat units (AAHUs) of wooded wetlands and 8.9 AAHUs of emergent wetlands. CE/ICA has determined that purchasing mitigation credits from a credit service within the watershed would be the most cost-effective way of mitigating this impact, and therefore the federal interest plan would result in no net loss of wetlands. While RFFAs within the project area (e.g., actions proposed under the Jefferson City Memorial Master Plan) could also result in the loss of wetlands locally, USACE would not anticipate a significant cumulative impact to this resource. This is because the RFFAs identified within the project area would generally modify currently existing infrastructure (e.g., roadway maintenance or widening projects), and wetlands are not generally within the immediate vicinity of these features. Thus, USACE anticipates a very minor effect on wetlands from these RFFAs.

Historically, the study area would have exhibited a wider diversity of fish and wildlife species. However, past actions have resulted in most of the original habitat being lost and left the surviving habitat degraded and fragmented. Thus, species in the study area are generally edge and urban adaptive species that can tolerate these kinds of conditions. This has blunted further impacts that could be caused by present actions, and most ongoing actions in the study area occur in locations that are already

developed. The River Transition Overlay Annexation has had the beneficial effect of adding scrutiny for developments around environmentally sensitive features that might be used by fish and wildlife. The federal interest plan would have minor impacts to fish and wildlife in the short term, though this resource would benefit from the regeneration of floodplain habitat in the long-term. Activities around the Jefferson City Memorial Airport, highways, and roadways would have little effect on the study area's fish and wildlife and would have a negligible potential to counteract the federal interest plan's long-term benefits to fish and wildlife.

This discussion is focused on Indiana bat, northern long-eared bat, tricolored bat, and monarch butterfly because these are the only threatened or endangered species that are potentially affected by the federal interest plan. Past actions have removed much of the forested habitat that provides summer roosting locations for these tree-roosting bats. Present activities may remove trees from time to time, but forested habitat is not generally removed in noteworthy quantities. The federal interest plan would remove approximately 37.4 acres of wooded habitat during construction, though tree removal activities would be timed to occur during the winter hibernation period for these species. In contrast, on-site mitigation at the Capital View Area borrow site under the federal interest plan would convert approximately 45.4 acres to forested habitat, which would benefit these species in the long-term. In addition, the approximately 27.1 acres of cleared scrub habitat in the Church Farm Conservation Area borrow site would be allowed to recover over time, further lessening the impact of tree removal. Tree removal may also be necessary for actions proposed in the Jefferson City Memorial Airport Master Plan and for planned projects involving the study area's highways and roadways. However, trees are generally sparse in the immediate vicinity of the airport, highways, and roadways, so USACE does not anticipate substantial loss of summer roosting habitat for listed bats resulting from these RFFAs. Therefore, USACE would not expect a substantial adverse cumulative impact to Indiana bat, northern long-eared bat, or tricolored bat.

Past actions have likely resulted in lost pollinator habitat suitable for monarch butterfly, and ongoing land maintenance activities likely prevent the recovery of this habitat to some extent. The federal interest plan may result in the incidental loss of some milkweed (*Asclepias* spp.) plants, and some RFFAs involving construction activities would have the potential for this as well. However, because the removal of these pollinator areas would be incidental and not systematic, USACE does not anticipate any meaningful potential for the project area or the lower Missouri River floodplain overall to lose its ability to support monarch butterfly. Therefore, USACE would not expect a substantial adverse cumulative impact to monarch butterfly.

The study area's original aesthetics have been substantially altered by past actions that have largely removed the native floodplain habitat. Present actions largely act to maintain these conditions. The federal interest plan would cause minor short-term aesthetic impacts during construction activities. This is likely also the case with the actions proposed in the Jefferson City Memorial Airport Master Plan and for planned projects involving the study area's highways and roadways. There would not be a substantial cumulative impact to aesthetics because construction-related disturbances are fairly common in the study area anyway, and the federal interest plan would be

beneficial in the long-term by expanding riparian habitat. In summary, there are not expected to be any substantial cumulative or long-term, secondary impacts as a result of the federal interest plan.

9. Findings (40 C.F.R. § 230.12)

The action alternatives have been evaluated and determined in compliance with Clean Water Act Section 404(b)(1) guidelines, with the inclusion of appropriate and practical conditions to minimize pollution and adverse effects on the aquatic ecosystem. Because the federal interest plan is the only alternative that would result in long-term benefits to floodplain hydrology and habitat, USACE identifies the federal interest plan as the least environmentally damaging practicable alternative.

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HABITAT MODELING AND EVALUATION

1. Introduction

During the development of feasibility reports, the environmental impacts of each alternative evaluated in detail by the U.S. Army Corps of Engineers (USACE) must be captured and quantified to better compare the alternatives, and if necessary, determine any compensatory mitigation that may be required. One method to evaluate the environmental impacts of alternatives is the Habitat Evaluation Procedure (HEP). HEP was developed by the U.S. Fish and Wildlife Service (USFWS) and evaluates the quality and quantity of available habitat for selected wildlife species or groups of species. HEP provides information for two general types of wildlife habitat comparisons. One, the relative value of different areas at the same point in time, and two, the relative value of the same area at future points in time. By combining these two types of comparisons, the impact of proposed land and water use changes on wildlife habitat can be quantified. HEP describes relative habitat value for selected wildlife species as a Habitat Suitability Index (HSI) with a value ranging from 0.0 (unsuitable) to 1.0 (optimal). This value is multiplied by the area of available habitat to obtain Habitat Units (HUs). To calculate habitat value over a period of time, such as a 50-year period of analysis, HUs are averaged on a yearly basis to provide Average Annual Habitat Units (AAHU).

1.1 Study Background

Unit L-142 is an unconstructed unit of the Missouri River Levee System (MRLS) authorized by the 1941 and 1944 Flood Control Acts (Public Law 228, 77th Congress, 1st Session, and Public Law 534, 78th Congress, 2d Session) on the left bank of the Missouri River at Jefferson City. In December 1973, Unit L-142 was classified "inactive" because USACE's 1960's restudy indicated it was not economically justified. The area that would have been landward of L-142 now sits landward of the non-federal Capital View levee. The Capital View Area is shown in **Figure 1**.

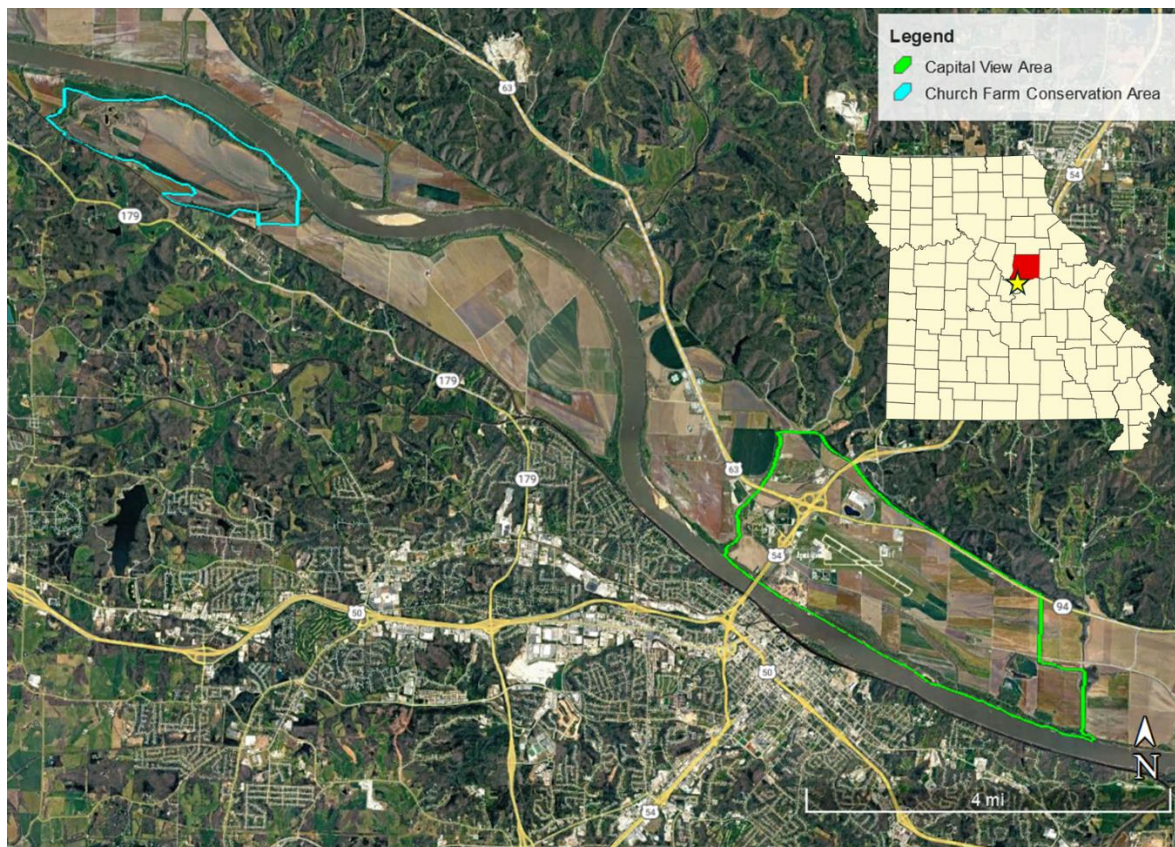


Figure 1. Study Location

Most recently, the 2019 flood caused extensive damages to agriculture and infrastructure in communities in the states of Iowa, Nebraska, Kansas, and Missouri. Specifically at Jefferson City, the Capital View leveed area was inundated in the aftermath of the flood, the four states formed the Flood Recovery Advisory Working Group to identify actions that could reduce systemwide flood risk, reduce reoccurring damages, and improve system resiliency. In addition to the system-wide evaluations as described below, Jefferson City was identified as a priority area for flood risk evaluation, prompting this site-specific feasibility study.

USACE is undertaking the Lower Missouri Jefferson City L-142 Flood Risk Management Study ("the Study") to identify alternatives to reduce the potential risk of loss of life as well as reduce economic damages due to flooding in the Capital View Area. USACE has identified the construction of a new federal levee set back from the existing non-federal levee, along with the removal of the Capital View levee west of U.S. Highway 54, as a viable means of achieving the Study's purpose and need. USACE has identified this levee setback alternative as the federal interest plan (see **Figure 2**).

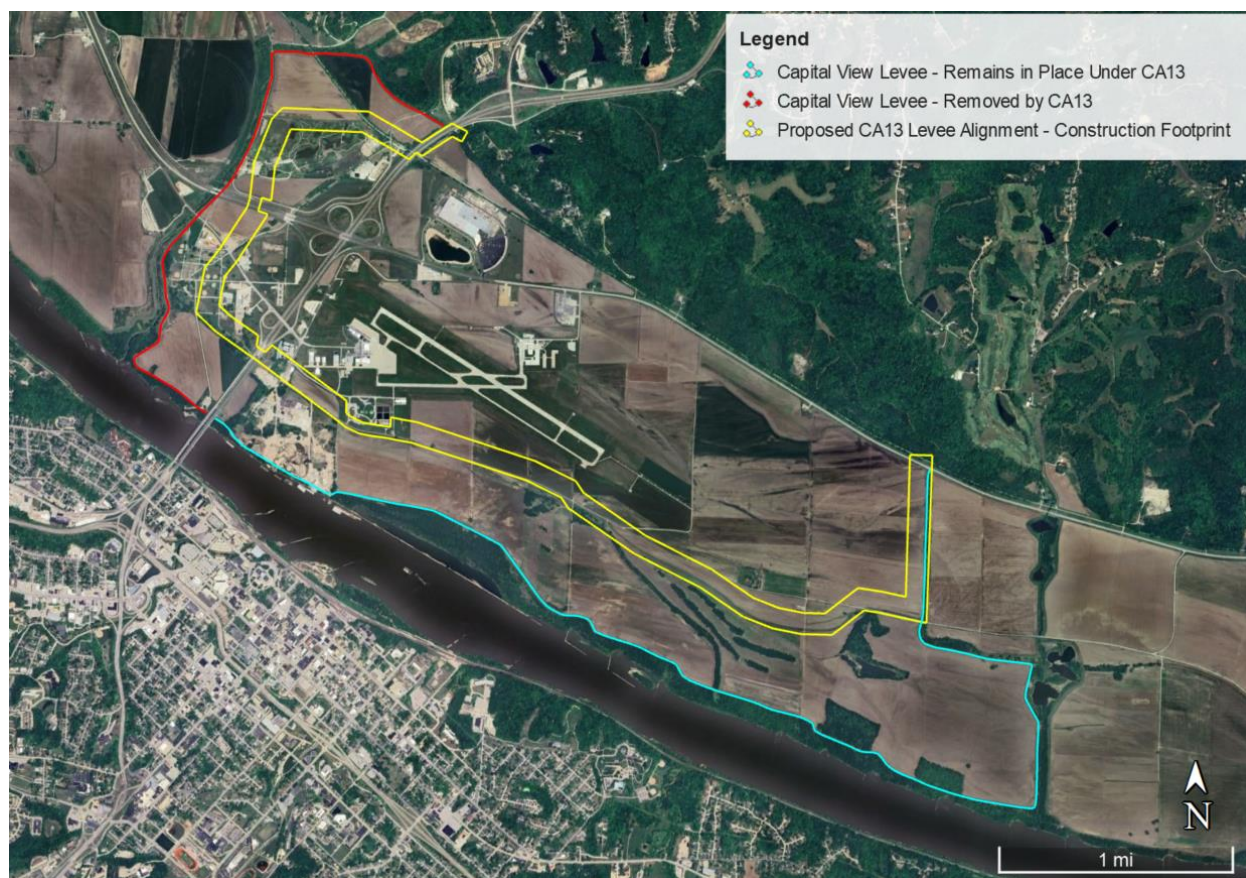


Figure 2. Levee Setback under the Federal Interest Plan

1.2 Habitat Suitability Index Selection

USACE elected to use the Functional Assessment of Colorado Wetlands (FACWet) Method 3.0 model for the Study based on four factors. First, it is necessary to use a model that has been certified or approved by the National Ecosystem Restoration Planning Center of Expertise per Engineer Circular 1105-2-412. The FACWet model has been approved for regional use within the civil works boundary of the Kansas City District. This regional approval expires 13 January 2028.

Second, the study setting consists of Missouri River floodplain and exhibits heterogeneous habitat. Historically, the Missouri River floodplain featured an array of aquatic and terrestrial habitats, such as backwaters, oxbows, emergent wetlands, and floodplain forests. While these habitats have been greatly diminished and degraded relative to their historic condition, it is still typical across much of the Missouri River floodplain for multiple habitat types to be present. The Capital View Area exhibits wetlands and riparian habitats dominated by herbaceous, scrub-shrub, and forest species, though all of these habitats share many qualities due to their placement in the Missouri River floodplain (e.g., hydrology characterized by periodic river flooding). The FACWet model is broadly applicable to floodplain habitats such as these, and this circumvents the needs for multiple ecological models which could become too cumbersome for efficient comparison of alternatives.

Third, the FACWet model does not rely on the habitat requirements of any one species and instead evaluates an array of habitat qualities that are relevant to a larger number of local

species. Under some circumstances, models that are focused on the habitat needs of a single, particular species can introduce uncertainty into the applicability of the analysis. For example, if the selected model is for animals with habitat requirements that are unrepresentative for most of the local fauna, the degree of environmental impact expected from a proposed action may be misjudged. The FACWet model avoids this by eschewing focus on a particular subject species and instead uses habitat variables that are applicable to wide array of species.

Fourth, while the FACWet model uses data for a variety of habitat values, scoring is designed to be a rapid process in which multiple sites can be evaluated within a relatively short time. This is an important quality for USACE feasibility studies in which multiple alternative plans need to be compared to one another within a reasonable timeframe. USACE selected the FACWet model because it is thorough enough to make the results of its analysis reliable while being rapid enough to be compatible with feasibility-level analysis.

1.3 FACWet Model Overview

The FACWet method is a weight-of-evidence approach based on hydrogeomorphic theory. In routine application, FACWet utilizes the best evidence available through desktop analysis and field verification within a rapid assessment timeframe to develop and support ratings for eight variables. Variables are rated based on the severity and extent that identified stressors cause departure from a reference standard condition. FACWet deconstructs the function of the assessed area through three primary attributes: 1) Buffer and Landscape Context, 2) Hydrology and 3) Abiotic and Biotic Habitat. These three primary attributes are quantified by stated variables (see **Table 2**) and in some cases, sub-variables. A weight has been assigned to each category, and the resultant Functional Capacity Index (FCI) is produced on a 0.00 to 1.00 scale, with a 1.00 rating indicating a pristine/reference standard condition (Johnson et al., 2013).

Table 2. Summary of FACWet Attributes, Variables, and Sub-variables with Associated Weighting

Attribute	Variable Number	Variable Name	Sub-Variable Name	Total Weight of Variable in Composite FCI
Buffer and Landscape Context	V1	Habitat Connectivity	SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.04
Buffer and Landscape Context	V1	Habitat Connectivity	SV 1.2 Barriers to Migration and Dispersal	0.04
Buffer and Landscape Context	V2	Contributing Area	SV 2.1 Buffer Condition	0.11
Buffer and Landscape Context	V2	Contributing Area	SV 2.2 Buffer Extent	0.11
Buffer and Landscape Context	V2	Contributing Area	SV 2.3 Buffer Width	0.11
Buffer and Landscape Context	V2	Contributing Area	SV 2.4 Surrounding Land Use	0.11
Hydrology	V3	Water Source	No sub-variable	0.13
Hydrology	V4	Water Distribution	No sub-variable	0.17
Hydrology	V5	Water Outflow	No sub-variable	0.17
Abiotic and Biotic Habitat	V6	Geomorphology	No sub-variable	0.15
Abiotic and Biotic Habitat	V7	Chemical Environment	SV 7.1 Nutrient Enrichment	0.07
Abiotic and Biotic Habitat	V7	Chemical Environment	SV 7.2 Sedimentation / Turbidity	0.07
Abiotic and Biotic Habitat	V7	Chemical Environment	SV 7.3 Toxic Contamination	0.07
Abiotic and Biotic Habitat	V7	Chemical Environment	SV 7.4 Temperature	0.07
Abiotic and Biotic Habitat	V7	Chemical Environment	SV 7.5 Soil Chemistry and Redox	0.07
Abiotic and Biotic Habitat	V8	Vegetation Structure and Complexity	SV 8.1 Tree Stratum	0.15
Abiotic and Biotic Habitat	V8	Vegetation Structure and Complexity	SV 8.2 Shrub Stratum	0.15
Abiotic and Biotic Habitat	V8	Vegetation Structure and Complexity	SV 8.3 Herb Stratum	0.15
Abiotic and Biotic Habitat	V8	Vegetation Structure and Complexity	SV 8.4 Aquatic Stratum	0.15

Source: Derived from Johnson et al., 2013

Variable scoring is calibrated to parallel the academic grading scale (see **Table 3**) based upon a concise narrative description of the condition of the key driver of wetland health, rather than a measure of a process rate or unit. Specific instructions for scoring each variable are included on the individual FACWet datasheets but generally, a provided list of stressors is intended to capture the most common stressors that affect that variable. Based on the composite effect of all recorded stressors, an informal academic letter grade (“A” through “F” with a “+”/“-” scale) would be assigned. Criteria for scoring is based on overall level of variable alteration which is

provided on the FACWet datasheets (raw datasheets may be found in **Appendix A**). Following the narrative descriptions assigned using the FACWet datasheets, a decimal value between 0.00 and 1.00, would then be assigned to convert the letter grade to numbers so arithmetic operations may be performed (Johnson et al., 2013).

Table 3. Narrative Descriptions of FACWet Variable Scores

Score Range	Letter Grade	Narrative Condition Category	Interpretation
1.0 – 0.9	A	Reference Standard	Pristine or nearly so. Supports highest level of sustainable functioning.
<0.9 – 0.8	B	Highly Functioning	Stressors detectably alter the variable's form in minor ways. The variable still retains its essential qualities and supports a high level of ecological function.
<0.8 – 0.7	C	Functioning	Obvious alteration and degradation of the variable, but it still supports basic, natural, passive wetland functioning.
<0.7 – 0.6	D	Functionally Impaired	Major ecologically harmful alterations to the variable. Active management is commonly required to support maintenance of wetland characteristics.
<0.6	F	Non-Functioning	Massive deleterious alteration of the variable. The level of alteration generally results in an inability of the variable to support wetland conditions, or it otherwise makes the area biologically unsuitable.

Variable 1 – Habitat Connectivity

The Habitat Connectivity Variable (V1) in FACWet is described by the two sub-variables- Neighboring Wetland (SV1.1) and Riparian Habitat Loss and Barriers to Migration and Dispersal (SV1.2). SV1.1 measures how isolated from other naturally occurring wetlands, or in the case of this application, other habitat types such as riparian areas (e.g., bottomland hardwood forests) the Assessment Area (AA) has become as a result of habitat destruction within a 500-meter (m) zone called a Habitat Connectivity Envelope (HCE). SV1.2 rates the degree to which the AA has become isolated from existing neighboring wetlands and riparian habitat by artificial barriers that inhibit migration and dispersal of organisms within the HCE (Johnson et al., 2013).

Variable 2 – Contributing Area

The Contributing Area Variable (V2) is described by four sub-variables: Buffer Condition (SV2.1), Buffer Extent (SV2.2), Buffer Width (SV2.3) and Surrounding Land Use (SV2.4). These variables are measured within a 250m zone surrounding the AA. As land use intensifies around the AA, so does the potential that the landscape will make deleterious material contributions to the wetland, increase habitat isolation and/or generally elevate in stress on biota, particularly fauna. SV2.1 measures the functionality and composition of the vegetative buffer. SV2.2 assigns a score based on the percentage of the AA that has a vegetative buffer. SV2.3 is scored by randomly measuring the width of eight areas and averaging the measurements together for a total average vegetative buffer width. SV2.4 assesses the severity of impairment based on the surrounding land use. The four sub-variables are then averaged to assign a final score to V2 (Johnson et al., 2013).

Variable 3 – Water Source

The Water Source Variable (V3) has no sub-variable and assesses the upgradient hydrological connectivity. This is a measure of the AA water source, including the quantity and timing of water delivery as well as the water source's ability to perform sediment transport, erosion and soil pore flushing. Stressors are impacted by augmentation, depletion or alteration of inflow timing and hydrodynamics (Johnson et al., 2013).

Variable 4 – Water Distribution

The Water Distribution Variable (V4) has no sub-variable and determines hydrologic connectivity within the AA. V4 measures the alteration of the spatial distribution of surface and groundwater within the AA. This variable is scored based on stressors that alter flow patterns, impact the hydrograph and increase or decrease the depth and/or duration of the water table or surface (Johnson et al., 2013).

Variable 5 – Water Outflow

The Water Outflow Variable (V5) has no sub-variable and is concerned with the down-gradient hydrologic connectivity and flow of water and water-borne materials and energy moving out of the AA. V5 is a measure of impacts that affect the hydrologic outflow of water including the passage of water through its normal low- and high-flow periods, surface outlets, infiltration/groundwater recharge and energetic characteristics of water delivered to dependent habitats (Johnson et al., 2013).

Variable 6 – Geomorphology

The Geomorphology Variable (V6) has no sub-variable and is a measure to the degree to which the geomorphic setting within the AA has been altered. Such stressors may include fill, excavation, dikes, sedimentation, channelization, and hardened banks (Johnson et al., 2013).

Variable 7 – Water and Soil Chemical Environment

The Water and Soil Chemical Environment Variable (V7) is described through five sub-variables: Nutrient Enrichment (SV7.1), Sedimentation and Turbidity (SV7.2), Toxic Contamination (SV7.3), Temperature (SV7.4) and Soil Chemistry and Redox (SV7.5). These sub-variables measure the soil and water media within the AA, though the origin of stressors may occur outside the AA (e.g. non-point source pollution). These five sub-variables are averaged to produce a final score for V7 (Johnson et al., 2013).

Variable 8 – Vegetation Structure and Complexity

The Vegetation Structure and Complexity Variable (V8) is described through four sub-variables: Tree Stratum (SV8.1), Shrub Stratum (SV8.2), Herbaceous Stratum (SV8.3) and Aquatic Stratum (SV8.4). Each stratum coverage is recorded and compared to expected habitat types of the reference standard. Additional stressors, such as exotic/invasive species, mowing and dewatering, will also be factored into each sub-variable score. The sub-variables are then averaged to produce a final score for V8 (Johnson et al., 2013).

Functional Capacity Indices

After each variable score is calculated, they are used to calculate the FCIs. FCI is a rating of the capacity of the AA to perform a function relative to its reference standard. FACWet considers seven key functions performed by wetlands:

- Support of characteristic wildlife habitat
- Support of characteristic fish/aquatic habitat
- Flood attenuation
- Short-term and long-term water storage
- Nutrient/toxicant removal
- Sediment retention/shoreline stabilization
- Production export/food chain support

Each of these seven functions is comprised of variables which have the preeminent control over the level of functioning. While additional variables may play a role in creating a given function, if they are not a primary driver, they are not included in the FCI calculation. Furthermore, variables that play a more prominent role in driving a function are subsequently weighted higher. Once total functional points are calculated by adding the relevant variable scores together (and their associated weights) these points are averaged to provide a resultant FCI. An overall composite FCI is also calculated by averaging all seven functional category FCIs together.

Table 4 lists the interpretation of a FCI score (Johnson et al., 2013).

Table 4. Narrative Descriptions of FCI Scores Produced by FACWet Model

FCI Score	Functional Category	Interpretation
1.0 – 0.9	Reference Standard	AA if functioning or near its Reference Standard capacity.
<0.9 – 0.8	Highly Functioning	AA retains all of its natural functions. While the capacity of some or all have been altered somewhat, the function of the wetland is still fundamentally sound.
<0.8 – 0.7	Functioning	The capacity of some or all of the AAs functions has been markedly altered, but the wetland still provides the types of functions associated with its habitat type.
<0.7 – 0.6	Functionally Impaired	The functioning of the wetland has been severely altered. Certain functions may be nearly extinguished, or they may be grossly altered to be more representative of a different class of wetland (e.g., a fen converted to a depressional system). Despite the profound changes, the AA still supports wetland habitat.
<0.6	Non-Functioning	AA no longer possesses the basic criteria necessary to support wetland conditions.

2. Methods

The study area features wetland and riparian habitat in a variety of conditions. Some areas feature habitat that is functioning relatively similarly to historic habitat. However, other areas are very heavily disturbed and, in some cases, have essentially lost their ecological function. Because the FACWet model compares the assessed area to an example of “essentially pristine” habitat, model inputs can vary greatly depending on the specific area observed. For this reason, USACE has categorized the various kinds of extant habitat present at the study area. These categories are based on the primary vegetation layer (i.e., trees, shrubs, or herbaceous plants), successional trajectories, and the kinds of habitat degradations present. Field assessments by USACE personnel have determined that habitat areas that are similar in these qualities have essentially identical FACWet model inputs, so impacts to each category of habitat are considered collectively. These habitat categories are described in greater detail in **Section 2.1**.

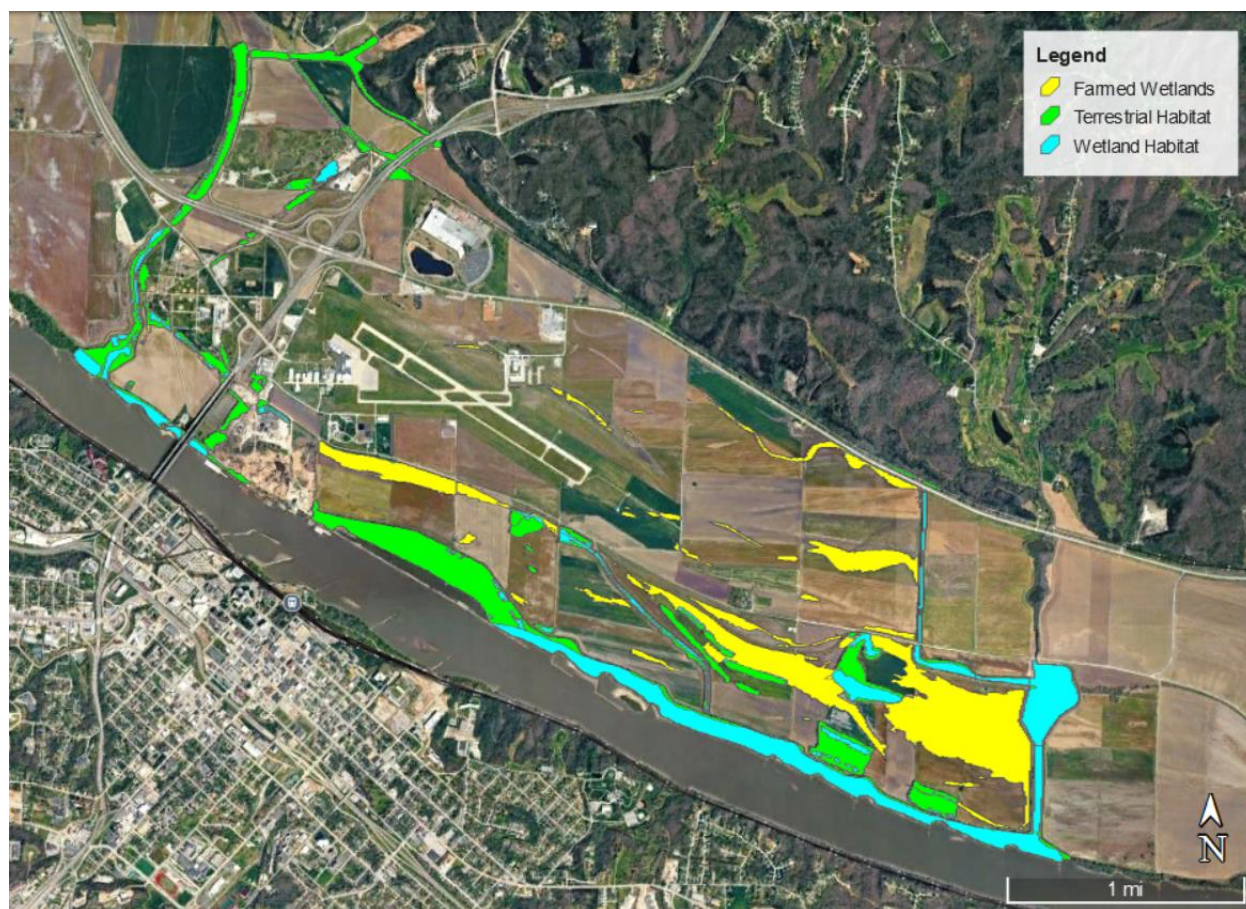


Figure 3. Map of General Habitat Types at the Capital View Area

2.1 Modeling Habitat Categories

Leveed Farmed Wetlands – These are areas that have the hydrologic and soil conditions to theoretically support the growth of hydrophytic vegetation and wetland ecology but are typically used for row crop agriculture. Because floodplain soils are so productive, huge swathes of the native Missouri River floodplain habitat that existed historically have been converted to agriculture. This is certainly true of the study area, as a majority of the area landward of the Capital View levee is used for row crop agriculture. The most obvious impact of this is on

vegetation. The majority of this land would have had woody vegetation on it under historical conditions (Bragg & Tatschl, 1977) and it also would have supported a diverse array of native herbaceous species in the understory.

Under the current conditions, corn and soybeans are typically planted in these fields which act as monoculture stands that crowd out the native species that were found here originally. The few non-crops that do manage to grow here while these fields are cultivated are generally weedy species, and farmers spend a considerable amount of effort to limit their presence. However, varying levels of saturation from year-to-year occasionally leave some of these areas temporarily unsuited for cultivation. Under these circumstances, it's common for these areas to be left fallow, which provides opportunities for emergent wetland species to grow. Such growth is often characterized by graminoids (e.g., sedges) and forbs. While these fallow areas are still regularly cleared to keep them available for agriculture, small woody plants may also be present in some capacity. These frequent disturbances to the plant community often promote the presence of invasive species such as reed canary grass (*Phalaris arundinacea*).

The Capital View levee cut offs this habitat's surface water connection with the Missouri River and greatly reduces this habitat's hydrological inputs. In addition to this, agricultural land generally features ditches or similar features to drain the land and make it more suitable for planting crops. Thus, wetland hydrology is greatly threatened in this setting because water inputs are limited and the water that does make it to the habitat is drained away to the greatest extent possible. However, field investigations have indicated that the soil in these areas does feature hydric qualities, and aerial imagery indicates that in some years conditions are too wet for cultivation. This suggests that the land has not entirely lost its ability to support wetlands in some capacity, even if limited. These areas are subject to numerous other degradations as well. Topographical depressions are frequently filled in to prevent ponding, fertilizers used to grow crops promote eutrophication, and the routine mechanical soil disturbance disrupts the natural soil chemistry, to name a few.

This kind of habitat category is also present within the borrow area located at the Church Farm Conservation Area. The primary difference in quality for this habitat category between the Capital View Area and the Church Farm Conservation Area is the fact that the levee surrounding the Church Farm Conservation Area has multiple breaches that have not been repaired. This results in a more natural hydrologic connection between the Missouri River and the floodplain located here. As a result, farmed wetlands in the Church Farm Conservation Area receive higher scores in the Water Source, Water Distribution, and Water Outflow variables than farmed wetlands in the Capital View Area. These levee breaches, along with the greatly reduced presence of roadways, also result in a higher score for the Migration / Dispersal Barrier variable. The generally wetter conditions in the Church Farm Conservation Area appear to result in a greater amount of farmland left fallow in any given year. Because of this reduced degree of disturbance, farmed wetlands in the Church Farm Conservation Area also score more highly in the Water and Soil Chemical Environment variables and Vegetation Structure and Complexity variables. However, this increase in relative value and ecological output is only modest because these areas are still managed as farmland, which greatly disturbs natural habitat through agricultural practices (e.g., hydrology impaired by ditching).

While many methods of wetland delineation use the presence of hydrophytic vegetation, this cannot be used to delineate farmed wetlands since they have lost most or all of their native vegetation when not left fallow. Instead, USACE has opted to use the presence of hydric soil

indicators to identify the boundaries of farmed wetlands. These indicators suggest that these areas would be amenable to wetland restoration, and thus impacts here (e.g., land development) could result in the loss of potentially restorable habitat and therefore warrant mitigation. While the study area is relatively flat, USACE field investigations of the study area found that hydric soils were generally associated with lower elevation areas. This finding is intuitive since these are the locations that water would naturally flow towards. In the Capital View Area (i.e., the area in and around the Capital View levee), USACE personnel took soil samples in various locations within the study area and found that hydric soil indicators were generally common in samples taken at or below 540 feet above sea level. To account for natural variation and to take a conservative approach (i.e., assuming a greater level of potential impact), USACE is treating all farmland at or below 541 feet above sea level in the Capital View Area as farmed wetland for the purposes of habitat modeling. USACE used LiDAR data to evaluate surface elevation.

USACE applied a similar methodology for delineation in the Church Farm Conservation Area. However, this area is upstream from the Jefferson City area and therefore sits at a generally higher elevation. Based on aerial imagery, data from the USFWS National Wetlands Inventory, and data from the Natural Resources Conservation Service Web Soil Survey, USACE is treating all farmland at or below 548 feet above sea level in the Church Farm Conservation Area as farmed wetland for the purposes of habitat modeling. Based on aerial imagery, it appears that levee breaches at this location have resulted in some additional farmland being too wet to cultivate in some years. Thus, USACE is treating these additional fallow areas as farmed wetlands for the purposes of habitat modeling as well.

Leveed Non-Hydric Farmland – These are areas that are currently managed as farmland and are not expected to have soil conditions favorable to the growth of hydrophytic vegetation. Naturally, these areas would have supported riparian vegetation such as floodplain forests. However, the plants that would have grown here would have been tolerant of better drained soils. As with farmed wetlands, these areas have been greatly degraded as a consequence of agricultural development. This habitat category is also present in the borrow area located at the Church Farm Conservation Area. However, because this habitat category still has its hydrology altered by agricultural practices and the soils here do not appear to generally support the growth of hydrophytic vegetation, USACE assumes that the levee breaches at the Church Farm Conservation Area do not meaningfully alter any of the assessed variables between this area and the Capital View Area.

Leveed Floodplain Forest – These are forested areas located landward of the Capital View levee. The canopy layer is generally comprised of species that are common to the Missouri River floodplain, such as eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), and American sycamore (*Platanus occidentalis*). Species such as these are generally considered early to mid-successional because they are adapted to rapidly colonizing new locations. Their presence is therefore not surprising since these forests are typically located on former farmland. This early to mid-successional character is also reflected in the shrub and herbaceous layers, which commonly feature weedy and invasive species. These forests are therefore only somewhat representational of the forest plant communities that were originally present in the study area.

While the hydrology of these forests is not as actively altered as farmed wetland areas, it still deviates from the natural condition substantially. The Capital View levee is the primary cause of

disturbance here, for the same reasons as described for farmed wetlands. Leveed forests are not drained however, allowing for somewhat improved hydrology compared to farmed areas. Since these areas have been farmed at one point in time, legacy effects probably have some influence. For example, the topography of these areas may have been altered at some point in the past to make them more suitable for agriculture. These forests are typically located right next to farmland, which causes further impacts. For example, fertilizer used on farmland can wash off into the adjacent forests, resulting in eutrophication.

This habitat category includes some areas which meet the requirements of the wetland delineation methodology outlined under the farmed wetland description. USACE treats these areas as wetlands as well, in addition to other potential wetlands identified by the USFWS National Wetland Inventory. This results in this habitat category including both wetland and non-hydric versions. Because these hydric and non-hydric areas appear to be generally subject to the same degradations and maintain similar conditions, USACE uses the same assumptions for these areas for the purposes of FACWet modeling.

Non-Leveed Missouri River Floodplain Forest – These are forested areas located between the Missouri River and the Capital View levee. Out of all of the habitat categories considered in this appendix, this kind of forest is most similar to historic floodplain forest. Being outside of the levee means that this habitat retains its full hydrologic connection with the Missouri River. The vegetation layers in this kind of forest appear to be superior to those of the leveed floodplain forests. Probable reasons for this include:

- A more natural hydrology promoting the presence of local species.
- Less active disturbance from human activities (i.e., lands that have been more-or-less left alone for a longer period of time).
- The Capital View levee acting somewhat as a barrier to runoff from agricultural areas.

However, these areas are still far too disturbed to act as a reference standard for the purposes of the FACWet model. While these forests appear to be subject to less disturbance than forests in the leveed area, these forests still have a history of tree clearing either to prepare farmland or simply to collect timber. Invasive species are still present in these forests as well, even if their presence is somewhat diminished when compared to leveed areas. While these forests are located outside of the levee, these forests still suffer from meaningfully altered hydrology. The Bank Stabilization and Navigation Project (BSNP) has engineered the Missouri River to be a self-scouring channel for navigation. In addition, most of the lower Missouri River's floodplain is leveed, which greatly restricts the river's hydrologic access to the floodplain. During high water events, these forests are subject to higher volumes of water flowing at higher speeds because the flow of the river is channelized and constricted. Under historical conditions, high water events would spread water out over much or all of the floodplain. The Capital View levee acts to prevent these floodwaters from spreading out over most of the floodplain at the study area, and so the non-leveed areas are subject to deeper flooding events at a higher frequency than normal. Likewise, depositional material becomes more concentrated in these non-leveed forests instead of being spread out over the entire floodplain.

This habitat category includes some areas which meet the requirements of the wetland delineation methodology outlined under the farmed wetland description. USACE treats these areas as wetlands as well, in addition to other potential wetlands identified by the USFWS National Wetland Inventory. This results in this habitat category including both wetland and non-

hydric versions. Because these hydric and non-hydric areas appear to be generally subject to the same degradations and maintain similar conditions, USACE uses the same assumptions for these areas for the purposes of FACWet modeling.

Non-Leveed Tributary Forest – These forests are generally similar to non-leveed Missouri River floodplain forests but are located along tributaries that feed into the Missouri River. The primary difference between these habitat categories is that the hydrologic connection these tributary areas have with the Missouri River is altered to a greater degree. Under historic conditions, flood events would spread water across much or all of the floodplain. This surface water flow would act as another kind of hydrologic input for these tributary areas, promoting the growth of plants that can manage these large flood events. Now that this surface water flow across the floodplain has been cut off, water inputs are generally limited to the upstream drainage and backwater from the main channel during highwater events. Additional restrictions on flow, such as the bridges that cross over these tributaries in multiple locations, further impact the natural hydrology.

These forests are generally very narrow because the adjacent levees are positioned to maximize the amount of farmland present. This has a large impact on the character of the forest and promotes the growth of species that are tolerant of regular disturbance (e.g., routine mowing along the edges of these habitats). Because of this, these areas appear to support vegetation similar to the leveed forest habitat areas.

This habitat category includes some areas which meet the requirements of the wetland delineation methodology outlined under the farmed wetland description. USACE treats these areas as wetlands as well, in addition to other potential wetlands identified by the USFWS National Wetland Inventory. This results in this habitat category including both wetland and non-hydric versions. Because these hydric and non-hydric areas appear to be generally subject to the same degradations and maintain similar conditions, USACE uses the same assumptions for these areas for the purposes of FACWet modeling.

Leveed Disturbed Wooded Strip – The study area exhibits many locations along roadways and paths with a narrow strip of woody vegetation. These places are highly disturbed due to a variety of factors. The buffer vegetation is very intensively managed for either agriculture or by mowing along roadways. Because this habitat category is generally located along roadways, chemical impacts from salt and oil are a frequent disturbance. The close proximity to farmland also promotes eutrophication due to fertilizer runoff. These strips frequently feature trees, though these are sparser than in forested areas. The shrub and herbaceous layers are usually thick with growth because the highly limited tree cover allows most sunlight to reach the ground. Species composition appears to be comparable to the leveed forest habitat, though invasive species may have a greater presence in these places.

No examples of this habitat category within the study area meet the requirements of the wetland delineation methodology outlined under the farmed wetland description. Wetland ecology was not apparent in these areas during field observation by USACE personnel. USACE therefore concludes that all examples of this habitat category within the study area are non-hydric.

Leveed Floodplain Scrub – Habitat in this category has been subject to intensive disturbance in the near past or is a cleared area that has recently been allowed to progress past the preliminary stages of ecological succession. For example, farmland that has been fallow long enough to support the growth of young trees that can eventually reestablish a canopy layer.

While adult trees are commonly present in this habitat category, they are far sparser than in the leveed floodplain forest category. This habitat category can be thought of as a “younger” version of the leveed floodplain forest category and is generally comparable in terms of species composition and the kinds of disturbances that are impacting the local ecosystem. If these areas are allowed to continue progressing through ecological succession, USACE assumes that these areas would develop into leveed floodplain forest by the end of the 50-year period of analysis.

This habitat category is present in the borrow area of the Church Farm Conservation Area. The leveed floodplain scrub located here benefits hydrologically from the levee breaches that have not been repaired. Thus, this habitat category scores more highly on the Water Source, Water Distribution, and Water Outflow variables at the Church Farm Conservation Area than it does in the Capital View Area. However, in the borrow area this habitat category is surrounded by intact levee and farmland, so these variables are still impaired relative to the natural condition. Because the vegetation here appears to be at a younger stage of ecological succession when compared to the Capital View Area, it also scores lower on the tree canopy, shrub, and herbaceous vegetation layer condition variables.

This habitat category includes some areas which meet the requirements of the wetland delineation methodology outlined under the farmed wetland description. USACE treats these areas as wetlands as well, in addition to other potential wetlands identified by the USFWS National Wetland Inventory. This results in this habitat category including both wetland and non-hydric versions. Because these hydric and non-hydric areas appear to be generally subject to the same degradations and maintain similar conditions, USACE uses the same assumptions for these areas for the purposes of FACWet modeling.

Non-Leveed Tributary Scrub – This habitat category corresponds with non-leveed tributary forest in essentially the same way that leveed floodplain scrub corresponds with leveed floodplain forest. Non-leveed tributary scrub habitat is in an early stage of ecological succession, and USACE assumes that these areas would develop into non-leveed tributary forest by the end of the 50-year period of analysis.

This habitat category includes some areas which meet the requirements of the wetland delineation methodology outlined under the farmed wetland description. USACE treats these areas as wetlands as well, in addition to other potential wetlands identified by the USFWS National Wetland Inventory. This results in this habitat category including both wetland and non-hydric versions. Because these hydric and non-hydric areas appear to be generally subject to the same degradations and maintain similar conditions, USACE uses the same assumptions for these areas for the purposes of FACWet modeling.

Ditch Leveed Emergent Wetland – Some emergent wetlands in the study area appear in ditches, generally associated with roadways or agricultural fields. It is possible that many if not these areas were established during the development of these features. For example, these areas may have been excavated in order to provide additional material for the roadway to be built at a slightly higher elevation. Regardless, the presence of these roadways has a major influence on the hydrology of these areas. The road interferes with overland flow of water, which would have been generally unimpeded in the historic floodplain, and precipitation runs off the impermeable road surface into the wetland. Similar to the farmed wetland habitat category, these areas are subject to regular mechanical disturbance in the form of mowing that prevents the establishment of woody vegetation. However, these areas are further disturbed by the oils

and salts that runoff roadways and excess nutrients that runoff agricultural fields. Thus, these areas are subject to a variety of mechanical and chemical disturbances. Vegetation is severely impacted in these locations and is frequently limited to lawn grasses and weeds that can tolerate this habitat degradation.

The boundaries of these areas are defined using the same methodology as the farmed wetlands. Areas dominated by emergent vegetation at or below 541 feet above sea level in the Jefferson City area or 548 feet above sea level in the Church Farm Conservation Area that are in close proximity to roadways are treated as roadside ditch leveed emergent wetland for the purposes of habitat modeling.

2.2 Reference Standards

In the FACWet model, inputs for variables are determined based on the severity and extent that identified stressors cause departure from a reference standard condition. Reference standards represent habitats that are pristine or nearly pristine and support the highest level of sustainable ecological function. Typically, an example of pristine or similar habitat would be identified so that comparisons could be drawn between it and the assessed wetland in question. However, the current day Missouri River floodplain no longer features such pristine habitat. Current habitats in the Missouri River floodplain are made up of areas that are either recovered or recovering from previous human disturbances that, to one degree or another, removed the original pristine habitat. To address this, the habitats assessed in this study are evaluated against general descriptions of pristine habitat using professional best judgement and knowledge of recovered Missouri River floodplain habitat, as applicable and appropriate.

The central hardwood floodplain forest ecological system (NatureServe, 2024a) is used as the reference standard when evaluating wooded and farmland habitats. The central hardwood floodplain forest habitat represents the natural forest habitat that dominated the Missouri River floodplain under historic conditions. Current wooded habitat represents degraded versions of this habitat.

The central hardwood floodplain forest ecological system represents temperate floodplain forests found along the Missouri River and other rivers across much of temperate North America. The canopy layer is generally dominated by box elder (*Acer negundo*), silver maple (*Acer saccharinum*), hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), American sycamore (*Platanus occidentalis*), eastern cottonwood (*Populus deltoides*), and American elm (*Ulmus americana*). Pawpaw (*Asimina triloba*), American hornbeam (*Carpinus caroliniana*), and silky dogwood (*Cornus amomum*) are typical of the shrub layer. While the coverage of the shrub layer varies from forest to forest, it is commonly sparse which gives these areas a parklike appearance. Vines, such as poison ivy (*Toxicodendron radicans*), are frequently abundant. The herbaceous layer often has abundant spring ephemerals, though by mid-summer ferns and forbs are the typical representatives of the understory.

The eastern North American marsh, wet meadow, and shrubland ecological system (NatureServe, 2024b) is used as the reference standard when evaluating the emergent wetland habitats. Farmed wetlands are evaluated against this reference standard because they more closely approximate this kind of habitat. The emergent wetland areas that exist within the study area today are the closest equivalent to the marsh and wet meadow habitat that existed here historically, even if some of the extant habitat was created artificially (e.g., roadway construction). Under historic conditions, vegetation structure varied from site to site. In general,

however, the dominant vegetation includes graminoids, such as cattails (*Typha* spp.) and sedges (*Carex* spp.), as well as forbs, such as thoroughworts (*Eupatorium* spp.) and knotweeds (*Polygonum* spp.). Shrubs like dogwoods (*Cornus* spp.) and willows (*Salix* spp.) may be present to some degree as well. Sites undergoing ecological succession may also include tree saplings.

2.3 Future without Project Assumptions

The study area has an extensive history of disturbance. The native riparian habitat has been cleared away for agriculture and other developments. The Capital View levee and BSNP have greatly altered the hydraulics of the study area, which indirectly affects which kinds of plants are promoted. These disturbances have been impacting the study area's habitat quality for quite some time, and USACE has concluded that this condition would very likely be maintained for the foreseeable future if no project were to be implemented. No substantial developments have been identified that would alter the amount or kind of habitat present in the study area. USACE anticipates that ecological succession would continue in places where woody vegetation is allowed to encroach on emergent vegetation. Thus, USACE expects that, over the 50-year period of analysis, leveed floodplain scrub areas would transition to leveed floodplain forest areas and that non-leveed tributary scrub areas would transition to non-leveed tributary forest areas.

As previously noted, the habitat conditions at the Church Farm Conservation Area are influenced by levee breaches that provide a more natural floodplain hydrology compared to the Capital View Area. Coordination between USACE and the Missouri Department of Conservation (MDC) has indicated that while MDC has the intention to repair these levee breaches, the anticipated timeline for these repairs has not yet been determined. Because it is currently uncertain when these repairs would occur, USACE is assuming for habitat modeling purposes that the existing hydrological conditions for this site would be maintained throughout the 50-year period of analysis. Like the Capital View Area, USACE assumes that scrub habitat in the Church Farm Conservation Area would continue to undergo ecological succession and develop into floodplain forest habitat. USACE assumes that by Year 50, the conditions of the various vegetation layers in these scrub areas (i.e., tree canopy, shrub, and herbaceous) between the Capital View and Church Farm Conservation Areas would be essentially of the same quality.

Tables documenting the variable-by-variable assumptions under the future without project are provided in Section 5.

2.4 Future with Project Assumptions

Tables documenting the variable-by-variable assumptions under the various future with project scenarios are provided in Section 5.

2.4.1 CA11 Assumptions

CA11 is the “nonstructural” alternative that is included in the final array of alternatives considered in the Study. This alternative would implement a collection of non-structural measures, such as floodproofing, structure elevation, and buyouts of properties at risk of flood damages. None of the measures included in this alternative would be expected to cause habitat impacts. Thus, USACE assumes that the future with project under this alternative would be no different than the future without project in terms of habitat quality and quantity.

2.4.2 Federal Interest Plan Assumptions

The federal interest plan would construct a new levee with a setback alignment relative to the currently existing Capital View levee. USACE assumes that all wetland and wooded habitat within the construction footprint of the federal interest plan alignment would be lost as a consequence of construction activities. However, USACE assumes the turf grasses that would vegetate this levee would be roughly equivalent to the non-hydric farmland in terms of habitat value. This is because both kinds of areas have lost their natural riparian vegetation and neither have wetland hydrology. In both areas, habitat value is marginal and is limited to foraging opportunities to species that are tolerant of human disturbance, such as Canada geese.

The federal interest plan would reestablish a more natural hydrological connection between the Missouri River and the floodplain west of the Capital Sand quarry in the area riverward of the proposed alignment. However, because the quarry acts as a topographical highpoint and because the Capital View levee would remain in place east of the quarry, habitat riverward of the proposed alignment in this area would not experience any enhanced hydrology. Current habitat in the hydrologically reconnected part of the floodplain would receive a boost to the Water Source, Water Distribution, and Water Outflow variables due to reestablished floodplain hydrology. The Migration / Dispersal Barrier variable would also increase since there would be a more direct connection between this currently leveed habitat and the habitat currently beyond the levee. Habitat, currently outside of the Capital View levee, would also experience similar benefits. However, the hydrological benefits for these areas would be small, as these places already have a hydrological connection with the Missouri River and the benefit of the levee setback would just be the allowance of flood waters to inundate a wider area and therefore deposit sediment at a more natural level.

USACE assumes that habitat within the Capital View Area's borrow site would generally be lost. Native vegetation would be cleared prior to excavation. The nearby presence of the Jefferson City Memorial Airport would require USACE to ensure that the excavated area remains drained so that standing water would not form and create a potentially hazardous attractant for waterfowl. Because of this, USACE assumes that borrow collection activities at this location would result in the loss of all wetland-related ecological value there. USACE assumes that post-excavation conditions at this borrow site would be essentially equivalent to the non-hydric farmland currently present there in terms of ecological value. Thus, USACE anticipates no substantial ecological impact due to disruptions of that kind of land cover.

USACE anticipates the partial removal of the Capital View levee would be accomplished by excavating levee material from the landward side of the levee. This would minimize habitat impacts because habitat is generally scarcer on the landward side. However, there is one small stand of non-hydric leveed floodplain forest adjacent to part of the Capital View levee that would be removed. USACE anticipates clearing approximately 0.8 acres of this habitat to create adequate space for excavation activities. USACE anticipates no substantial ecological impacts associated with the use of staging areas because habitat is not substantially present in these locations. Because the Capital View Area has been developed with a variety of roadways, USACE anticipates that further habitat disturbance to create access routes would not be necessary to a meaningful degree.

As with the future without project assumptions, USACE assumes that scrub habitat would generally improve in the vegetation layer variables due to ecological succession and eventually

reach the same scores as the corresponding forested habitat scores by the end of the 50-year period of analysis. Habitat located landward of the federal interest plan levee alignment or landward of the remaining portion of the Capital View levee would be expected to maintain the same conditions as the future without project. This is because the hydrology of these areas would not be meaningfully improved, and the federal interest plan is not anticipated to cause substantial new developments.

The boundaries of the borrow excavation at the Church Farm Conservation Area contain three habitat categories that would be meaningfully affected by this activity: farmed wetlands, scrub wetlands, and non-hydric farmland. Because this area is far away from the Jefferson City Memorial Airport, USACE would not need to manage it or shape the topography to prevent wetland conditions from creating a potential waterfowl attractant. Because of this, and because excavation would bring the surface closer to the groundwater level, USACE does not anticipate that borrow collection at the Church Farm Conservation Area would result in the loss of wetland acreage. However, borrow excavation would clear vegetation and disturb local soil conditions, so there would be a decrease in the quality of wetland habitat here. The Water and Soil Chemical Environment variables and Vegetation Structure and Complexity variables would both decrease. However, USACE anticipates that excavation would create an opportunity to improve geomorphology in scrub wetland areas which have been adversely affected by historic agriculture. Farmed areas would not be expected to have beneficial effects to this variable because USACE assumes they would still be in agricultural use over the long-term.

While these wetland areas would be expected to degrade in quality over the short-term, USACE anticipates they would be able to recover over the long-term. The scrub wetlands in the Church Farm Conservation Area are currently undergoing ecological succession and borrow collection at this site would essentially reset the process. Because these wetlands are relatively early in the succession process currently, USACE assumes that under the federal interest plan these wetlands would reach essentially the same ecological condition by Year 50 that these areas would under the No Action Alternative by Year 25. Because USACE assumes that the farmed wetland areas would continue to be managed for agriculture, the recovery of these areas would be expected to be slow. USACE assumes that the farmed wetland areas would fully recover to their Year 0 conditions by Year 50.

USACE does not anticipate any substantial ecological impacts due to borrow excavation in the non-hydric farmland areas. Unlike the farmed wetland areas, non-hydric farmland does not feature the saturated conditions that occasionally prevent the farmed wetlands from being cultivated. The non-hydric farmland therefore does not exhibit areas that are commonly left fallow. Because disruptions to the non-hydric farmland would not result in the loss of these fallow areas and because USACE anticipates that this farmland would continue to be managed for agriculture, post-borrow conditions in these places would be expected to be essentially equivalent to current conditions in terms of ecological value.

2.4.1 Potential Mitigation Option Assumptions – Capital View Area Borrow Site

One potential option to mitigate impacts associated with the implementation of the federal interest plan would be on-site habitat restoration. The borrow site in the Capital View Area provides an opportunity for this because the site would be located in the hydrologically reconnected floodplain. While USACE would be unable to restore wetlands within this area due to its close proximity to the Jefferson City Memorial Airport, this area would still be suitable for

the restoration of non-wetland riparian forest. This kind of habitat would not pose a substantial risk to the operation of the airport because it would not feature standing water features attractive to particularly problematic species, such as Canada geese. Farmland is also attractive to geese for foraging, so the conversion of the borrow site from mostly agricultural land into riparian forest may provide a minor benefit to the airport.

In the event that the Capital View Area is used to collect borrow material but is not restored afterward (Mitigation Measure J1), USACE assumes this area would have a habitat value largely comparable to non-hydric farmland. USACE anticipates that under this scenario, current land management practices would largely be maintained, which would keep this site in agricultural production. Wetlands would not be able to recover here due to USACE keeping the site drained to prevent standing water near the airport. Because this area would be characterized by routine vegetation clearing for agriculture and the absence of wetlands, USACE has modeled this entire area under this scenario as having equivalent habitat value as non-hydric farmland.

On-site restoration of riparian forest for mitigation at this location would be achievable with two different methods. The first method would be to manage the area for invasive species and apply monitoring and adaptive management to better facilitate ecological succession. This approach would take advantage of the prevalence of early- to mid-successional tree species in the nearby area, such as eastern cottonwood. USACE assumes that this approach would result in habitat recovery highly similar to the recovery and ecological succession of the wetland scrub habitat within the Church Farm Conservation Area anticipated under the federal interest plan. While USACE assumes that these two sites would achieve similar results by Year 50, USACE anticipates the monitoring and adaptive management applied to the Capital View Area site would result in quicker recovery. For that reason, USACE assumes the Year 10 and Year 25 scores would be higher in the adaptively managed site.

The second method would actively plant the borrow site after excavation activities with tree seedlings from a variety of species. These seedlings would be from a collection of native floodplain-adapted species, such as eastern cottonwood, silver maple, American sycamore, and others. Monitoring and adaptive management would be applied here to ensure the successful growth of the trees and prevent the site from being overtaken by invasive plants, such as reed canary grass. The condition of the Capital View Area borrow site under this approach would be fairly comparable to the ecological succession approach, but the site would be expected to recover more quickly and achieve a greater ecological value by Year 50 under the planting approach. This is because tree growth throughout the site would begin almost immediately after excavation activities as opposed to the gradual filling in of the site as nearby trees supply the seeds for new growth. In addition, USACE anticipates that tree species diversity would be greater under the planting approach, as USACE would be able to select which species would be added to the site. USACE anticipates this greater diversity would also foster more natural soil conditions, providing greater benefits to the Water and Soil Chemical Environment variables. Thus, the planting approach would involve more activity and cost on the part of the project but would be expected to result in a greater total lift per acre compared to the ecological succession approach. The total acreage necessary to mitigate impacts to non-hydric habitat would therefore be smaller for the planting approach.

USACE would also have the option to either restore the minimum acreage necessary to mitigate impacts to non-hydric habitat (i.e., “break even” on AAHUs losses and gains) or restore the

entire available acreage. This latter option would generate more AAHUs than would be equivalent to the impacts to non-hydric habitat. The benefit of taking the “full area” option is that it could potentially satisfy mitigation needs at an advantageous incremental cost compared to the “break even” option and result in a greater amount of ecologically significant riparian habitat. **Table 5** summarizes the acreages restored under these mitigation measures.

Table 5. Potential Mitigation Measures at the Capital View Area Borrow Site

Mitigation Measure	Acres under Ecological Succession	Acres Planted
J1. No Action	0	0
J2. Woody Succession, Break Even	15.2	0
J3. Woody Plantings, Break Even	0	13.9
J4. Woody Succession, Full Area	45.4	0
J5. Woody Plantings, Full Area	0	45.4

Figure 4 shows one way that Mitigation Measure J2 could be implemented within the Capital View Area borrow site. Mitigation Measure J3 would restore a smaller area but would otherwise be similar. Mitigation Measures J4 and J5 would restore the entire borrow site.



Figure 4. Potential Habitat Mitigation within the Capital View Area Borrow Site (Mitigation Measure J2)

Regardless of which mitigation approach would be applied at the Capital Area borrow site, USACE would assume that excavation activities here under the federal interest plan would generally remove all currently present habitat. This includes a small quantity of farmed wetlands and leveed floodplain forest, some of which is also wetland. Because USACE would prevent the formation of wetlands and standing pools of water within relatively close proximity to the Jefferson City Memorial Airport, USACE assumes for modeling purposes that wetlands within the Capital View Area borrow site would lose wetland ecology regardless of mitigation approach.

2.4.2 Potential Mitigation Option Assumptions – Church Farm Conservation Area Borrow Site

Similar to the Capital View Area borrow site, the Church Farm Conservation Area borrow site provides an opportunity for on-site mitigation. Unlike the Capital View Area borrow site, the Church Farm Conservation Area is located more than five miles away from the Jefferson City Memorial Airport, so wetland habitat at this location does not pose any significant airspace concern. Mitigation actions involving the restoration of wetland habitat would therefore be practicable here.

In the event that the Church Farm Conservation Area is used to collect borrow material but is not restored afterward (Mitigation Measure C1), USACE assumes the land management at this location would be maintained. Areas that are used for agricultural under current conditions would continue to be farmed, and areas that have been allowed to undergo ecological succession would be allowed to continue this process. USACE assumes the pace of habitat recovery would be faster in areas allowed to regenerate habitat, as farmed areas would be subject to regular disturbance. As with the Capital View Area borrow site, USACE anticipates that the habitat value of non-hydric farmland would be largely unimpacted by excavation.

Mitigation by the restoration of emergent wetland habitat at this location would be accomplished by seeding native floodplain-adapted herbaceous species after borrow collection activities were complete. USACE would excavate material to create a variable topography with differing moisture conditions that would favor the growth of a wider number of species. This habitat would essentially be a high-quality version of the habitat that develops in fallow agricultural fields here when soil conditions are too saturated for cultivation. While this mitigation habitat would not be cleared away for crop plantings, periodic clearing of some kind would be needed to prevent encroachment by woody species. Without this management, USACE assumes this area would undergo ecological succession and eventually result in a floodplain forest habitat. Monitoring and adaptive management for invasive species would also be needed, as the herbaceous plants intended for this area would never grow tall enough to shade out invasive competitors like reed canary grass.

The two methods of wooded habitat mitigation detailed for the Capital View Area would also be applicable at this location. The primary distinction for the Church Farm Conservation Area is that wetland conditions could be maintained here and, like the emergent habitat areas, USACE would excavate borrow material to result in a variable topography that should better support a variety of wetland species. Similar to the Capital View Area, USACE formulated separate options for mitigating this kind of habitat that vary in terms of cost and complexity (i.e., using ecological succession or actively planting desired species).

Similar to the Capital View Area borrow site, USACE formulated an array of mitigation measures applicable to the Church Farm Conservation Area that would use various combinations of options. One option would be to just restore the minimum number of acres necessary to mitigate wetland impacts. Mitigating forested wetlands with plantings would result in fewer acres needed overall compared to mitigation through ecological succession. Note that the "break even" mitigation measures at this location would not include mitigation for non-hydric habitat by restoring floodplain forest on non-hydric farmland. This is because the project sponsor, the City of Jefferson City, Missouri, owns the land of the Capital View Area borrow site but not the Church Farm Conservation Area. Any land in the Church Farm Conservation Area restored for habitat mitigation would need to be purchased by the sponsor. Mitigation for non-hydric habitat would therefore be more cost effective at the Capital View Area since it would not involve this additional real estate cost, so USACE did not formulate redundant "break even" measures for this habitat category in the Church Farm Conservation Area.

Four additional mitigation options would restore the entire Church Farm Conservation Area borrow site with a mixture of habitat types. Wetlands would be restored in areas currently represented by farmed wetlands and scrub wetlands, while non-wetland floodplain forest would be restored in areas currently represented by non-hydric farmland. One set of options would prioritize forested wetlands by only restoring as many acres of emergent wetlands as necessary for mitigating impacts to this kind of habitat. The remaining wetland acreage would be restored as forested wetlands. The other set of options would prioritize emergent wetlands and only restore as many acres of wooded wetlands as necessary for mitigation. The purpose of including these two sets of options here is to provide additional variety in terms of costs and outputs. While the long-term maintenance of emergent wetlands makes them more costly per acre, they recover more quickly and therefore provide a greater lift per acre over the fifty-year period of analysis. The two methods for forest mitigation would be applicable to both sets of options, resulting in four total mitigation measures that would restore the entire Church Farm Conservation Area borrow site. **Table 6** summarizes the acreages of each type of habitat under each mitigation measure at the Church Farm Conservation Area.

Table 6. Potential Mitigation Measures at the Church Farm Conservation Area Borrow Site

Mitigation Measure	Acres under Ecological Succession, Floodplain Forest Wetlands	Acres Planted, Floodplain Forest Wetlands	Acres Planted, Emergent Wetlands	Acres under Ecological Succession, Non-Hydric Floodplain Forest	Acres Planted, Non-Hydric Floodplain Forest
C1. No Action	0	0	0	0	0
C2. Emergent Plantings, Woody Succession, Break Even	29.2	0	18.6	0	0
C3. Emergent and Woody Plantings, Break Even	0	27.4	17.7	0	0
C4. Emergent Plantings, Woody Succession, Prioritizing Forested Wetlands	123.3	0	65.6	39.5	0
C5. Emergent and Woody Plantings, Prioritizing Forested Wetlands	0	123.3	65.6	0	39.5
C6. Emergent Plantings, Woody Succession, Prioritizing Emergent Wetlands	29.2	0	159.7	39.5	0
C7. Emergent and Woody Plantings, Prioritizing Emergent Wetlands	0	27.4	161.5	0	39.5

Figure 5 shows one way that Mitigation Measure C2 could be implemented within the Church Farm Conservation Area borrow site. Mitigation Measure C3 would restore a smaller area but would otherwise be similar. Mitigation Measures C4, C5, C6, and C7 would restore the entire borrow site.



Figure 5. Potential Habitat Mitigation within the Church Farm Conservation Area Borrow Site (Mitigation Measure C2)

2.4.3 Potential Mitigation Option Assumptions – Mitigation Credit Purchased

USACE identified the potential for mitigation by purchasing credits from a third-party mitigation service. USACE used the Regulatory In-lieu Fee and Bank Information Tracking System (RIBITS) website to evaluate which credit providers operate within the same watershed as the study area. As of November 2025, available options for credits include a mitigation bank and an in-lieu fee program.

USACE identified the Swallow Tail, LLC, Smith Creek Wetland and Stream Mitigation Bank as a potential means to mitigate impacts associated with the federal interest plan. This site has been restored with wetland and non-wetland riparian forest habitat to generate credits. USACE coordinated with Swallow Tail, LLC to model the Smith Creek site in FACWet. This enabled USACE to determine what acreage at the Smith Creek site would be equivalent to the impacts at the Capital View and Church Farm Conservation Areas in terms of AAHUs. While USACE distinguishes between impacts to wooded wetland habitats and emergent wetland habitats, this mitigation credit bank does not. To account for this, USACE worked with Swallow Tail, LLC to determine the approximate coverages of woody and herbaceous vegetation at the Smith Creek site. Based on these coverages, USACE determined that for any given acreage of wetland habitat at this location, approximately 75% of the ecological value identified by the FACWet model could be reasonably attributed to emergent wetlands and 20% could be reasonably attributed to wooded wetlands. This allowed USACE to determine a single acreage at the Smith Creek site that would represent the equivalent of the lost value of emergent and wooded wetlands within the study area.

USACE determined separate acreages for equivalent AAHU values in wetland and non-hydric habitats. This enabled USACE to compare multiple mitigation options: one that would use the Smith Creek site just to mitigate for wetland impacts, and one that would purchase credits at this bank to mitigate for all wetland and non-hydric habitat impacts. For the non-hydric habitats, the Smith Creek site would use the riparian forest areas that were restored to generate stream credits.

USACE identified an in-lieu fee program as a potential mitigation option through the Land Learning Foundation. Under this option, USACE would direct the Land Learning Foundation to restore particular types of habitats to mitigate the impacts associated with the federal interest plan. To determine what acreages would be equivalent to the impacts expected under the federal interest plan, USACE assumed that the Land Learning Foundation would restore land with existing conditions similar to the Church Farm Conservation Area. This is because this kind of agricultural land is common in this part of the Missouri River watershed, and it would represent a typical scenario for habitat restoration for this region. USACE assumed that the Land Learning Foundation would use similar restoration methods that USACE would use for planting new habitat at the Church Farm Conservation Area as well. As with the mitigation bank, USACE determined separate acreages for equivalent AAHU values in wetland and non-hydric habitats to compare multiple mitigation options.

Because the availability of credits from any particular service in the future is uncertain, USACE averaged the estimated costs of the mitigation options described in this section to estimate the cost of credit purchase more generally. Cost estimates for the mitigation bank were provided directly by Swallow Tail, LLC. Cost estimates for the in-lieu fee program were derived by taking the cost from a recent credit purchase from an in-lieu fee program and applying the previous

purchase's cost per acre to the acreage necessary under the federal interest plan. USACE assumes this cost per acre would be appropriate for the emergent wetland, wooded wetland, and non-hydric floodplain forest habitat types. USACE averaged these estimates together to create two mitigation options involving the purchase of credits: credits for wetland habitat only (Mitigation Measure M2) and credits for all affected habitat types (Mitigation Measure M3).

3. Model Results and Discussion

Table 7 summarizes the impacts associated with the alternatives. CA11's nonstructural measures would not cause any meaningful impacts to habitat, so this alternative would result in no loss in AAHUs. The implementation of the federal interest plan would require wetland and riparian habitat removal during the construction of the new levee alignment and borrow excavation activities, resulting in a net loss of 11.7 AAHUs. Habitat west of the Capital Sand quarry that would not be removed by project implementation would benefit from the restoration of floodplain hydrology, but the lift gained from this would not be enough to offset impacts. USACE sought to minimize impacts to wetlands by designing the levee alignment to avoid these areas to the extent practicable. The result of this is that most impacts in the Capital View Area would be to non-wetland habitat (7.0 lost non-wetland AAHUs against 4.7 lost wetland AAHUs). Most of the wetland impacts would be to farmed wetlands, which are the lowest quality kind of wetland present in this area.

Table 7. Summary of Habitat Impacts at the Capital View Area

Habitat Types	NAA	CA11	CA13 – Hydrology Restored	CA13 – Hydrology Maintained	CA13 - Total
Leveed Farmed Wetland	57	57	0.1	53.1	53.2
Leveed Non-Hydric Farmland	7.5	7.5	0	7.5	7.5
Leveed Floodplain Forest, Hydric	20.9	20.9	1.7	18.8	20.5
Leveed Floodplain Forest, Non-Hydric	61	61	10.2	48	58.2
Non-Leveed MO River Floodplain Forest, Hydric	84.8	84.8	12.3	72.6	84.9
Non-Leveed MO River Floodplain Forest, Non-Hydric	72.3	72.3	9.2	63.2	72.4
Non-Leveed Tributary Forest, Hydric	38.6	38.6	1	37.6	38.6
Non-Leveed Tributary Forest, Non-Hydric	29.9	29.9	27.1	3.1	30.2
Leveed Disturbed Wooded Strip, Non-Hydric	6.7	6.7	1.9	1.1	3
Leveed Floodplain Scrub, Hydric	3.6	3.6	0	3.3	3.3
Leveed Floodplain Scrub, Non-Hydric	6.5	6.5	0	5.5	5.5
Non-Leveed Tributary Scrub, Hydric	6	6	4	2	6
Non-Leveed Tributary Scrub, Non-Hydric	7.2	7.2	7	0.3	7.3
Leveed Roadside Ditch Wetland	2.7	2.7	0	2.4	2.4
Hydric Wooded Habitat, Total	153.9	153.9			153.3
Net Change in Hydric Wooded Habitat	N/A	0			-0.6
Hydric Emergent Habitat, Total	59.7	59.7			55.6
Net Change in Hydric Emergent Habitat	N/A	0			-4.1
All Hydric Habitat, Total	213.6	213.6			208.9
Net Change in All Hydric Habitat	N/A	0			-4.7
Non-Hydric Total	191.1	191.1			184.1
Net Change in Non-Hydric	N/A	0			-7.0
Grand Total	404.7	404.7			393.0
Total Net Change	N/A	0			-11.7

Note: Impacts are Quantified as Average Annual Habitat Units.

Table 8 summarizes the impacts associated with borrow excavation activities at the Church Farm Conservation Area. No borrow material would be needed under CA11, so no excavation or habitat impacts would occur. The borrow activity under the federal interest plan would result in 5.8 lost AAHUs of wetland ecological value. Most of the affected acreage is farmland and USACE anticipates that the affected scrub wetlands would recover more quickly because they are not maintained for agriculture. For those reasons, most of the impact at this location would be to emergent wetlands instead of wooded wetlands. USACE would not anticipate any substantial impact to non-wetland habitat in this location.

Table 8. Summary of Habitat Impacts at Church Farm Conservation Area

Habitat Types	NAA	CA11	CA13
Leveed Farmed Wetland	45.5	45.5	40.7
Leveed Floodplain Scrub, Hydric	19.8	19.8	18.8
Hydric Wooded Habitat, Total	19.8	19.8	18.8
Net Change in Hydric Wooded Habitat	N/A	0	-1
Hydric Emergent Habitat, Total	45.5	45.5	40.7
Net Change in Hydric Emergent Habitat	N/A	0	-4.8
Grand Total (All Hydric Habitat)	65.3	65.3	59.5
Total Net Change	N/A	0	-5.8

Impacts are quantified as average annual habitat units

USACE anticipates the federal interest plan would result in impacts to both the Capital View Area and the Church Farm Conservation Area. Together, they would result in total net loss of 17.5 AAHUs. 10.5 of these lost AAHUs would be to wetland habitat types. More specifically, these wetland impacts would include 1.6 AAHUs of wooded wetlands lost and 8.9 AAHUs of emergent wetlands lost. Mitigation would therefore be necessary for the federal interest plan.

Table 9 shows the net AAHUs provided by various mitigation scenarios at the Capital View Area borrow site. Due to the close proximity of the airport, mitigation activities at this location would be limited to non-wetland habitat. In the “Break Even” scenarios, only the acreage of habitat equivalent to the 7.0 AAHUs of impacts to non-hydric habitat types would be restored. These two scenarios would therefore result in the same net lift of 7.0 AAHUs. Where these scenarios differ is in the acreage necessary. Because USACE anticipates that habitat quality would be somewhat better under the plantings method opposed to the ecological succession method, the former would require 13.9 acres while the latter would require 15.2 acres. In the “Full Area” scenarios, all 45.4 acres would be restored. Because the acreages are equal under these scenarios, the plantings method provides a greater total lift of 15.6 AAHUs as opposed to 13.5 AAHUs under the ecological succession method. Regardless of which scenario is included in the federal interest plan, however, mitigation would still be necessary for wetland impacts.

Table 9. Summary of Ecological Lift from Mitigation Measures at the Capital View Area Borrow Site

Habitat Type	J1. No Action	J2. Woody Succession, Break Even	J3. Woody Plantings, Break Even	J4. Woody Succession, Full Area	J5. Woody Plantings, Full Area
Non-Hydric Farmland Maintained for Agriculture	7.5	5.1	5.3	0	0
Non-Hydric Farmland Potentially Converted to Floodplain Forest	0	9.4	9.2	28	30.1
Non-Hydric Habitat, Total	7.5	14.5	14.5	28	30.1
Net Change in Non-Hydric Habitat Value, Without CA13 Impacts (and With CA13 Impacts)	N/A	7.0 (0)	7.0 (0)	20.5 (13.5)	22.6 (15.6)

Habitat values are quantified as average annual habitat units. Parenthetical values are the net lift after the federal interest plan's impacts

Table 10 shows the net AAHUs provided by the various mitigation scenarios at the Church Farm Conservation Area. In the “Break Even” scenarios, only the acreage of habitat equivalent to the 8.9 AAHUs and 1.6 AAHUs of impacts to emergent and wooded wetland habitat categories, respectively, would be restored. However, neither of these scenarios would mitigate the 7.0 AAHUs of impacts to the non-hydric habitat types. The “Break Even” scenarios are equal in terms of their habitat unit output, though mitigation through planting instead of ecological succession would require a smaller overall acreage. The “Maximum Forest” scenarios would restore the entire 228.4-acre area affected by borrow activities. These scenarios would only restore the minimum amount of land necessary as emergent wetlands in order to mitigate impacts to this habitat category, and the remaining land would be restored as forested habitat. The habitat lift under these scenarios is considerably larger than under the “Break Even” scenarios. Mitigation by plantings would result in a larger lift than mitigation by ecological succession due to the higher quality of habitat anticipated under the former.

Table 10. Summary of Ecological Lift from Mitigation Measures at the Church Farm Conservation Area Borrow Site

Habitat Type	C1. No Action	C2. Emergent Plantings, Woody Succession, Break Even	C3. Emergent and Woody Plantings, Break Even	C4. Emergent Plantings, Woody Succession, Maximum Forest	C5. Emergent and Woody Plantings, Maximum Forest	C6. Emergent Plantings, Woody Succession, Maximum Emergent	C7. Emergent and Woody Plantings, Maximum Emergent
Farmed Wetlands Maintained for Agriculture	45.5	35.5	36.2	0	0	0	0
Farmed Wetlands Potentially Converted to Emergent Wetland	0	14.1	13.4	49.6	49.6	120.7	122.0
Farmed Wetlands Potentially Converted to Floodplain Forest Wetlands	0	1.4	0.2	63.6	67.9	1.4	0.2
Scrub Wetlands	19.8	19.0	20.2	19	20.2	19	20.2
Non-Hydric Farmland	6.8	6.8	6.8	0	0	0	0
Non-Hydric Farmland Potentially Converted to Non-Hydric Floodplain Forest	0	0	0	25.7	27.5	25.7	27.5
Hydric Wooded Habitat, Total	19.8	20.4	20.4	82.6	88.1	20.4	20.4
Net Change in Hydric Wooded Habitat, Without CA13 Impacts (and With CA13 Impacts)	0	0.6 (0)	0.6 (0)	62.8 (62.2)	68.3 (67.7)	0.6 (0)	0.6 (0)
Hydric Emergent Habitat, Total	45.5	49.6	49.6	49.6	49.6	120.7	122.0
Net Change in Hydric Emergent Habitat, Without CA13 Impacts (and With CA13 Impacts)	0	4.1 (0)	4.1 (0)	4.1 (0)	4.1 (0)	75.2 (71.1)	76.5 (72.4)
Total Hydric Habitat	65.3	70.0	70.0	132.2	137.7	141.1	142.4
Net Change in Total Hydric Habitat, Without CA13 Impacts (and With CA13 Impacts)	0	4.7 (0)	4.7 (0)	66.9 (62.2)	72.4 (67.7)	75.8 (71.1)	77.1 (72.4)
Non-Hydric Habitat, Total	6.8	6.8	6.8	25.7	27.5	25.7	27.5
Net Change in Non-Hydric Habitat, Without CA13 Impacts (and With CA13 Impacts)	0	0 (-7.0)	0 (-7.0)	18.9 (11.9)	20.7 (13.7)	18.9 (11.9)	20.7 (13.7)
Grand Total Habitat	72.1	76.8	76.8	157.9	165.2	166.8	169.9
Net Change in Grand Total Habitat, Without CA13 Impacts (and With CA13 Impacts)	0	4.7 (-7.0)	4.7 (-7.0)	85.8 (74.1)	93.1 (81.4)	94.7 (83.0)	97.8 (86.1)

Habitat values are quantified as average annual habitat units. Parenthetical values are the net lift after the federal interest plan's impacts

The “Maximum Emergent” scenarios would also restore the entire 228.4-acre area affected by borrow activities. These scenarios would only restore the minimum amount of land necessary as forested wetlands to mitigate impacts to this habitat category. The acreage necessary for this would be smaller when mitigating by planting instead of by ecological succession. The acreage of non-hydric farmland restored as floodplain forest would be the same under the “Maximum Emergent” scenarios as under the “Maximum Forest” scenarios because USACE anticipates these non-hydric areas would be unsuited for restoration as emergent wetlands. The “Maximum Emergent” scenarios produce a greater total habitat lift than the “Maximum Forest” scenarios though they would restore the same acreage overall. This is because areas restored as emergent habitat recover quickly and begin to resemble reference conditions in less time than forested sites. Mitigation of forested habitat by planting requires less acreage than mitigation by ecological succession, and this allows for additional acreage to be restored as emergent wetland habitat. For that reason, the greatest lift possible would be under the “Maximum Emergent” scenario that restores forested habitat by planting.

Mitigation through the purchase of credits would require an amount of credits equivalent to the net loss modeled under the federal interest plan. In the Capital View Area, the federal interest plan would result in a net loss of 0.6 AAHUs of wooded wetlands, 4.1 AAHUs of emergent wetlands, and 7.0 AAHUs of non-wetland floodplain habitat. In the Church Farm Conservation Area, the federal interest plan would result in a net loss of 1.0 AAHUs of wooded wetlands and 4.8 AAHUs of emergent wetlands. Wetland mitigation credits would therefore need to be equivalent to 1.6 AAHUs of wooded wetlands and 8.9 AAHUs of emergent wetlands. Mitigation credits for non-wetland habitat would need to be equivalent to 7.0 AAHUs of riparian habitat.

4. Mitigation Analysis

4.1 Cost Effectiveness and Incremental Cost Analysis (CE/ICA) Methods

USACE formulated various scenarios of habitat mitigation involving a variety of actions that could be taken at different locations. These scenarios are largely combinable with one another, and these combinations form the various mitigation alternatives that could satisfy the mitigation requirements of the federal interest plan and, for some combinations, result in habitat lift exceeding the net impacts associated with the federal interest plan. USACE policy, presented in Engineer Regulation 1105-2-103, requires that an array of mitigation alternatives be analyzed for cost effectiveness and incremental benefits gained. Cost Effectiveness and Incremental Cost Analysis (CE/ICA) is the technique used by USACE to develop cost-effective restoration projects and mitigation strategies. Analysis of cost effectiveness, in general, compares the relative costs and benefits of alternative plans. The most efficient plans that provide the greatest increase in output for the least increase in cost are called the best buys. USACE carefully considers the best buy plans for their relative costs and benefits and selects a mitigation plan after determining that its incremental costs associated with its additional habitat outputs are justified.

Specifically, cost-effectiveness analysis compares the costs and expected environmental outputs among various plans. If different plans can produce the same level of output, only the least expensive (least-cost) choice makes economic sense for that level of output; economically *inefficient* alternative plans can be eliminated from further consideration. Similarly, if one alternative plan can produce a greater level of output for the same or less cost than others (cost-effective), only the greater output choice makes economic sense; economically *ineffective* plans can be eliminated. After elimination of inefficient and ineffective alternative plans, there

remain several least-cost, cost-effective plans offering a range of output values from which to identify the means of meeting the habitat mitigation objective. This process is done using the Institute for Water Resources (IWR) Planning Suite II 2.0.9.35 software.

IWR Planning Suite requires the inputs of several measures, each with its own costs and benefits. These costs and benefits are provided in the form of annual costs and net AAHUs. The process for calculating annual costs consists of gathering project first costs for construction and real estate. The sum of these costs makes up the total capital costs. The total investment cost is annualized using the FY26 interest rate of 3.25% over the project life of 50 years. This annualized investment cost is added to annual OMAM&M (operation, maintenance, adaptive management, and monitoring) costs to get a total annual cost.

In addition to costs and output, the combinability and dependency of each measure must be determined. Combinability and dependency are two types of relationships used in plan generation. Measures may or may not be mutually exclusive, and it is the property of combinability that allows planners to mix and match measures into different plans. All measures are initially assumed to be combinable, and if they are not, must be labeled as such to ensure they do not end up in the same plan. Conversely, the implementation of a measure in a plan may be dependent on the inclusion of a separate measure in the same plan. In this analysis, every viable combination of measures must include one measure from each of the three locations listed in **Table 11**. There are measures that are not to be combined with certain other measures. These incompatibilities are due to mutually exclusive land use decisions or because the combination would result in unacceptable unmitigated impacts to wetlands.

Table 11 presents the fifteen mitigation measures formulated for this study, three of which are “no action” measures that would involve no mitigation at a particular location or no purchase of mitigation credits. Using the combinability rules presented in this table, USACE formulated 36 mitigation alternatives that would meet or exceed the mitigation requirements caused by impacts associated with the federal interest plan, in addition to a no action alternative (Mitigation Alternative J1 C1 M1).

Table 11. Summary of Mitigation Measures

Mitigation Measure	Location	Net Total Output (AAHUs)	Annualized Cost	Combinability Rules
J1. No Action	Capital View Area	0	\$0	Incompatible with measures from the same location
J2. Woody Succession, Break Even	Capital View Area	7.0	\$11,800	Incompatible with measures from the same location
J3. Woody Plantings, Break Even	Capital View Area	7.0	\$15,500	Incompatible with measures from the same location
J4. Woody Succession, Full Area	Capital View Area	20.5	\$36,100	Incompatible with measures from the same location
J5. Woody Plantings, Full Area	Capital View Area	22.6	\$50,800	Incompatible with measures from the same location
C1. No Action	Church Farm Conservation Area	0	\$0	Incompatible with measures from the same location. Incompatible with M1 except when with J1 (No Action)
C2. Emergent Plantings, Woody Succession, Break Even	Church Farm Conservation Area	10.5	\$204,400	Incompatible with measures from the same location
C3. Emergent and Woody Plantings, Break Even	Church Farm Conservation Area	10.5	\$207,900	Incompatible with measures from the same location
C4. Emergent Plantings, Woody Succession, Prioritizing Forested Wetlands	Church Farm Conservation Area	91.6	\$661,800	Incompatible with measures from the same location
C5. Emergent and Woody Plantings, Prioritizing Forested Wetlands	Church Farm Conservation Area	98.9	\$714,900	Incompatible with measures from the same location
C6. Emergent Plantings, Woody Succession, Prioritizing Emergent Wetlands	Church Farm Conservation Area	100.5	\$951,600	Incompatible with measures from the same location
C7. Emergent and Woody Plantings, Prioritizing Emergent Wetlands	Church Farm Conservation Area	103.6	\$978,500	Incompatible with measures from the same location
M1. No Purchased Credits	Mitigation Site within Watershed	0	\$0	Incompatible with measures from the same location. Incompatible with C1 except when with J1 (No Action)
M2. Purchase Credits to Mitigate Wetland Impacts Only	Mitigation Site within Watershed	10.5	\$29,800	Incompatible with measures from the same location. Must be combined with C1
M3. Purchase Credits to Mitigate All Impacts	Mitigation Site within Watershed	17.5	\$45,100	Incompatible with measures from the same location. Must be combined with J1 and C1 together

Within IWR Planning Suite, once a planning study comprised of variables, outputs, and attributes has been defined with the plan editor, the plan generation module uses the information in **Table 11** to generate a planning set with plans comprised of all possible combinations of measures. After the planning set is generated, it must be determined which of all the combinations of measures comprise a viable and cost-effective plan. To do this, a CE/ICA is performed within IWR Planning Suite by the software. IWR Planning Suite uses this tool to categorize each plan as “non cost effective”, “cost-effective”, or “best buy.” A “cost-effective” plan means that no other plan can generate the same or more benefits for a lower cost.

4.1 Cost Effectiveness and Incremental Cost Analysis (CE/ICA) Results

CE/ICA identified 14 cost-effective plans. These plans are presented in **Table 12** and **Figure 6**. With the exception of Alternatives J2 C1 M2 and J2 C4 M1, mitigation measures J2, J3, C2, and C3 were not included in the cost-effective mitigation alternatives. Because these measures would only restore the minimum number of acres necessary to break even on impacts associated with the federal interest plan, CE/ICA indicates that mitigation using larger acreages is generally more cost effective. The cost-effective plans with lower overall costs included purchasing mitigation credits (i.e., mitigation measures M2). The plans including mitigation measures C4, C5, C6, or C7 were substantially more expensive, but would also generate a great amount of habitat lift.

Table 12. Cost-Effective Plans

Alternative	Annual Cost	Net AAHUs	Annual Cost per Net AAHU
J1 C1 M1 (No Action)	\$0	0	\$0
J1 C1 M2	\$29,800	10.5	\$2,840
J2 C1 M2	\$41,600	17.5	\$2,380
J4 C1 M2	\$65,900	31.0	\$2,130
J5 C1 M2	\$80,600	33.1	\$2,440
J1 C4 M1	\$661,800	91.6	\$7,220
J2 C4 M1	\$673,600	98.6	\$6,830
J4 C4 M1	\$697,900	112.1	\$6,230
J5 C4 M1	\$712,600	114.2	\$6,240
J4 C5 M1	\$751,000	119.4	\$6,290
J5 C5 M1	\$765,700	121.5	\$6,300
J5 C6 M1	\$1,002,400	123.1	\$8,140
J4 C7 M1	\$1,014,600	124.1	\$8,180
J5 C7 M1	\$1,029,300	126.2	\$8,160

Figure 6 depicts the costs and outputs of the cost-effective plans as a scatter plot. The alternatives from left to right have a correlated trend of increasing costs and increasing outputs.

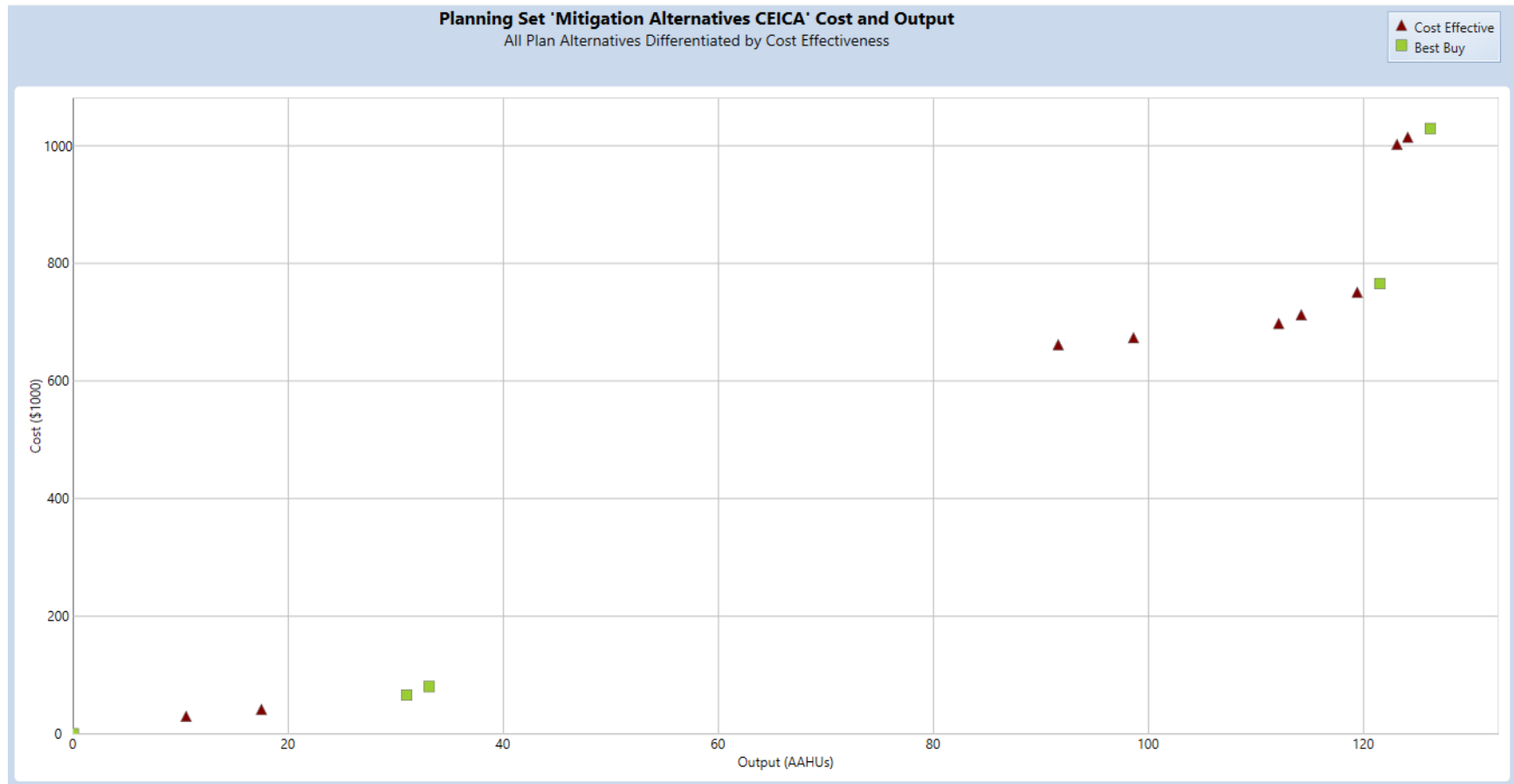


Figure 6. Cost-Effective Plans Scatter Plot

Of the fourteen cost-effective plans, five have been identified as best buy plans because they have the lowest incremental costs to incremental outputs. The remaining nine cost-effective plans are not carried forward. The best buy alternatives are shown in **Table 13** and **Figure 7**.

Table 13. Best Buy Plans

Alternative	Annual Cost	Net AAHUs	Annual Cost per Net AAHU	Incremental Cost	Incremental Output (Net AAHUs)	Incremental Cost per Incremental Output
J1 C1 M1 (No Action)	\$0	0	\$0	\$0	0	\$0
J4 C1 M2	\$65,900	31.0	\$2,130	\$65,900	31.0	\$2,130
J5 C1 M2	\$80,600	33.1	\$2,440	\$14,700	2.1	\$7,000
J5 C5 M1	\$765,700	121.5	\$6,300	\$685,100	88.4	\$7,750
J5 C7 M1	\$1,029,300	126.2	\$8,160	\$263,600	4.7	\$56,090

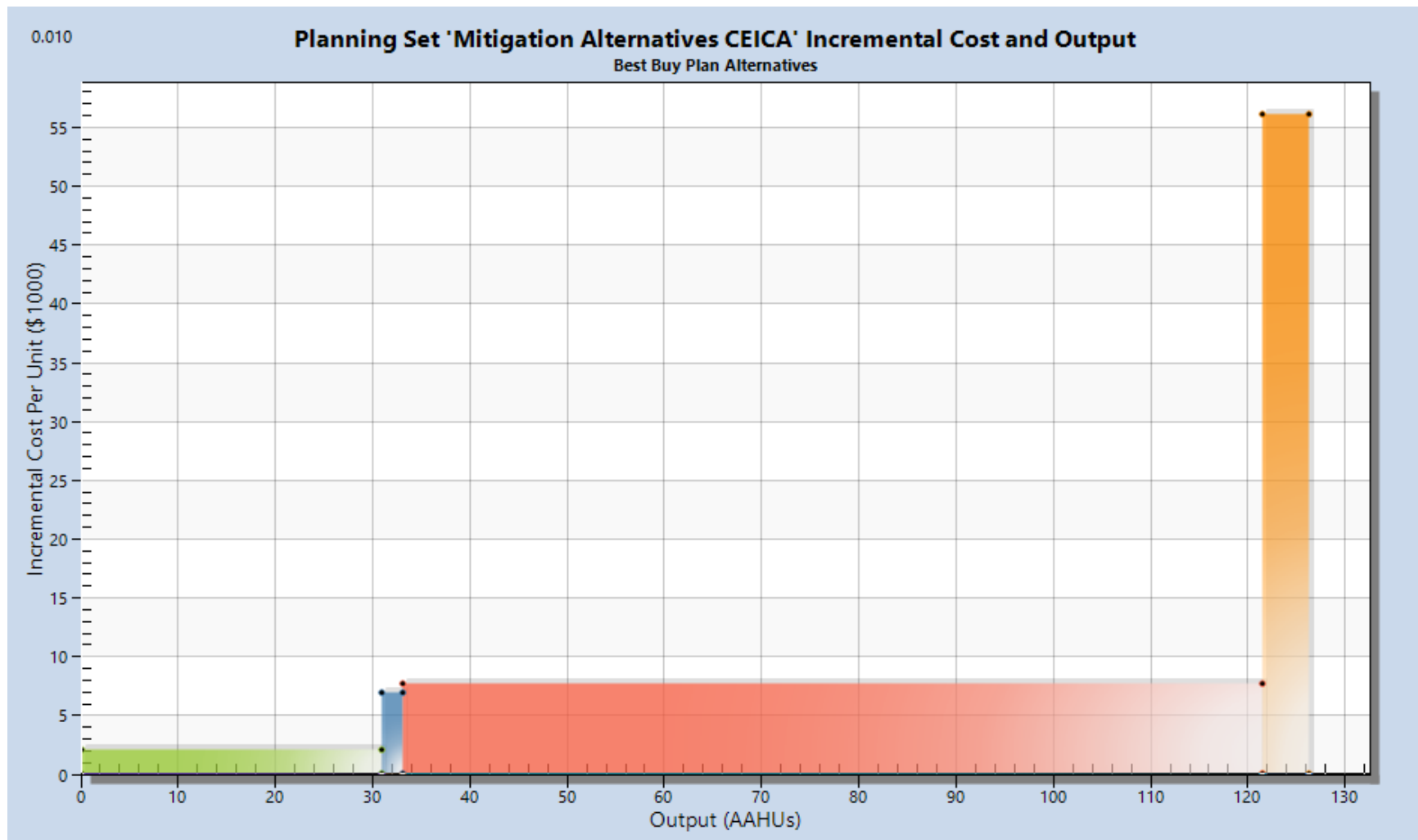


Figure 7. Best Buy Plans Bar Graph

After reviewing the CE/ICA results, USACE identifies mitigation alternative J4 C1 M2 as the preferred option to mitigate impacts associated with the federal interest plan. This mitigation alternative provides important advantages over the other best buy plans. First, mitigation alternative J4 C1 M2 would satisfy the federal interest plan's mitigation requirements at the lowest annual cost of the best buy plans (approximately \$65,900). Second, unlike mitigation alternatives J5 C5 M1 and J5 C7 M1, mitigation alternative J4 C1 M2 would not require the project sponsor to acquire real estate in fee and manage wetland habitat in the long-term. The non-wetland floodplain forest habitat that the sponsor would be responsible for managing long-term under this mitigation alternative would be essentially the same as the currently existing floodplain forest habitat located on adjacent sponsor-owned land. The sponsor would therefore already be familiar with the management needs of the mitigation area and would not need to acquire new expertise or substantially alter their land management activities for this area.

Another important quality of J4 C1 M2 is that it would include adaptive management for vegetation. Because the vegetation at the Capital View Area borrow site would be adaptively managed, USACE would have a greater degree of control over the species composition in this area. This would help to ensure that vegetation attractive to bird species that are particularly problematic for airspace safety near the airport (e.g., geese) would not proliferate.

In summary, mitigation alternative J4 C1 M2 would generate ecological lift in excess of the federal interest plan's impacts and fully mitigate wetland-related impacts without incurring unreasonably large incremental costs, burdening the sponsor with difficult and expensive land management responsibilities, or risking an increase in wildlife-related airspace hazards for the nearby airport.

Table 14. Summary of the Federal Interest Plan's Impacts including the Mitigation Alternative

Habitat Category	Net Impact of CA13 (AAHUs)	Net Impact of J4 C1 M2 (AAHUs)	Combined Impact of the Federal Interest Plan (AAHUs)
Hydric Wooded Habitat	-1.6	1.6	0
Hydric Emergent Habitat	-8.9	8.9	0
Non-Hydric Habitat	-7.0	20.5	13.5
All Habitat Categories	-17.5	31.0	13.5

Table 14 summarizes the combined effect of the federal interest plan on habitat. The adverse impacts associated with CA13 are matched or exceeded by the beneficial effects caused by the mitigation alternative J4 C1 M2. The combined outcome would be no net loss of wetland habitat value, and an increase in non-wetland habitat value of 13.5 AAHUs. The federal interest plan's overall impact on habitat would therefore be beneficial in the long-term.

5. References

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6. Supplemental Tables**Table 15. Leveed Farmed Wetland - Land Use and Hydrology Maintained**

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.75	0.75	0.75	0.75	Variable. Farmed areas are generally located between more natural habitats and frequently have good access to these areas. Roadways inhibit access to some areas
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Buffer areas feature much variation from highly disturbed roadside grasses to more moderately disturbed wooded areas
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Buffer extent variable
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.1	0.1	0.1	0.1	Hydrology very highly disturbed. Levee and BSNP alter hydrologic connection between river and land. Farmland hydrology further altered for agriculture: drains, ditches, etc.
V4 Water Distribution	0.1	0.1	0.1	0.1	Degradation resulting from altered water source. Further impacts include ditches and roadways
V5 Water Outflow	0.1	0.1	0.1	0.1	Degradation resulting from altered water source. Further impacts include ditches, roadways, and levees
V6 Geomorphology	0.1	0.1	0.1	0.1	Geomorphology highly altered by unnatural rivers processes. For example, natural processes for sediment deposition and erosion have been impacted by river development. Further degradation due to agriculture (e.g., grading, compaction, plowing) also apply
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.05	0.05	0.05	0.05	Heavy introduction of nutrients due to fertilizers used in agriculture

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.2 Sedimentation / Turbidity	0.05	0.05	0.05	0.05	Heavy impacts due to agriculture. Erosion and agricultural runoff
SV 7.3 Toxic Contamination / pH	0.05	0.05	0.05	0.05	Heavy impacts due to agriculture and general development. Agricultural, storm, and road runoff all potential sources of contamination
SV 7.4 Temperature	0.05	0.05	0.05	0.05	Heavily altered shading regime due to agriculture. Monoculture replaced native layering. Harvest leaves land mostly exposed.
SV 7.5 Soil chemistry / Redox potential	0.05	0.05	0.05	0.05	Heavy impacts due to agriculture. Unnatural drainage and mechanical ground disturbance are common issues
Final V7 Variable Score	0.05	0.05	0.05	0.05	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	Vegetation layer coverages typical for emergent wetlands. Lands with hydric soils in this area would have supported multiple kinds of wetland habitats during historic conditions but farmed wetlands most closely approximate emergent wetlands.
SV 8.2 TREE CANOPY Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
SV 8.3 SHRUB Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.1	0.1	0.1	0.1	Row crop w/ occasional instances of other species. During wet conditions, field may be left fallow and allow weedy species to grow. However, site is generally maintained for agriculture, so any ecological value that develops in the short term gets cleared regularly
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.21	0.21	0.21	0.21	

Table 16. Leveed Farmed Wetland - Hydrologic Reconnection, Land Use Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.75	0.8	0.8	0.8	Partially removed levee is reduced as a dispersal barrier.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.1	0.15	0.15	0.15	Variable benefits from partial removal of levee. However, agricultural land use practices (e.g., ditches) still result in highly degraded hydrology
V4 Water Distribution	0.1	0.15	0.15	0.15	Variable benefits from partial removal of levee. However, agricultural land use practices (e.g., ditches) still result in highly degraded hydrology
V5 Water Outflow	0.1	0.15	0.15	0.15	Variable benefits from partial removal of levee. However, agricultural land use practices (e.g., ditches) still result in highly degraded hydrology
V6 Geomorphology	0.1	0.1	0.1	0.1	Initial condition essentially maintained.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.05	0.05	0.05	0.05	Initial condition essentially maintained.
SV 7.2 Sedimentation / Turbidity	0.05	0.05	0.05	0.05	Initial condition essentially maintained.
SV 7.3 Toxic Contamination / pH	0.05	0.05	0.05	0.05	Initial condition essentially maintained.
SV 7.4 Temperature	0.05	0.05	0.05	0.05	Initial condition essentially maintained.
SV 7.5 Soil chemistry / Redox potential	0.05	0.05	0.05	0.05	Initial condition essentially maintained.
Final V7 Variable Score	0.05	0.05	0.05	0.05	Initial condition essentially maintained.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	Vegetation layer coverages typical for emergent wetlands, which this land cover type most closely approximates.
SV 8.2 TREE CANOPY Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
SV 8.3 SHRUB Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.1	0.1	0.1	0.1	Initial condition essentially maintained.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.21	0.23	0.23	0.23	

Table 17. Leveed Floodplain Forest - Land Use and Hydrology Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development.
SV 1.2 Migration / Dispersal Barriers	0.75	0.75	0.75	0.75	Variable. While highways cut off habitat in parts, most barriers are relatively easy to pass through.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Buffer areas feature much variation from highly disturbed roadside grasses to more moderately disturbed wooded areas.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Buffer extent variable.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
V3 Water Source	0.62	0.62	0.62	0.62	Actively managed hydrology: levee. Increased runoff from impermeable surfaces.
V4 Water Distribution	0.58	0.58	0.58	0.58	Alteration of water source. Road grades.
V5 Water Outflow	0.6	0.6	0.6	0.6	Alteration of water source. Levees. Road grades. Ditches.
V6 Geomorphology	0.8	0.8	0.8	0.8	Historical use as agricultural land likely.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.75	0.75	0.75	Agricultural runoff.
SV 7.2 Sedimentation / Turbidity	0.85	0.85	0.85	0.85	Agricultural runoff.
SV 7.3 Toxic Contamination / pH	0.8	0.8	0.8	0.8	Agricultural runoff, road runoff to some extent, dischargers.
SV 7.4 Temperature	0.85	0.85	0.85	0.85	Forest buffers often thin or otherwise allow more sunlight to reach forest floor.
SV 7.5 Soil chemistry / Redox potential	0.75	0.75	0.75	0.75	Unnatural desaturation. Possible history of soil dumping.
Final V7 Variable Score	0.79	0.79	0.79	0.79	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.75	0.75	0.75	0.75	Homogenization, dewatering, invasive species
SV 8.3 SHRUB Vegetation Layer Condition	0.75	0.75	0.75	0.75	Homogenization, dewatering, invasive species

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.7	0.7	0.7	0.7	Homogenization, dewatering, invasive species, nearby herbicide use
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.68	0.68	0.68	0.68	

Table 18. Leveed Floodplain Forest - Hydrologic Reconnection, Land Use Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.75	0.8	0.8	0.8	Partially removed levee is reduced as a dispersal barrier.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.62	0.78	0.78	0.78	Removal of levee rapidly improves water source variable.
V4 Water Distribution	0.58	0.7	0.7	0.7	Removal of levee rapidly improves water distribution variable. Requirement to prevent water from pooling near the airport limits the benefits to this variable relative to V3.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
V5 Water Outflow	0.6	0.72	0.72	0.72	Removal of levee rapidly improves water outflow variable. Requirement to prevent water from pooling near the airport limits the benefits to this variable relative to V3.
V6 Geomorphology	0.8	0.8	0.8	0.8	Initial condition essentially maintained.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 7.2 Sedimentation / Turbidity	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 7.3 Toxic Contamination / pH	0.8	0.8	0.8	0.8	Initial condition essentially maintained.
SV 7.4 Temperature	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 7.5 Soil chemistry / Redox potential	0.75	0.75	0.8	0.8	Gradual improvement with restored hydrological connection
Final V7 Variable Score	0.79	0.79	0.79	0.79	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 8.3 SHRUB Vegetation Layer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.7	0.7	0.7	0.7	Initial condition essentially maintained.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.68	0.74	0.74	0.74	

Table 19. Non-Leveed Missouri River Floodplain Forest - Land Use and Hydrology Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.8	0.8	0.8	0.8	Variable. Barriers are generally represented by floodplain levee, which is a relatively minor barrier
SV 2.1 Buffer Condition	0.8	0.8	0.8	0.8	Buffer areas generally correspond to adjacent forest along Missouri River or its tributaries, or grasses of a levee
SV 2.2 Buffer Extent	0.95	0.95	0.95	0.95	Buffered in nearly all areas
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.8	0.8	0.8	0.8	Upstream modifications that augment water. Restriction flow across floodplain due to levee
V4 Water Distribution	0.75	0.75	0.75	0.75	Alteration of water source. Adjacent levees. Entrenchment
V5 Water Outflow	0.8	0.8	0.8	0.8	Alteration of water source. Levees. BSNP
V6 Geomorphology	0.82	0.82	0.82	0.82	Increased sedimentation. Historical impacts from agricultural land use likely

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.8	0.8	0.8	0.8	Agricultural runoff
SV 7.2 Sedimentation / Turbidity	0.87	0.87	0.87	0.87	Increased deposition due to BSNP + levee
SV 7.3 Toxic Contamination / pH	0.8	0.8	0.8	0.8	Agricultural runoff, dischargers
SV 7.4 Temperature	0.85	0.85	0.85	0.85	Forest buffers often thin or otherwise allow more sunlight to reach forest floor
SV 7.5 Soil chemistry / Redox potential	0.85	0.85	0.85	0.85	Unnatural saturation and desaturation somewhat counteract each other
Final V7 Variable Score	0.84	0.84	0.84	0.84	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.85	0.85	0.85	0.85	Homogenization, changes to saturation, invasive species
SV 8.3 SHRUB Vegetation Layer Condition	0.85	0.85	0.85	0.85	Homogenization, changes to saturation, invasive species
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.75	0.75	0.75	0.75	Homogenization, changes to saturation, invasive species
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.78	0.78	0.78	0.78	

Table 20. Non-Leveed Missouri River Floodplain Forest - Hydrology Restored by Levee Setback, Land Use Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.8	0.85	0.85	0.85	Partially removed levee is reduced as a dispersal barrier.
SV 2.1 Buffer Condition	0.8	0.8	0.8	0.8	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.95	0.95	0.95	0.95	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.8	0.82	0.82	0.82	Modest improvement from removal of levee allowing a more natural hydrology
V4 Water Distribution	0.75	0.77	0.77	0.77	Modest improvement from removal of levee allowing a more natural hydrology
V5 Water Outflow	0.8	0.82	0.82	0.82	Modest improvement from removal of levee allowing a more natural hydrology
V6 Geomorphology	0.82	0.82	0.82	0.82	Initial condition essentially maintained.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.80	0.80	0.80	0.80	Initial condition essentially maintained.
SV 7.2 Sedimentation / Turbidity	0.87	0.87	0.87	0.87	Initial condition essentially maintained.
SV 7.3 Toxic Contamination / pH	0.8	0.8	0.8	0.8	Initial condition essentially maintained.
SV 7.4 Temperature	0.85	0.85	0.85	0.85	Initial condition essentially maintained.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.5 Soil chemistry / Redox potential	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
Final V7 Variable Score	0.84	0.84	0.84	0.84	Initial condition essentially maintained.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 8.3 SHRUB Vegetation Layer Condition	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.78	0.79	0.79	0.79	

Table 21. Non-Leveed Tributary Forest - Land Use Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.8	0.8	0.8	0.8	Variable. Barriers are generally represented by floodplain levee, which is a relatively minor barrier
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Buffer areas generally represented by levee turf grasses, though some wooded areas as well
SV 2.2 Buffer Extent	0.95	0.95	0.95	0.95	Buffered in nearly all areas
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.78	0.78	0.78	0.78	Upstream constrictions. Increased runoff upstream. Restricted flow across floodplain
V4 Water Distribution	0.75	0.75	0.75	0.75	Alteration of water source. Adjacent levees. Culverts. Entrenchment
V5 Water Outflow	0.78	0.78	0.78	0.78	Alteration of water source. Levees. Channel Incision. Constrictions.
V6 Geomorphology	0.75	0.75	0.75	0.75	Channelization, sedimentation
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.75	0.75	0.75	Agricultural runoff
SV 7.2 Sedimentation / Turbidity	0.82	0.82	0.82	0.82	Agricultural runoff, erosion
SV 7.3 Toxic Contamination / pH	0.78	0.78	0.78	0.78	Agricultural runoff, road runoff to some extent, dischargers
SV 7.4 Temperature	0.85	0.85	0.85	0.85	Forest buffers often thin or otherwise allow more sunlight to reach forest floor

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.5 Soil chemistry / Redox potential	0.85	0.85	0.85	0.85	Unnatural saturation and desaturation somewhat counteract each other
Final V7 Variable Score	0.79	0.79	0.79	0.79	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.8	0.8	0.8	0.8	Homogenization, dewatering, invasive species
SV 8.3 SHRUB Vegetation Layer Condition	0.8	0.8	0.8	0.8	Homogenization, dewatering, invasive species
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.7	0.7	0.7	0.7	Homogenization, changes to saturation, invasive species
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.76	0.76	0.76	0.76	

Table 22. Non-Leveed Tributary Forest – Hydrologic Reconnection, Land Use Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.8	0.85	0.85	0.85	Partially removed levee is reduced as a dispersal barrier.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.95	0.95	0.95	0.95	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.78	0.8	0.8	0.8	Modest improvement from removal of levee allowing a more natural hydrology
V4 Water Distribution	0.75	0.77	0.77	0.77	Modest improvement from removal of levee allowing a more natural hydrology
V5 Water Outflow	0.78	0.8	0.8	0.8	Modest improvement from removal of levee allowing a more natural hydrology
V6 Geomorphology	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 7.2 Sedimentation / Turbidity	0.82	0.82	0.82	0.82	Initial condition essentially maintained.
SV 7.3 Toxic Contamination / pH	0.78	0.78	0.78	0.78	Initial condition essentially maintained.
SV 7.4 Temperature	0.85	0.85	0.85	0.85	Initial condition essentially maintained.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.5 Soil chemistry / Redox potential	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
Final V7 Variable Score	0.79	0.79	0.79	0.79	Initial condition essentially maintained.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.8	0.8	0.8	0.8	Initial condition essentially maintained.
SV 8.3 SHRUB Vegetation Layer Condition	0.8	0.8	0.8	0.8	Initial condition essentially maintained.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.7	0.7	0.7	0.7	Initial condition essentially maintained.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.76	0.76	0.76	0.76	

Table 23. Leveed Disturbed Wooded Strip - Land Use Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.75	0.75	0.75	0.75	Variable. Barriers are generally represented by floodplain levee, but also minor roadways in parts
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Buffer areas feature much variation from highly disturbed roadside grasses to more moderately disturbed wooded areas
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Buffer extent variable
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.62	0.62	0.62	0.62	Actively managed hydrology: levee. Increased runoff from impermeable surfaces
V4 Water Distribution	0.58	0.58	0.58	0.58	Alteration of water source. Road grades
V5 Water Outflow	0.6	0.6	0.6	0.6	Alteration of water source. Levees. Road grades. Ditches
V6 Geomorphology	0.75	0.75	0.75	0.75	Historical use as agricultural land likely. Disturbance from road/path construction
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.75	0.75	0.75	Agricultural runoff
SV 7.2 Sedimentation / Turbidity	0.85	0.85	0.85	0.85	Agricultural runoff
SV 7.3 Toxic Contamination / pH	0.7	0.7	0.7	0.7	Agricultural runoff, dischargers, road runoff
SV 7.4 Temperature	0.75	0.75	0.75	0.75	Spottier tree cover results in greater temperature impact compared to forests

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.5 Soil chemistry / Redox potential	0.75	0.75	0.75	0.75	Unnatural desaturation. Possible history of soil dumping
Final V7 Variable Score	0.76	0.76	0.76	0.76	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.65	0.65	0.65	0.65	Homogenization, dewatering, invasive species, difference in layer coverage
SV 8.3 SHRUB Vegetation Layer Condition	0.65	0.65	0.65	0.65	Homogenization, dewatering, invasive species, difference in layer coverage
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.62	0.62	0.62	0.62	Homogenization, dewatering, invasive species, difference in layer coverage
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.66	0.66	0.66	0.66	

Table 24. Leveed Disturbed Wooded Strip – Hydrologic Reconnection, Land Use Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.75	0.8	0.8	0.8	Partially removed levee is reduced as a dispersal barrier.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.62	0.78	0.78	0.78	Removal of levee rapidly improves water source variable.
V4 Water Distribution	0.58	0.7	0.7	0.7	Removal of levee rapidly improves water distribution variable. Requirement to prevent water from pooling near the airport limits the benefits to this variable relative to V3.
V5 Water Outflow	0.6	0.72	0.72	0.72	Removal of levee rapidly improves water outflow variable. Requirement to prevent water from pooling near the airport limits the benefits to this variable relative to V3.
V6 Geomorphology	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 7.2 Sedimentation / Turbidity	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 7.3 Toxic Contamination / pH	0.7	0.7	0.7	0.7	Initial condition essentially maintained.
SV 7.4 Temperature	0.75	0.75	0.75	0.75	Initial condition essentially maintained.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.5 Soil chemistry / Redox potential	0.75	0.75	0.8	0.8	Gradual improvement to this variable.
Final V7 Variable Score	0.76	0.76	0.77	0.77	Initial condition essentially maintained.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
SV 8.3 SHRUB Vegetation Layer Condition	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.62	0.62	0.62	0.62	Initial condition essentially maintained.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.66	0.71	0.71	0.71	

Table 25. Leveed Floodplain Scrub - Land Use and Hydrology Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.75	0.75	0.75	0.75	Variable. Barriers are generally represented by floodplain levee, which is a relatively minor barrier
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Buffer areas feature much variation from highly disturbed roadside grasses to more moderately disturbed wooded areas
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Buffer extent variable
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.62	0.62	0.62	0.62	Actively managed hydrology: levee. Increased runoff from impermeable surfaces
V4 Water Distribution	0.58	0.58	0.58	0.58	Alteration of water source. Road grades
V5 Water Outflow	0.6	0.6	0.6	0.6	Alteration of water source. Levees. Road grades. Ditches
V6 Geomorphology	0.8	0.8	0.8	0.8	Historical use as agricultural land likely
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.75	0.75	0.75	Agricultural runoff
SV 7.2 Sedimentation / Turbidity	0.85	0.85	0.85	0.85	Agricultural runoff
SV 7.3 Toxic Contamination / pH	0.8	0.8	0.8	0.8	Agricultural runoff, dischargers
SV 7.4 Temperature	0.7	0.75	0.8	0.85	Spottier tree cover results in greater temperature impact compared to forests. Assumed to improve as ecological succession expands tree coverage

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.5 Soil chemistry / Redox potential	0.75	0.75	0.75	0.75	Unnatural desaturation. Possible history of soil dumping
Final V7 Variable Score	0.77	0.78	0.79	0.79	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.65	0.7	0.73	0.75	Homogenization, dewatering, invasive species, difference in layer coverage. Assumed to reach conditions found in leveed floodplain forest due to ecological succession.
SV 8.3 SHRUB Vegetation Layer Condition	0.65	0.7	0.75	0.75	Homogenization, dewatering, invasive species, difference in layer coverage. Assumed to reach conditions found in leveed floodplain forest due to ecological succession.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.62	0.68	0.7	0.7	Homogenization, dewatering, invasive species, difference in layer coverage. Assumed to reach conditions found in leveed floodplain forest due to ecological succession.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.67	0.68	0.68	0.68	

Table 26. Non-Leveed Tributary Scrub - Land Use Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.8	0.8	0.8	0.8	Variable. Barriers are generally represented by floodplain levee, which is a relatively minor barrier
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Buffer areas generally represented by levee turf grasses, though some wooded areas as well
SV 2.2 Buffer Extent	0.95	0.95	0.95	0.95	Buffered in nearly all areas
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.78	0.78	0.78	0.78	Upstream constrictions. Increased runoff upstream. Restricted flow across floodplain
V4 Water Distribution	0.75	0.75	0.75	0.75	Alteration of water source. Adjacent levees. Culverts. Entrenchment
V5 Water Outflow	0.78	0.78	0.78	0.78	Alteration of water source. Levees. Channel Incision. Constrictions.
V6 Geomorphology	0.75	0.75	0.75	0.75	Channelization, historical use as agricultural land likely
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.75	0.75	0.75	Agricultural runoff
SV 7.2 Sedimentation / Turbidity	0.8	0.8	0.8	0.8	Agricultural runoff, erosion, deposition
SV 7.3 Toxic Contamination / pH	0.78	0.78	0.78	0.78	Agricultural runoff, road runoff to some extent, dischargers
SV 7.4 Temperature	0.7	0.75	0.8	0.85	Spottier tree cover results in greater temperature impact compared to forests. Assumed to improve as ecological succession expands tree coverage

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.5 Soil chemistry / Redox potential	0.88	0.88	0.88	0.88	Unnatural saturation and desaturation somewhat counteract each other
Final V7 Variable Score	0.78	0.79	0.79	0.79	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.65	0.7	0.75	0.8	Homogenization, dewatering, invasive species, difference in layer coverage. Assumed to reach conditions found in non-leveed tributary forest due to ecological succession.
SV 8.3 SHRUB Vegetation Layer Condition	0.65	0.75	0.8	0.8	Homogenization, dewatering, invasive species, difference in layer coverage. Assumed to reach conditions found in non-leveed tributary forest due to ecological succession.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.62	0.68	0.7	0.7	Homogenization, dewatering, invasive species, difference in layer coverage. Assumed to reach conditions found in non-leveed tributary forest due to ecological succession.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.73	0.74	0.75	0.76	

Table 27. Non-Leveed Tributary Scrub – Hydrology Restored by Levee Setback, Land Use Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.8	0.85	0.85	0.85	Partially removed levee is reduced as a dispersal barrier.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.95	0.95	0.95	0.95	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.78	0.8	0.8	0.8	Modest improvement from removal of levee allowing a more natural hydrology
V4 Water Distribution	0.75	0.77	0.77	0.77	Modest improvement from removal of levee allowing a more natural hydrology
V5 Water Outflow	0.78	0.8	0.8	0.8	Modest improvement from removal of levee allowing a more natural hydrology
V6 Geomorphology	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 7.2 Sedimentation / Turbidity	0.8	0.8	0.8	0.8	Initial condition essentially maintained.
SV 7.3 Toxic Contamination / pH	0.78	0.78	0.78	0.78	Initial condition essentially maintained.
SV 7.4 Temperature	0.7	0.75	0.8	0.85	Initial condition essentially maintained.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.5 Soil chemistry / Redox potential	0.88	0.88	0.88	0.88	Initial condition essentially maintained.
Final V7 Variable Score	0.78	0.79	0.79	0.79	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.65	0.7	0.75	0.8	Projected conditions essentially the same as the future without project.
SV 8.3 SHRUB Vegetation Layer Condition	0.65	0.75	0.8	0.8	Projected conditions essentially the same as the future without project.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.62	0.68	0.7	0.7	Projected conditions essentially the same as the future without project.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.73	0.75	0.76	0.76	

Table 28. Ditch Leveed Emergent Wetland - Land Use Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.75	0.75	0.75	0.75	Variable. Definitionally associated with roadways, though some areas have relatively good access
SV 2.1 Buffer Condition	0.65	0.65	0.65	0.65	Buffer areas generally dominated by roadside grasses
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Buffer extent variable
SV 2.3 Buffer Width	0.65	0.65	0.65	0.65	Buffer width variable, though generally narrower due to roadways
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.58	0.58	0.58	0.58	Actively managed hydrology: levee. Increased runoff from impermeable surfaces
V4 Water Distribution	0.54	0.54	0.54	0.54	Alteration of water source. Road grades
V5 Water Outflow	0.56	0.56	0.56	0.56	Alteration of water source. Levees. Road grades. Ditches
V6 Geomorphology	0.68	0.68	0.68	0.68	Fill (roadside ditch), compaction, grading
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.75	0.75	0.75	Agricultural runoff
SV 7.2 Sedimentation / Turbidity	0.75	0.75	0.75	0.75	Agricultural runoff, runoff from road
SV 7.3 Toxic Contamination / pH	0.6	0.6	0.6	0.6	Road drainage, agricultural runoff
SV 7.4 Temperature	0.7	0.7	0.7	0.7	Temperature impacts from lack of plant layers
SV 7.5 Soil chemistry / Redox potential	0.7	0.7	0.7	0.7	Unnatural desaturation. Minor mechanical disturbance from mowers. Possible history of soil dumping

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
Final V7 Variable Score	0.69	0.69	0.69	0.69	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	Vegetation layer coverages typical for eastern North American marsh, wet meadow, and shrubland ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	N/A	N/A	N/A	N/A	
SV 8.3 SHRUB Vegetation Layer Condition	N/A	N/A	N/A	N/A	
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.62	0.62	0.62	0.62	Weeds, invasives, homogenization, dewatering, mowing
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.61	0.61	0.61	0.61	

Table 29. Non-Hydric Leveed Farmland - Land Use Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.75	0.75	0.75	0.75	Variable. Farmed areas are generally located between more natural habitats, and frequently have good access to these areas
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Buffer areas feature much variation from highly disturbed roadside grasses to more moderately disturbed wooded areas
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Buffer extent variable
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.05	0.05	0.05	0.05	Hydrology very highly disturbed. Levee and BSNP alter hydrologic connection between river and land. Farmland hydrology further altered for agriculture: drains, ditches, etc. Score slightly lower here than in farmed wetland because this area lacks the benefit of wetter soils.
V4 Water Distribution	0.05	0.05	0.05	0.05	Degradation resulting from altered water source. Further impacts include ditches and roadways. Score slightly lower here than in farmed wetland because this area lacks the benefit of wetter soils.
V5 Water Outflow	0.05	0.05	0.05	0.05	Degradation resulting from altered water source. Further impacts include ditches, roadways, and levees. Score slightly lower here than in farmed wetland because this area lacks the benefit of wetter soils.
V6 Geomorphology	0.1	0.1	0.1	0.1	Geomorphology highly altered by unnatural rivers processes. For example, natural processes for sediment deposition and erosion have been impacted by river development. Further degradation due to agriculture (e.g., grading, compaction, plowing) also apply
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.05	0.05	0.05	0.05	Heavy introduction of nutrients due to fertilizers used in agriculture
SV 7.2 Sedimentation / Turbidity	0.05	0.05	0.05	0.05	Heavy impacts due to agriculture. Erosion and agricultural runoff
SV 7.3 Toxic Contamination / pH	0.05	0.05	0.05	0.05	Heavy impacts due to agriculture and general development. Agricultural, storm, and road runoff all potential sources of contamination
SV 7.4 Temperature	0.05	0.05	0.05	0.05	Heavily altered shading regime due to agriculture. Monoculture replaced native layering. Harvest leaves land mostly exposed.
SV 7.5 Soil chemistry / Redox potential	0.05	0.05	0.05	0.05	Heavy impacts due to agriculture. Unnatural drainage and mechanical ground disturbance are common issues
Final V7 Variable Score	0.05	0.05	0.05	0.05	Composite of all V7 sub-variables.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system. Assumes this ecological system would have predominated on these kinds of soils historically due to ecological succession. However, aquatic vegetation is not present in these particular areas because they definitionally have non-hydric soils.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0	0	0	0	Layer lost
SV 8.3 SHRUB Vegetation Layer Condition	0	0	0	0	Layer lost
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.05	0.05	0.05	0.05	Row crop with occasional instances of other species. Other species generally weedy
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.17	0.17	0.17	0.17	

Table 30. Non-Hydric Leveed Farmland - Habitat Regenerated in Capital View Area by Natural Succession of Wooded Vegetation with Adaptive Management

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.75	0.8	0.8	0.8	Partially removed levee is reduced as a dispersal barrier.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.05	0.78	0.78	0.78	Removal of levee and taking the land out of agriculture rapidly improves water source variable.
V4 Water Distribution	0.05	0.7	0.7	0.7	Removal of levee and taking the land out of agriculture rapidly improves water distribution variable. Requirement to prevent water from pooling near the airport limits the benefits to this variable relative to V3.
V5 Water Outflow	0.05	0.72	0.72	0.72	Removal of levee and taking the land out of agriculture rapidly improves water outflow variable. Requirement to prevent water from pooling near the airport limits the benefits to this variable relative to V3.
V6 Geomorphology	0.1	0.78	0.78	0.78	Removal of levee, taking the land out of agriculture cause initial improvement of geomorphology variable (e.g., no more tilling), and reintroducing geomorphological variation following borrow activities. Requirement to prevent formation of standing water for airport safety limits the potential lift to this category, however.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.05	0.65	0.75	0.75	Rapid initial improvement, though further recovery will be a gradual process. Agricultural activities are expected to continue nearby, limiting the potential improvement to this variable.
SV 7.2 Sedimentation / Turbidity	0.05	0.65	0.8	0.85	Rapid initial improvement, though complete recovery will be a gradual process.
SV 7.3 Toxic Contamination / pH	0.05	0.65	0.75	0.8	Rapid initial improvement, though complete recovery will be a gradual process.
SV 7.4 Temperature	0.05	0.65	0.75	0.8	Rapid initial improvement, though complete recovery will be a gradual process.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.5 Soil chemistry / Redox potential	0.05	0.65	0.75	0.8	Rapid initial improvement, though complete recovery will be a gradual process.
Final V7 Variable Score	0.05	0.65	0.76	0.79	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system. However, aquatic vegetation is not present in these particular areas because they definitionally have non-hydric soils.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0	0	0.25	0.65	Recovery of this layer slower than other layers due to slower growth of plants into the canopy layer.
SV 8.3 SHRUB Vegetation Layer Condition	0	0.15	0.45	0.7	Recovery of this layer faster than canopy, though still slower than non-woody plants.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.05	0.35	0.65	0.7	Fairly rapid recovery of this layer relative to other layers.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.17	0.61	0.67	0.72	

Table 31. Non-Hydric Leveed Farmland - Habitat Regenerated in Capital View Area by Planting Wooded Vegetation

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.2 Migration / Dispersal Barriers	0.75	0.8	0.8	0.8	Partially removed levee is reduced as a dispersal barrier.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.05	0.78	0.78	0.78	Removal of levee and taking the land out of agriculture rapidly improves water source variable.
V4 Water Distribution	0.05	0.7	0.7	0.7	Removal of levee and taking the land out of agriculture rapidly improves water distribution variable. Requirement to prevent water from pooling near the airport limits the benefits to this variable relative to V3.
V5 Water Outflow	0.05	0.72	0.72	0.72	Removal of levee and taking the land out of agriculture rapidly improves water outflow variable. Requirement to prevent water from pooling near the airport limits the benefits to this variable relative to V3.
V6 Geomorphology	0.1	0.78	0.78	0.78	Removal of levee, taking the land out of agriculture cause initial improvement of geomorphology variable (e.g., no more tilling), and reintroducing geomorphological variation following borrow activities. Requirement to prevent formation of standing water for airport safety limits the potential lift to this category, however.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.05	0.65	0.75	0.85	Rapid initial improvement, though further recovery will be a gradual process. Agricultural activities are expected to continue nearby, limiting the potential improvement to this variable. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.2 Sedimentation / Turbidity	0.05	0.65	0.8	0.9	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.3 Toxic Contamination / pH	0.05	0.65	0.75	0.9	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.4 Temperature	0.05	0.65	0.75	0.95	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.5 Soil chemistry / Redox potential	0.05	0.65	0.75	0.9	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
Final V7 Variable Score	0.05	0.65	0.76	0.89	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system. However, aquatic vegetation is not present in these particular areas because they definitionally have non-hydric soils.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0	0	0.5	0.95	Recovery of this layer slower than other layers due to slower growth of plants into the canopy layer. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.3 SHRUB Vegetation Layer Condition	0	0.6	0.85	0.95	Recovery of this layer faster than canopy, though still slower than non-woody plants. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.05	0.9	0.95	0.95	Fairly rapid recovery of this layer relative to other layers. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.17	0.65	0.72	0.78	

Table 32. Leveed Farmed Wetland (Church Farm Conservation Area) - Land Use and Connected Hydrology Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Variable. Farmed areas are generally located between more natural habitats and frequently have good access to these areas. Levee is somewhat of a dispersal barrier but has been breached.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Buffer areas feature much variation from highly disturbed roadside grasses to more moderately disturbed wooded areas
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Buffer extent variable
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
V3 Water Source	0.15	0.15	0.15	0.15	Hydrology very highly disturbed. Hydrologic connection between river and floodplain has been somewhat improved by levee breaches. However, hydrology is still largely impacted due to agricultural use: drains, ditches, etc.
V4 Water Distribution	0.15	0.15	0.15	0.15	Degradation resulting from altered water source. Further impacts include ditches and roadways
V5 Water Outflow	0.15	0.15	0.15	0.15	Degradation resulting from altered water source. Further impacts include ditches, roadways, and levees
V6 Geomorphology	0.1	0.1	0.1	0.1	Geomorphology highly altered by unnatural rivers processes. For example, natural processes for sediment deposition and erosion have been impacted by river development. Further degradation due to agriculture (e.g., grading, compaction, plowing) also apply
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.3	0.3	0.3	0.3	Heavy introduction of nutrients due to fertilizers used in agriculture. A larger percentage of land under this cover type is occasionally left fallow during years when conditions are too wet for planting, allowing some temporary regeneration of habitat and a reduction in the severity of impacts to this variable.
SV 7.2 Sedimentation / Turbidity	0.3	0.3	0.3	0.3	Heavy impacts due to agriculture. Erosion and agricultural runoff. A larger percentage of land under this cover type is occasionally left fallow during years when conditions are too wet for planting, allowing some temporary regeneration of habitat and a reduction in the severity of impacts to this variable.
SV 7.3 Toxic Contamination / pH	0.3	0.3	0.3	0.3	Heavy impacts due to agriculture and general development. Agricultural, storm, and road runoff all potential sources of contamination. A larger percentage of land under this cover type is occasionally left fallow during years when conditions are too wet for planting, allowing some temporary regeneration of habitat and a reduction in the severity of impacts to this variable.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.4 Temperature	0.3	0.3	0.3	0.3	Heavily altered shading regime due to agriculture. Monoculture replaced native layering. Harvest leaves land mostly exposed. A larger percentage of land under this cover type is occasionally left fallow during years when conditions are too wet for planting, allowing some temporary regeneration of habitat and a reduction in the severity of impacts to this variable.
SV 7.5 Soil chemistry / Redox potential	0.3	0.3	0.3	0.3	Heavy impacts due to agriculture. Unnatural drainage and mechanical ground disturbance are common issues. A larger percentage of land under this cover type is occasionally left fallow during years when conditions are too wet for planting, allowing some temporary regeneration of habitat and a reduction in the severity of impacts to this variable.
Final V7 Variable Score	0.3	0.3	0.3	0.3	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	Vegetation layer coverages typical for emergent wetlands. Lands with hydric soils in this area would have supported multiple kinds of wetland habitats during historic conditions but farmed wetlands most closely approximate emergent wetlands.
SV 8.2 TREE CANOPY Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
SV 8.3 SHRUB Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.3	0.3	0.3	0.3	Row crop with occasional instances of other species. Other species generally weedy. A larger percentage of land under this cover type is occasionally left fallow during years when conditions are too wet for planting, allowing some temporary regeneration of habitat and a reduction in the severity of impacts to this variable.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.28	0.28	0.28	0.28	

Table 33. Leveed Farmed Wetland (Church Farm Conservation Area) – Used for Borrow, No Mitigatory Action

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.15	0.15	0.15	0.15	Initial condition essentially maintained.
V4 Water Distribution	0.15	0.15	0.15	0.15	Initial condition essentially maintained.
V5 Water Outflow	0.15	0.15	0.15	0.15	Initial condition essentially maintained.
V6 Geomorphology	0.1	0.1	0.1	0.1	Initial condition essentially maintained.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.3	0.05	0.15	0.3	Water and soil chemical environment heavily disturbed by borrow taking activities and is made more vulnerable to additional disturbances. This scenario assumes a gradual recovery from impacts and that by Year 50 conditions will have recovered enough to be essentially equivalent to initial conditions.
SV 7.2 Sedimentation / Turbidity	0.3	0.05	0.15	0.3	Water and soil chemical environment heavily disturbed by borrow taking activities and is made more vulnerable to additional disturbances. This scenario assumes a gradual recovery from impacts and that by Year 50 conditions will have recovered enough to be essentially equivalent to initial conditions.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.3 Toxic Contamination / pH	0.3	0.05	0.15	0.3	Water and soil chemical environment heavily disturbed by borrow taking activities and is made more vulnerable to additional disturbances. This scenario assumes a gradual recovery from impacts and that by Year 50 conditions will have recovered enough to be essentially equivalent to initial conditions.
SV 7.4 Temperature	0.3	0.05	0.15	0.3	Water and soil chemical environment heavily disturbed by borrow taking activities and is made more vulnerable to additional disturbances. This scenario assumes a gradual recovery from impacts and that by Year 50 conditions will have recovered enough to be essentially equivalent to initial conditions.
SV 7.5 Soil chemistry / Redox potential	0.3	0.05	0.15	0.3	Water and soil chemical environment heavily disturbed by borrow taking activities and is made more vulnerable to additional disturbances. This scenario assumes a gradual recovery from impacts and that by Year 50 conditions will have recovered enough to be essentially equivalent to initial conditions.
Final V7 Variable Score	0.3	0.05	0.15	0.3	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	Vegetation layer coverages typical for emergent wetlands. Lands with hydric soils in this area would have supported multiple kinds of wetland habitats during historic conditions but farmed wetlands most closely approximate emergent wetlands.
SV 8.2 TREE CANOPY Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
SV 8.3 SHRUB Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.3	0.05	0.15	0.3	Vegetation heavily disturbed by borrow activities. This scenario assumes a gradual recovery from impacts and that by Year 50 conditions will have recovered enough to be essentially equivalent to initial conditions.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.28	0.22	0.24	0.28	

Table 34. Leveed Farmed Wetland (Church Farm Conservation Area) - Connected Hydrology Maintained, Mitigation by Natural Succession of Wooded Vegetation with Adaptive Management

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.15	0.78	0.78	0.78	Taking the site out of agriculture, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V4 Water Distribution	0.15	0.76	0.76	0.76	Taking the site out of agriculture, earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
V5 Water Outflow	0.15	0.76	0.76	0.76	Taking the site out of agriculture, earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V6 Geomorphology	0.1	0.9	0.9	0.9	Earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural geomorphology.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.3	0.65	0.75	0.75	Rapid initial improvement, though complete recovery will be a gradual process. Agricultural activities are expected to continue nearby, limiting the potential improvement to this variable.
SV 7.2 Sedimentation / Turbidity	0.3	0.65	0.8	0.85	Rapid initial improvement, though complete recovery will be a gradual process.
SV 7.3 Toxic Contamination / pH	0.3	0.65	0.75	0.8	Rapid initial improvement, though complete recovery will be a gradual process.
SV 7.4 Temperature	0.3	0.65	0.75	0.8	Rapid initial improvement, though complete recovery will be a gradual process.
SV 7.5 Soil chemistry / Redox potential	0.3	0.65	0.75	0.8	Rapid initial improvement, though complete recovery will be a gradual process.
Final V7 Variable Score	0.3	0.65	0.76	0.79	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.4: 100%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	N/A	0	0.25	0.65	Recovery of this layer slower than other layers due to slower growth of plants into the canopy layer.
SV 8.3 SHRUB Vegetation Layer Condition	N/A	0.15	0.45	0.7	Recovery of this layer faster than canopy, though still slower than non-woody plants.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.3	0.35	0.65	0.7	Fairly rapid recovery of this layer relative to other layers.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.28	0.65	0.70	0.76	

Table 35. Leveed Farmed Wetland (Church Farm Conservation Area) - Connected Hydrology Maintained, Mitigation by Planting Wooded Vegetation

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.15	0.78	0.78	0.78	Taking the site out of agriculture, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
V4 Water Distribution	0.15	0.76	0.76	0.76	Taking the site out of agriculture, earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V5 Water Outflow	0.15	0.76	0.76	0.76	Taking the site out of agriculture, earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V6 Geomorphology	0.1	0.9	0.9	0.9	Earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural geomorphology.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.3	0.65	0.75	0.85	Rapid initial improvement, though complete recovery will be a gradual process. Agricultural activities are expected to continue nearby, limiting the potential improvement to this variable. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.2 Sedimentation / Turbidity	0.3	0.65	0.8	0.9	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.3 Toxic Contamination / pH	0.3	0.65	0.75	0.9	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.4 Temperature	0.3	0.65	0.75	0.95	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.5 Soil chemistry / Redox potential	0.3	0.65	0.75	0.9	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
Final V7 Variable Score	0.3	0.65	0.76	0.89	Composite of all V7 sub-variables.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.4: 100%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	N/A	0	0.5	0.95	Recovery of this layer slower than other layers due to slower growth of plants into the canopy layer. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 8.3 SHRUB Vegetation Layer Condition	N/A	0.6	0.85	0.95	Recovery of this layer faster than canopy, though still slower than non-woody plants. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.3	0.9	0.95	0.95	Fairly rapid recovery of this layer relative to other layers. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.28	0.68	0.76	0.82	

Table 36. Leveed Farmed Wetland (Church Farm Conservation Area) - Connected Hydrology Maintained, Mitigation by Planting Emergent Vegetation

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.15	0.78	0.78	0.78	Taking the site out of agriculture, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V4 Water Distribution	0.15	0.76	0.76	0.76	Taking the site out of agriculture, earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V5 Water Outflow	0.15	0.76	0.76	0.76	Taking the site out of agriculture, earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V6 Geomorphology	0.1	0.9	0.9	0.9	Earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural geomorphology.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.3	0.65	0.75	0.85	Rapid initial improvement, though complete recovery will be a gradual process.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.2 Sedimentation / Turbidity	0.3	0.65	0.8	0.9	Rapid initial improvement, though complete recovery will be a gradual process.
SV 7.3 Toxic Contamination / pH	0.3	0.65	0.75	0.9	Rapid initial improvement, though complete recovery will be a gradual process.
SV 7.4 Temperature	0.3	0.65	0.95	0.95	Rapid initial improvement, though complete recovery will be a gradual process.
SV 7.5 Soil chemistry / Redox potential	0.3	0.65	0.75	0.9	Rapid initial improvement, though complete recovery will be a gradual process.
Final V7 Variable Score	0.3	0.65	0.79	0.89	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	SV 8.4: 100%	Vegetation layer coverages typical for emergent wetlands
SV 8.2 TREE CANOPY Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
SV 8.3 SHRUB Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.3	0.9	0.95	0.95	Emergent vegetation capable of rapid recovery. Assumes maintenance activities to limit the spread of invasive plants.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.28	0.79	0.81	0.82	

Table 37. Leveed Floodplain Scrub – Land Use and Connected Hydrology Maintained at Church Farm Conservation Area

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Variable. Barriers are generally represented by a breached floodplain levee, which is a relatively minor barrier
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Buffer areas feature much variation from highly disturbed roadside grasses to more moderately disturbed wooded areas
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Buffer extent variable
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.78	0.78	0.78	0.78	Hydrologic connection to the Missouri River through levee breaches, though most of the structure remains. Agricultural land use and associated features (e.g., ditches) also interfere with the natural availability of water for this land cover type.
V4 Water Distribution	0.76	0.76	0.76	0.76	Hydrologic connection to the Missouri River through levee breaches, though most of the structure remains. Agricultural land use and associated features (e.g., ditches) also interfere with natural distribution of water for this land cover type.
V5 Water Outflow	0.76	0.76	0.76	0.76	Hydrologic connection to the Missouri River through levee breaches, though most of the structure remains. Agricultural land use and associated features (e.g., ditches) also interfere with the natural outflow of water for this land cover type.
V6 Geomorphology	0.8	0.8	0.8	0.8	Historical use as agricultural land likely
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.75	0.75	0.75	Agricultural runoff

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.2 Sedimentation / Turbidity	0.85	0.85	0.85	0.85	Agricultural runoff
SV 7.3 Toxic Contamination / pH	0.8	0.8	0.8	0.8	Agricultural runoff, dischargers
SV 7.4 Temperature	0.7	0.75	0.8	0.85	Spottier tree cover results in greater temperature impact compared to forests. Assumed to improve as ecological succession expands tree coverage
SV 7.5 Soil chemistry / Redox potential	0.8	0.8	0.8	0.8	Unnatural desaturation, moderated by hydrologic connection to the Missouri River. Possible history of soil dumping
Final V7 Variable Score	0.78	0.79	0.79	0.79	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.2	0.4	0.65	0.75	Homogenization, dewatering, invasive species, difference in layer coverage. Assumed to reach conditions found in leveed floodplain forest due to ecological succession.
SV 8.3 SHRUB Vegetation Layer Condition	0.4	0.6	0.7	0.75	Homogenization, dewatering, invasive species, difference in layer coverage. Assumed to reach conditions found in leveed floodplain forest due to ecological succession.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.6	0.65	0.7	0.7	Homogenization, dewatering, invasive species, difference in layer coverage. Assumed to reach conditions found in leveed floodplain forest due to ecological succession.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.68	0.71	0.74	0.76	

Table 38. Leveed Floodplain Scrub (Church Farm Conservation Area) - Connected Hydrology Maintained, Mitigation by Natural Succession of Wooded Vegetation without Adaptive Management

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Removed levee no longer acts as a dispersal barrier.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.78	0.78	0.78	0.78	Initial condition essentially maintained.
V4 Water Distribution	0.76	0.76	0.76	0.76	Initial condition essentially maintained.
V5 Water Outflow	0.76	0.76	0.76	0.76	Initial condition essentially maintained.
V6 Geomorphology	0.8	0.9	0.9	0.9	Earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural geomorphology.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.6	0.70	0.75	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process. Agricultural activities are expected to continue nearby, limiting the potential improvement to this variable.
SV 7.2 Sedimentation / Turbidity	0.85	0.6	0.75	0.85	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.3 Toxic Contamination / pH	0.8	0.6	0.7	0.8	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process.
SV 7.4 Temperature	0.7	0.6	0.75	0.8	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process.
SV 7.5 Soil chemistry / Redox potential	0.8	0.6	0.7	0.8	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process.
Final V7 Variable Score	0.78	0.60	0.72	0.79	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.2	0	0.2	0.65	Initial loss of current vegetative cover due to borrow activities. Then, habitat regeneration and ecological succession improve site conditions over time. This layer regenerates more slowly than the other two. Due to habitat clearing essentially resetting ecological succession at this site, this scenario assumes vegetation by Year 50 would be essentially equivalent to Year 25 vegetation under the FWOP.
SV 8.3 SHRUB Vegetation Layer Condition	0.4	0.1	0.4	0.7	Initial loss of current vegetative cover due to borrow activities. Then, habitat regeneration and ecological succession improve site conditions over time. Due to habitat clearing essentially resetting ecological succession at this site, this scenario assumes vegetation by Year 50 would be essentially equivalent to Year 25 vegetation under the FWOP.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.6	0.3	0.6	0.7	Initial loss of current vegetative cover due to borrow activities, though this layer is expected to return to initial conditions quickly. Then, habitat regeneration and ecological succession improve site conditions over time. Due to habitat clearing essentially resetting ecological succession at this site, this scenario assumes vegetation by Year 50 would be essentially equivalent to Year 25 vegetation under the FWOP.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.68	0.64	0.69	0.76	

Table 39. Leveed Floodplain Scrub (Church Farm Conservation Area) - Connected Hydrology Maintained, Mitigation by Natural Succession of Wooded Vegetation with Adaptive Management

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Removed levee no longer acts as a dispersal barrier.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
V3 Water Source	0.78	0.78	0.78	0.78	Initial condition essentially maintained.
V4 Water Distribution	0.76	0.76	0.76	0.76	Initial condition essentially maintained.
V5 Water Outflow	0.76	0.76	0.76	0.76	Initial condition essentially maintained.
V6 Geomorphology	0.8	0.9	0.9	0.9	Earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural geomorphology.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.65	0.75	0.75	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process. Agricultural activities are expected to continue nearby, limiting the potential improvement to this variable. Assumes that adaptive management allows this variable to recover more quickly than natural succession without it but reaches the same value by Year 50.
SV 7.2 Sedimentation / Turbidity	0.85	0.65	0.8	0.85	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process. Assumes that adaptive management allows this variable to recover more quickly than natural succession without it but reaches the same value by Year 50.
SV 7.3 Toxic Contamination / pH	0.8	0.65	0.75	0.8	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process. Assumes that adaptive management allows this variable to recover more quickly than natural succession without it but reaches the same value by Year 50.
SV 7.4 Temperature	0.7	0.65	0.75	0.8	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process. Assumes that adaptive management allows this variable to recover more quickly than natural succession without it but reaches the same value by Year 50.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.5 Soil chemistry / Redox potential	0.8	0.65	0.75	0.8	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process. Assumes that adaptive management allows this variable to recover more quickly than natural succession without it but reaches the same value by Year 50.
Final V7 Variable Score	0.78	0.65	0.76	0.79	
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.2	0	0.25	0.65	Initial loss of current vegetative cover due to borrow activities. Then, habitat regeneration and ecological succession improve site conditions over time. This layer regenerates more slowly than the other two. Assumes that adaptive management allows this variable to recover more quickly than natural succession without it but reaches the same value by Year 50.
SV 8.3 SHRUB Vegetation Layer Condition	0.4	0.15	0.45	0.7	Initial loss of current vegetative cover due to borrow activities. Then, habitat regeneration and ecological succession improve site conditions over time. Assumes that adaptive management allows this variable to recover more quickly than natural succession without it but reaches the same value by Year 50.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.6	0.35	0.65	0.7	Initial loss of current vegetative cover due to borrow activities, though this layer is expected to return to initial conditions quickly. Then, habitat regeneration and ecological succession improve site conditions over time. Assumes that adaptive management allows this variable to recover more quickly than natural succession without it but reaches the same value by Year 50.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.68	0.65	0.70	0.76	

Table 40. Leveed Floodplain Scrub (Church Farm Conservation Area) - Connected Hydrology Maintained, Mitigation by Planted Wooded Vegetation

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Removed levee no longer acts as a dispersal barrier.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.78	0.78	0.78	0.78	Initial condition essentially maintained.
V4 Water Distribution	0.76	0.76	0.76	0.76	Initial condition essentially maintained.
V5 Water Outflow	0.76	0.76	0.76	0.76	Initial condition essentially maintained.
V6 Geomorphology	0.8	0.9	0.9	0.9	Earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural geomorphology.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.75	0.65	0.75	0.85	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.2 Sedimentation / Turbidity	0.85	0.65	0.8	0.9	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.3 Toxic Contamination / pH	0.8	0.65	0.75	0.9	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.4 Temperature	0.7	0.65	0.75	0.95	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.5 Soil chemistry / Redox potential	0.80	0.65	0.75	0.9	This variable is at first disturbed by borrow taking activities. Rapid improvement afterwards, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
Final V7 Variable Score	0.78	0.65	0.76	0.89	

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.2	0	0.5	0.95	Initial removal of vegetation by borrow taking activities. Recovery of this layer slower than other layers due to slower growth of plants into the canopy layer. Higher scores than the natural succession scenario due to planting a high diversity of native species.
SV 8.3 SHRUB Vegetation Layer Condition	0.4	0.6	0.85	0.95	Initial removal of vegetation by borrow taking activities. Recovery of this layer faster than canopy, though still slower than non-woody plants. Higher scores than the natural succession scenario due to planting a high diversity of native species.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.6	0.9	0.95	0.95	Initial removal of vegetation by borrow taking activities. Fairly rapid recovery of this layer relative to other layers. Higher scores than the natural succession scenario due to planting a high diversity of native species.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.68	0.68	0.76	0.82	

Table 41. Non-Hydric Leveed Farmland (Church Farm Conservation Area) - Land Use Maintained and Connected Hydrology Maintained

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Variable. Farmed areas are generally located between more natural habitats and frequently have good access to these areas. Levee is somewhat of a dispersal barrier but has been breached.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Buffer areas feature much variation from highly disturbed roadside grasses to more moderately disturbed wooded areas
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Buffer extent variable
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.05	0.05	0.05	0.05	Hydrology very highly disturbed. Levee and BSNP alter hydrologic connection between river and land. Farmland hydrology further altered for agriculture: drains, ditches, etc. Score slightly lower here than in farmed wetland because this area lacks the benefit of wetter soils.
V4 Water Distribution	0.05	0.05	0.05	0.05	Degradation resulting from altered water source. Further impacts include ditches and roadways. Score slightly lower here than in farmed wetland because this area lacks the benefit of wetter soils.
V5 Water Outflow	0.05	0.05	0.05	0.05	Degradation resulting from altered water source. Further impacts include ditches, roadways, and levees. Score slightly lower here than in farmed wetland because this area lacks the benefit of wetter soils.
V6 Geomorphology	0.1	0.1	0.1	0.1	Geomorphology highly altered by unnatural rivers processes. For example, natural processes for sediment deposition and erosion have been impacted by river development. Further degradation due to agriculture (e.g., grading, compaction, plowing) also apply

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.05	0.05	0.05	0.05	Heavy introduction of nutrients due to fertilizers used in agriculture
SV 7.2 Sedimentation / Turbidity	0.05	0.05	0.05	0.05	Heavy impacts due to agriculture. Erosion and agricultural runoff
SV 7.3 Toxic Contamination / pH	0.05	0.05	0.05	0.05	Heavy impacts due to agriculture and general development. Agricultural, storm, and road runoff all potential sources of contamination
SV 7.4 Temperature	0.05	0.05	0.05	0.05	Heavily altered shading regime due to agriculture. Monoculture replaced native layering. Harvest leaves land mostly exposed.
SV 7.5 Soil chemistry / Redox potential	0.05	0.05	0.05	0.05	Heavy impacts due to agriculture. Unnatural drainage and mechanical ground disturbance are common issues
Final V7 Variable Score	0.05	0.05	0.05	0.05	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system. Assumes this ecological system would have predominated on these kinds of soils historically due to ecological succession. However, aquatic vegetation is not present in these particular areas because they definitionally have non-hydric soils.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0	0	0	0	Layer lost
SV 8.3 SHRUB Vegetation Layer Condition	0	0	0	0	Layer lost
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.05	0.05	0.05	0.05	Row crop with occasional instances of other species. Other species generally weedy
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.17	0.17	0.17	0.17	

Table 42. Non-Hydric Leveed Farmland - Connected Hydrology Maintained, Mitigation by Natural Succession of Wooded Vegetation with Adaptive Management

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.05	0.78	0.78	0.78	Taking the site out of agriculture, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V4 Water Distribution	0.05	0.76	0.76	0.76	Taking the site out of agriculture, earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V5 Water Outflow	0.05	0.76	0.76	0.76	Taking the site out of agriculture, earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V6 Geomorphology	0.1	0.9	0.9	0.9	Earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural geomorphology.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.05	0.65	0.75	0.75	Rapid initial improvement, though complete recovery will be a gradual process. Agricultural activities are expected to continue nearby, limiting the potential improvement to this variable.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.2 Sedimentation / Turbidity	0.05	0.65	0.8	0.85	Rapid initial improvement, though complete recovery will be a gradual process.
SV 7.3 Toxic Contamination / pH	0.05	0.65	0.75	0.8	Rapid initial improvement, though complete recovery will be a gradual process.
SV 7.4 Temperature	0.05	0.65	0.75	0.8	Rapid initial improvement, though complete recovery will be a gradual process.
SV 7.5 Soil chemistry / Redox potential	0.05	0.65	0.75	0.8	Rapid initial improvement, though complete recovery will be a gradual process.
Final V7 Variable Score	0.05	0.65	0.76	0.79	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0	0	0.25	0.65	Recovery of this layer slower than other layers due to slower growth of plants into the canopy layer.
SV 8.3 SHRUB Vegetation Layer Condition	0	0.15	0.45	0.7	Recovery of this layer faster than canopy, though still slower than non-woody plants.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.05	0.35	0.65	0.7	Fairly rapid recovery of this layer relative to other layers.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.17	0.65	0.70	0.76	

Table 43. Non-Hydric Leveed Farmed Wetland - Connected Hydrology Maintained, Mitigation by Planting Wooded Vegetation

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Initial condition essentially maintained.
SV 1.2 Migration / Dispersal Barriers	0.85	0.85	0.85	0.85	Initial condition essentially maintained.
SV 2.1 Buffer Condition	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.2 Buffer Extent	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Initial condition essentially maintained.
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Initial condition essentially maintained.
V3 Water Source	0.05	0.78	0.78	0.78	Taking the site out of agriculture, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V4 Water Distribution	0.05	0.76	0.76	0.76	Taking the site out of agriculture, earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V5 Water Outflow	0.05	0.76	0.76	0.76	Taking the site out of agriculture, earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural hydrology.
V6 Geomorphology	0.1	0.9	0.9	0.9	Earthwork from borrow activities, coupled with the site's hydrological connection to the Missouri River, rapidly reestablishes a more natural geomorphology.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.05	0.65	0.75	0.85	Rapid initial improvement, though complete recovery will be a gradual process. Agricultural activities are expected to continue nearby, limiting the potential improvement to this variable. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.2 Sedimentation / Turbidity	0.05	0.65	0.8	0.9	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.3 Toxic Contamination / pH	0.05	0.65	0.75	0.9	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.4 Temperature	0.05	0.65	0.75	0.95	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 7.5 Soil chemistry / Redox potential	0.05	0.65	0.75	0.9	Rapid initial improvement, though complete recovery will be a gradual process. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
Final V7 Variable Score	0.05	0.65	0.76	0.89	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	SV 8.2: 90%, SV 8.3: 15%, SV 8.4: 40%	Vegetation layer coverages typical for central hardwoods floodplain forest ecological system.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0	0	0.5	0.95	Recovery of this layer slower than other layers due to slower growth of plants into the canopy layer. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.3 SHRUB Vegetation Layer Condition	0	0.6	0.85	0.95	Recovery of this layer faster than canopy, though still slower than non-woody plants. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.05	0.9	0.95	0.95	Fairly rapid recovery of this layer relative to other layers. Assumes higher potential for benefits relative to natural succession due to a more diverse array of species provided by planting.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.17	0.68	0.76	0.82	

Table 44. Swallowtail LLC – Smith Creek Wetland – Potential Mitigation Site

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.9	0.9	0.9	0.9	Some minor local roadways. No major barriers to migration and dispersal.
SV 2.1 Buffer Condition	0.9	0.9	0.9	0.9	Buffer areas are of generally high quality. Human activity in the surrounding area may somewhat promote the presence of weedy species here.
SV 2.2 Buffer Extent	1	1	1	1	Buffer present around the entire site.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.9	0.9	0.9	0.9	Agriculture and other human activities upstream of the site result in minor disruption of water source.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
V4 Water Distribution	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use.
V5 Water Outflow	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use.
V6 Geomorphology	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use, though agriculture in adjacent areas still has some effect here.
SV 7.2 Sedimentation / Turbidity	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use, though agriculture in adjacent areas still has some effect here.
SV 7.3 Toxic Contamination / pH	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use, though agriculture and roadways in adjacent areas still have some effect here.
SV 7.4 Temperature	1	1	1	1	No substantial degradations to this variable.
SV 7.5 Soil chemistry / Redox potential	0.95	0.95	0.95	0.95	Site has recovered from historic agricultural use.
Final V7 Variable Score	0.93	0.93	0.93	0.93	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 20% SV 8.3: 5% SV 8.4: 98%	SV 8.2: 20% SV 8.3: 5% SV 8.4: 98%	SV 8.2: 20% SV 8.3: 5% SV 8.4: 98%	SV 8.2: 20% SV 8.3: 5% SV 8.4: 98%	Vegetation layer coverages typical for wetlands of this region. The site includes areas dominated by woody or emergent vegetation.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.95	0.95	0.95	0.95	This area is managed to maintain native species and to keep invasive species from overtaking the area.
SV 8.3 SHRUB Vegetation Layer Condition	0.95	0.95	0.95	0.95	This area is managed to maintain native species and to keep invasive species from overtaking the area.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.95	0.95	0.95	0.95	This area is managed to maintain native species and to keep invasive species from overtaking the area.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.88	0.88	0.88	0.88	

Table 45. Swallowtail LLC – Smith Creek Riparian Forest – Potential Mitigation Site

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 1.1 Neighboring Wetland and Riparian Habitat Loss	0.6	0.6	0.6	0.6	Habitat generally lost to development
SV 1.2 Migration / Dispersal Barriers	0.9	0.9	0.9	0.9	Some minor local roadways. No major barriers to migration and dispersal.
SV 2.1 Buffer Condition	0.9	0.9	0.9	0.9	Buffer areas are of generally high quality. Human activity in the surrounding area may somewhat promote the presence of weedy species here.
SV 2.2 Buffer Extent	1	1	1	1	Buffer present around the entire site.
SV 2.3 Buffer Width	0.75	0.75	0.75	0.75	Buffer width variable
SV 2.4 Surrounding Land Use	0.65	0.65	0.65	0.65	Typical score for areas with extensive row crop development
V3 Water Source	0.9	0.9	0.9	0.9	Agriculture and other human activities upstream of the site result in minor disruption of water source.
V4 Water Distribution	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use.
V5 Water Outflow	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use.
V6 Geomorphology	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use.
SV 7.1 Nutrient Enrichment / Eutrophication / Dissolved Oxygen (D.O.)	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use, though agriculture in adjacent areas still has some effect here.

Variable	Year 0 Score (FCI)	Year 10 Score (FCI)	Year 25 Score (FCI)	Year 50 Score (FCI)	Notes
SV 7.2 Sedimentation / Turbidity	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use, though agriculture in adjacent areas still has some effect here.
SV 7.3 Toxic Contamination / pH	0.9	0.9	0.9	0.9	Site has recovered from historic agricultural use, though agriculture and roadways in adjacent areas still have some effect here.
SV 7.4 Temperature	1	1	1	1	No substantial degradations to this variable.
SV 7.5 Soil chemistry / Redox potential	0.95	0.95	0.95	0.95	Site has recovered from historic agricultural use.
Final V7 Variable Score	0.93	0.93	0.93	0.93	Composite of all V7 sub-variables.
SV 8.1 Reference / Expected % Cover of Vegetation Layer	SV 8.2: 90% SV 8.3: 15% SV 8.4: 40%	SV 8.2: 90% SV 8.3: 15% SV 8.4: 40%	SV 8.2: 90% SV 8.3: 15% SV 8.4: 40%	SV 8.2: 90% SV 8.3: 15% SV 8.4: 40%	Vegetation layer coverages typical for riparian forests of this region.
SV 8.2 TREE CANOPY Vegetation Layer Condition	0.95	0.95	0.95	0.95	This area is managed to maintain native species and to keep invasive species from overtaking the area.
SV 8.3 SHRUB Vegetation Layer Condition	0.95	0.95	0.95	0.95	This area is managed to maintain native species and to keep invasive species from overtaking the area.
SV 8.4 HERBACEOUS Vegetation Layer Condition	0.95	0.95	0.95	0.95	This area is managed to maintain native species and to keep invasive species from overtaking the area.
SV 8.5 AQUATIC Vegetation Layer Condition	N/A	N/A	N/A	N/A	Layer not substantially present in reference condition.
Final FCI	0.88	0.88	0.88	0.88	

Table 46. Acres of Habitat in the Portion of the Capital View Area that would Hydrologically Maintained under the Federal Interest Plan

Habitat Type	NAA Acres	CA11 FWP Acres	CA13 Impacted Acres (Levee Construction)	CA13 FWP Acres
Leveed Farmed Wetland	276.1	276.1	20.5	255.6
Leveed Floodplain Forest (Wetland)	28.1	28.1	0.6	27.5
Non-Leveed Missouri River Floodplain Forest (Wetland)	92.7	92.7	0	92.7
Non-Leveed Tributary Forest (Wetland)	49.8	49.8	0	49.8
Leveed Floodplain Scrub (Wetland)	5.3	5.3	0.5	4.8
Non-Leveed Tributary Scrub (Wetland)	2.7	2.7	0	2.7
Ditch Leveed Emergent Wetland	4.4	4.4	0.5	3.9
Leveed Floodplain Forest (Non-Hydric)	74.1	74.1	4.3	69.8
Non-Leveed Missouri River Floodplain Forest (Non-Hydric)	80.7	80.7	0	80.7
Non-Leveed Tributary Forest (Non-Hydric)	4.1	4.1	0	4.1
Leveed Disturbed Wooded Strip (Non-Hydric)	4.0	4.0	2.6	1.4
Leveed Floodplain Scrub (Non-Hydric)	9.6	9.6	1.6	8.0
Non-Leveed Tributary Scrub (Non-Hydric)	0.4	0.4	0	0.4
Emergent Wetland Total	280.5	280.5	21.0	259.5
Wooded Wetland Total	178.6	178.6	1.1	177.5
All Wetland Types Total	459.1	459.1	22.1	437.0
Non-Hydric Total	172.9	172.9	8.5	164.5
Grand Total	632.0	632.0	30.6	601.5

Table 47. Acres of Habitat in the Portion of the Capital View Area that would Hydrologically Reconnected under the Federal Interest Plan

Habitat Type	NAA Acres	CA11 FWP Acres	CA13 Impacted Acres (Levee Construction)	CA13 Impacted Acres (Borrow Excavation)	CA13 FWP Acres
Leveed Farmed Wetland	0.7	0.7	0	0.3	0.4
Leveed Floodplain Forest (Wetland)	2.5	2.5	0	0.2	2.3
Non-Leveed Missouri River Floodplain Forest (Wetland)	15.5	15.5	0	0	15.5
Non-Leveed Tributary Forest (Wetland)	1.3	1.3	0	0	1.3
Non-Leveed Tributary Scrub (Wetland)	5.3	5.3	0	0	5.3
Potentially Restorable Non-Hydric Farmland	44.4	44.4	0	0	45.4
Leveed Floodplain Forest (Non-Hydric)	15.1	15.1	0.8	0.5	13.8
Non-Leveed Missouri River Floodplain Forest (Non-Hydric)	11.6	11.6	0	0	11.6
Non-Leveed Tributary Forest (Non-Hydric)	35.5	35.5	0	0	35.5
Leveed Disturbed Wooded Strip (Non-Hydric)	6.2	6.2	3.9	0	2.3
Non-Leveed Tributary Scrub (Non-Hydric)	9.3	9.3	0	0	9.3
Emergent Wetlands	0.7	0.7	0	0.3	0.4
Wooded Wetlands	24.6	24.6	0	0.2	24.4
All Wetlands	25.3	25.3	0	0.5	24.8
Non-Hydric Total	122.1	122.1	4.7	0.5	117.9
Grand Total	147.4	147.4	3.9	1.0	143.5

Table 48. Acres of Habitat in the Church Farm Conservation Area Borrow Site

Habitat Type	NAA Acres	CA11 FWP Acres	CA13 Impacted Acres but Allowed to Recover (CA13 FWP Acres)
Leveed Farmed Wetland	161.8	161.8	161.8
Leveed Floodplain Scrub (Wetland)	27.1	27.1	27.1
Potentially Restorable Non-Hydric Farmland	39.5	39.5	39.5
Emergent Wetlands	161.8	161.8	161.8
Wooded Wetlands	27.1	27.1	27.1
All Wetlands	188.9	188.9	188.9
Non-Hydric Total	39.5	39.5	39.5
Grand Total	228.4	228.4	228.4

8-STEP PROCESS FOR EO 11988: FLOODPLAIN MANAGEMENT

Lower Missouri Jefferson City L-142 Flood Risk Management Study

- Section 216 of the Water Resources Development Act of 2020
- Decision Process for Executive Order (E.O.) 11988 as Provided by 24 CFR §55.20

Step 1: Determine whether the action is located in a 100-year floodplain (or a 500-year floodplain for critical actions).

The study area is located in a 100-year floodplain. The National Flood Hazard Layer map included in this appendix displays the 100-year floodplain encompassing essentially the entire study area. In order to address the flood-related impacts that the study area is currently at risk of, the action alternatives developed and evaluated in this study are necessarily located within the floodplain. Therefore, E.O. 11988 applies. An evaluation of direct and indirect impacts associated with construction, occupancy, and modification of the floodplain is required.

Step 2: Notify the public for early review of the proposal and involve the affected and interested public in the decision-making process.

The first open house was held 22 May 2023 in Jefferson City, Missouri. The US Army Corps of Engineers, Kansas City District (USACE) team provided an overview of the study, goals, objectives, and planning process. An initial set of measures and management themes were also shared. After the presentation, the public was invited to visit stations to discuss specific issues including environmental resources, levees, hydrology and hydraulics, and the feasibility study process. Maps of the area were also available to gather ideas from stakeholders.

Public meetings were held 13 November 2023, 27 February 2024, 25 April 2024, 26 September 2024, and 8 January 2025. At these public meetings, USACE team provided updates on the plan formulation and study progress, project objectives, and initial alternative strategies and explained how those and future alternatives would be evaluated. The presentations concluded with a timeline for the study and public involvement, and information on how interested parties could be involved in the study, either by providing input or sending questions to USACE or the Missouri Department of Natural Resources. The presentations used at the public meetings are available on the USACE website.

Press releases were sent out from USACE to promote the study and public engagement opportunities. The first release was sent 15 May 2023 and announced the 22 May 2023 public meeting. The second release was distributed 6 November 2023 and announced the 13 November 2023 public meeting. A third release dated 20 February 2024 announced the 26 February 2024 public meeting. The fourth press release was sent 17 April 2024, informing the public of the 25 April 2024 public meeting. A fifth press release, sent 17 September 2024, invited the public and interested stakeholders to the 26 September 2024 public meeting.

The Draft Feasibility Report with Integrated Environmental Assessment was made available for public review and comment for a period of 55 days beginning in November 2024.

Step 3: Identify and evaluate practicable alternatives.

The objectives of this study are as follows:

- Reduce the risk of flood damage and/or improve resiliency for property, businesses, agriculture, and infrastructure (including critical facilities) near Jefferson City for the 50-year period of analysis beginning in 2026.
- Reduce the risk of flooding on human life and safety for the 50-year period of analysis beginning in 2026.
- Consider the project as part of the overall Lower Missouri River Flood Risk and Resiliency study planning objectives for system conveyance and flood risk planning in the future.

The primary planning constraint identified in this study concerns the presence of the Jefferson City Memorial Airport. USACE has a Memorandum of Agreement with the Federal Aviation Administration (FAA) that was formulated to avoid increasing bird and wildlife air strike hazards at airports.

The study evaluated a variety of measures for their effectiveness at reducing flood damage and improving resiliency at the study site while meeting environmental constraints. USACE used these measures to formulate an initial array of fourteen alternatives that could potentially achieve the study's objectives. During preliminary analysis, alternatives which did not satisfy the purpose and need of the study were screened out. Alternatives that were not cost effective and did not offer substantial comprehensive benefits were also screened out. With this process, USACE developed a final array of three alternatives. This final array, which includes the No Action Alternative (CA0), was carried forward for environmental effect analysis.

A. Locate the Project Within the Floodplain

The two action alternatives included in the final array would involve activities within the floodplain. The first of these alternatives, CA11, is known as the non-structural alternative because it would only use non-structural measures. These measures include wet floodproofing, dry floodproofing, elevating in place, buyouts, and relocations. All these measures would involve properties located within the floodplain.

The second of the action alternatives, the federal interest plan, would include several measures within the floodplain. First, the federal interest plan would construct an approximately 6-mile-long earthen federal levee landward of the alignment of the currently existing Capital View levee. Second, the Capital View levee would be removed west of U.S. Highway 54, while the rest of the levee would remain in place. Third, in the space between the newly constructed federal levee and the removed portion of the existing non-federal levee, approximately 45.4 acres of publicly owned land would be converted to floodplain forest habitat for mitigation with the benefit of restored floodplain hydrology. The Church Farm Conservation Area would be used for borrow material.

B. Locate the Project Outside of the Floodplain

No alternatives located outside of the floodplain were considered as part of the final array. Because the study area is located within the floodplain and because the purpose of the study is to reduce the risk of life loss and economic damage caused by flooding, it was largely

impractical to formulate measures that are located outside of the floodplain. A flood warning system is the only measure formulated for this study that would not necessarily require work in the floodplain for implementation. However, this measure was eliminated in the early screening stages of the study because the tributaries in the study area are not substantially contributing to flash flooding and because early warning for Missouri River flooding is already available.

C. No Action or Alternative Actions that Serve the Same Purpose

CA0 is the No Action Alternative for this study. This alternative was considered but it would fail to satisfy the purpose and need for this study. The study area would continue to at risk of life loss and economic damage from flooding events. The floodplain would not benefit from hydrological reconnection with the Missouri River or any of its tributaries under this alternative.

Step 4: Identify Potential Direct and Indirect Impacts Associated with Floodplain Development.

Section 4 of the main report for this study describes the impacts to the floodplain that would be expected under each alternative. CA0 and CA11 would not directly or indirectly impact the floodplain. Neither alternative would take any action that would alter the current hydrological conditions of the floodplain. CA0 and CA11 would experience flood events with the same frequency and intensity, though the non-structural measures included in CA11 would make some of the structures within the floodplain more resilient to these flood events. Additional floodplain development would not be indirectly caused by either alternative.

The federal interest plan would construct a new levee in the floodplain that would be setback from the currently existing Capital View levee. This current levee has a 17% annual exceedance probability (AEP) of overtopping, while the newly constructed levee would have a 1% AEP of overtopping. While much of the area contained within the new levee is already developed, this area also includes relatively non-developed agricultural land. Nevertheless, USACE does not anticipate that the implementation of the federal interest plan would promote additional development within this leveed area. This is because the newly constructed levee would not be designed to Federal Emergency Management Agency (FEMA) accreditation standards. The leveed area's flood risk would therefore still be associated with the 1% AEP as delineated by the FEMA Flood Insurance Rate Map. Additional levee height would be needed to meet the National Flood Insurance Program's accredited levee standards. Thus, the federal interest plan would result in the minor direct impact from the construction of the levee itself and would not result in indirect impacts to the floodplain by promoting additional floodplain development.

Step 5: Where practicable, design or modify the proposed action to minimize the potential adverse impacts to lives, property, and natural values within the floodplain and to restore, and preserve the values of the floodplain.

Because CA0 and CA11 would not cause adverse impacts to the floodplain, the discussion at this step will focus on the federal interest plan. The federal interest plan would not construct a levee at FEMA accreditation standards to avoid the potential adverse impact of additional development in the floodplain. The federal interest plan would remove the portion of the currently existing Capital View levee west of U.S. Highway 54. This would restore hydrological connectivity between the current and new levees over approximately 250 acres. In addition to

this, 45.4 acres of publicly owned land within this hydrologically restored area would be converted to native floodplain forest habitat for mitigation. The federal interest plan would benefit the floodplain in the long-term by restoring important floodplain values such as connectivity with streams and native floodplain habitat, both of which have been harmed by extensive floodplain development.

Step 6: Reevaluate the Alternatives.

CA0 would not address the vulnerability to flood-related impacts that the study area is currently subject to. The people, business, and infrastructure of the study area would not gain any resiliency to flood-related impacts. In addition, CA0 would leave the currently existing Capital View levee in its current alignment, and the floodplain would not benefit from any increased hydrological connectivity with the Missouri River.

CA11 would not adversely impact floodplain values and would make some structures within the floodplain more resilient to flood-related impacts. However, this alternative would not be a cost-effective means of meeting the purpose and need of the study. The non-structural measures included in this study would not be applicable to all structures currently at risk of flood-related impacts.

Although the federal interest plan would involve construction in a floodplain, this alternative has been designed in order to minimize adverse effects on floodplain values. The levee that would be constructed under this alternative has been designed so that it would not meet FEMA accreditation standards, which could otherwise indirectly cause additional development within the floodplain. Instead, the federal interest plan would benefit the floodplain in the long-term by restoring floodplain hydrology over approximately 250 acres and converting approximately 45.4 acres of this area to native floodplain habitat.

Step 7: Determination of No Practicable Alternative.

It is our determination that there is no practicable alternative for locating the project out of the flood zone. The federal interest plan is the only alternative in the final array that would adequately meet the purpose and need of the study in a cost-effective manner. While the federal interest plan would necessarily be located within the Missouri River floodplain, it would not be expected to have adverse impacts on human health, public property, and floodplain values. Instead, the federal interest plan would help to restore lost floodplain values in the long-term.

Step 8: Implement the Proposed Action.

If the federal interest plan was carried forward for implementation, USACE would ensure that this plan, as modified and described above, would be executed and necessary language would be included in all agreements with participating parties. USACE would also take an active role in monitoring the construction process to ensure no unnecessary impacts occur nor unnecessary risks are taken.

MONITORING AND ADAPTIVE MANAGEMENT PLAN

1. Project Overview

The federal interest plan includes the on-site mitigation of floodplain forest habitat at the Capital View Area borrow site. Natural revegetation by ecological succession is the key feature of this mitigation that would be monitored and adaptively managed.

There are uncertainties related to the physical and/or biological performance of this mitigation that could affect the ability to meet the project goals and objectives. There is always a risk of poor performance when restoring vegetation at a site due to local site conditions, weather patterns, quality and health of the vegetative materials, etc. These measures would be monitored following project construction or after initial implementation to inform decision-makers whether 1) The project is meeting performance measures and should continue as implemented 2) The project is not meeting performance measures and should be adjusted, or 3) The project has met success criteria and no further monitoring for ecological performance is needed.

USACE Implementation Guidance for Section 1161 (Monitoring Ecosystem Restoration) of the Water Resources Development Act of 2016, and Section 2036 (Mitigation for Fish and Wildlife and Wetlands Losses) of the Water Resources Development Act of 2007 require monitoring sufficient to evaluate ecosystem restoration and mitigation success. USACE is required to consider adaptive management (or contingency plans) for ecosystem restoration projects and mitigation projects because they often involve uncertainty that can be reduced through an adaptive management approach. For this project, adaptive management is an appropriate management strategy because there is: 1) uncertainty regarding the outcome of the management measures, 2) an ability to monitor and evaluate the system response to management measures, 3) capacity to learn from monitoring, and 4) the ability to apply a decision to change management if needed.

2. Objectives

An important part of the monitoring and adaptive management plan is the translation of the management goals and objectives from the planning process into specific performance measures (sometimes called metrics), success criteria (sometimes called targets), and decision triggers (triggers for implementing a contingency plan or other decision). During development of the monitoring and adaptive management plan the team worked from the impact/benefit assessments to define the physical, chemical, biological, and ecological criteria that would be monitored to assess project performance. Additionally, conservation measures (e.g., limited window for tree clearing and access) outlined in the Environmental Assessment to minimize any potential take of threatened and endangered species are also included in the Monitoring and Adaptive Management Plan.

All objectives and measures are described below to document uncertainty that needs to be further evaluated and addressed during the design phase, and any monitoring and adaptive management that may be needed to address any remaining risk.

2.1 Objective: Restore Floodplain Forest Habitat in the Capital View Area Borrow Site for Mitigation

2.1.1 Performance Measure

1. Establishment of native tree species in the regenerating riparian habitat area

2.1.2 Success Criteria

1. >50% coverage of native trees by year 5 and year 9
2. Improved structure (canopy, understory, ground cover)

2.1.3 Monitoring Design

1. Pre-construction site visit
 - a. Establish riparian habitat quality baseline
2. Post-construction site visit
 - a. Determine tree coverage and riparian corridor quality

2.1.4 Decision Triggers

1. Excessive mortality of trees
2. Insufficient coverage by trees
3. Excessive establishment of invasive species

2.1.5 Contingency Measure(s)

1. Plant trees, install fencing to prevent herbivory, add watering regime until trees are established
2. Treat invasive species with chemicals, or use mowing / controlled burns
3. Plant different native species if some species fail to establish naturally

3. Monitoring Design

The monitoring design for this project includes the minimum monitoring actions necessary to evaluate success of the implemented management measures. It focuses on monitoring the performance measures of the project objectives to determine success. Each relevant objective and the associated performance measures are described below along with information required by USACE guidance.

3.1 Objective: Restore Floodplain Forest Habitat in the Capital View Area Borrow Site for Mitigation**3.1.1 Performance Measure**

1. Establishment of native tree species in the regenerating riparian habitat area

3.1.2 Nature of Monitoring

1. Pre-construction site survey, then site surveys at the mitigation site– yearly for Years 1-5, then Year 7 and Year 9. Surveys would examine tree survival, riparian canopy cover, riparian forest structure (canopy, understory, ground cover), species composition, and invasive species dominance.

3.1.3 Duration

Monitoring would continue until project success criteria are met. Monitoring would be cost-shared between USACE and the non-Federal Sponsor for 10 years after construction is complete. Any additional monitoring beyond 10 years would be a non-Federal responsibility.

3.1.4 Periodicity

Pre-construction survey, then annual surveys for Years 1-5, then Year 7 and Year 9.

3.1.5 Data Analysis and Use

Pre-construction data would be used to inform baseline conditions. Post-construction data would be used to inform adequacy of the mitigation. Survival data, species identification, and

structure data would be used to assess the health and diversity of the restored habitat. Invasive species data would be used to determine if the site is adequately resisting invasion by invasive species.

3.1.6 Costs

USACE estimates that monitoring would annually cost approximately \$500 per acre over 45.4 acres. Over a ten-year monitoring period, the total monitoring cost estimate for this objective would therefore be \$22,700 annually.

3.1.7 Responsibilities

USACE and the non-Federal sponsor would share monitoring responsibilities for the 10-year monitoring period. This is a cost shared responsibility, but it is likely that USACE staff members would be performing the site visits and surveys.

3.1.8 Project Closeout Plan

Monitoring reports would be prepared by USACE after every monitoring visit and results shared with the Non-Federal Sponsor (NFS). Monitoring requirements for this activity would be completed following the last post-construction survey.

4. Assessment

Evaluating the monitoring data includes a comparison of the results of the monitoring effort compared to predictions made in the planning process and success criteria. The data collected to evaluate changes and success post-construction would be qualitatively and quantitatively compared to pre-construction data and decision triggers. The number of native species present in the mitigation area, percent survival of plants, and percent coverage by native species vs invasive species are all quantitative data that would be compared against target values for functional riparian habitats.

For each year with monitoring activities, USACE would prepare a report documenting the data collected during monitoring. The report would identify which success criteria have been met, and which have not. For mitigatory actions that have not met their success criteria, the report would assess the progress that has been made to meet them. The report would evaluate if any contingency measures were necessary and would identify which particular ones are recommended for implementation. USACE would provide this report to managers, decision makers, and stakeholders for discussion and consideration before the decision to implement contingency measures is made.

5. Decision-Making

This section describes the process whereby the results from monitoring and assessment would be used to make decisions concerning project management. Primary components of the decision-making process include decisions to be made, decision making responsibilities, how the decision-making group operates, how they report their decisions, and the required timing of decisions in order for potential adjustments to be effective. These components are described in **Table 49**.

Table 49. Decision-Making Framework

Decisions to be Made	Implement contingency measures
Decision Responsibility	Project PDT and Non-Federal Sponsor
Operation of Decision-Making Group	Virtual meeting would be called to discuss conditions and contingency measures
Reporting of Decisions	Decision would be documented in an MFR.
Required Timing for Decisions	Within 1 month

Once the results of monitoring have been assessed and evaluated, the project PDT and non-Federal sponsor can decide to: (1) continue the action with no adjustments because performance measures indicate a favorable trajectory, (2) adjust using a contingency plan, or reformulate the plan revisiting the planning process, or (3) decide the action is successful and complete based on meeting success criteria.

6. Contingency Plan

To address potential problems with project features, USACE has identified some potential modifications or different measures that could be implemented. **Table 50** includes a description of potential contingency measures, under what circumstances they would be implemented, an estimated cost for implementation, and identifies responsibilities. If the Decision-Making Group determines there would be no cost-appropriate adaptive management actions that would resolve a failure of this project to meet an objective, an After-Action Review (AAR) would be conducted to determine the reasons for this project not meeting this objective, to include suggestions on how to prevent this failure from occurring on similar projects in the future. These cost estimates are preliminary and would be refined and updated during Design.

Table 50. Potential Contingency Measures (Adaptive Management)

Contingency Measure	Decision Trigger	Cost Estimate	Responsible Party
Plant trees, install fencing to prevent herbivory, add watering regime until plants are established	Coverage by young trees is insufficient (<50% coverage by year 5)	Supplemental planting and associated costs: \$25,000 (per annum)	USACE
Treat invasive species with chemicals, use mowing or controlled burns	Invasive species in planted areas of the riparian corridor are excessive (>25% by Year 5).	2.5-times costs associated with annual O&M activities: \$13,600 (per annum)	USACE

PROGRAMMATIC AGREEMENT

**AMONG THE
U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT;
KANSAS STATE HISTORIC PRESERVATION OFFICER;
MISSOURI STATE HISTORIC PRESERVATION OFFICER;
IOWA TRIBE OF KANSAS AND NEBRASKA; MIAMI TRIBE OF OKLAHOMA;
THE OSAGE NATION; PAWNEE NATION OF OKLAHOMA;
AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
REGARDING**

**THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY GENERAL
INVESTIGATION STUDY IN THE STATES OF KANSAS AND MISSOURI**

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ATTACHMENT F: MIAMI TRIBE OF OKLAHOMA INADVERTANT DISCOVERY POLICY

ATTACHMENT G: GUIDANCE FROM THE MISSOURI SHPO

WHEREAS, the U.S. Army Corps of Engineers, Kansas City District (USACE) is partnering with the states of Kansas and Missouri on the Lower Missouri River Flood Risk and Resiliency General Investigation Study (hereinafter the Study) authorized under Section 216 of the Water Resources Development Act (WRDA) of 2020 that will develop systematic measures to reduce recurring flood damages and improve resiliency of infrastructure and investment to withstand future flood events; and

WHEREAS, the geographic scope of the Study in the states of Missouri and Kansas includes the lower Missouri River floodplain from river mile 500.0 to the confluence with the Mississippi River in St. Louis, MO at Missouri River mile 0.0 (Attachment A) and covers thousands of square miles of rural and urbanized areas where USACE projects have been constructed including over 1,000 miles of levees and floodwalls in the Missouri River Levee System; and

WHEREAS, the general area of potential effects (APE) for the Study, as defined in Attachment B, includes Federal, tribal, state, and privately owned lands within the active Lower Missouri River Basin in the states of Kansas and Missouri; within the general APE, individual site-specific feasibility-level studies (Study undertakings) will be undertaken by USACE as a result of the larger overall Study; those locations that have not yet been fully determined will each require a specific APE to be determined prior to project implementation; and

WHEREAS, USACE, as a Federal agency, is required to comply with Section 106 of the National Historic Preservation Act (NHPA), as amended (54 U.S.C. § 306108) and its implementing regulations, “Protection of Historic Properties,” codified in 36 C.F.R. § 800; and

WHEREAS, USACE has determined that Study undertakings have the potential to affect historic properties included in or eligible for inclusion in the National Register of Historic Places (NRHP) as defined under 36 C.F.R. § 800.16(y); and

WHEREAS, in accordance with 36 C.F.R. §§ 800.4(b)(2) and 800.5(a)(3), USACE has elected to use a phased and deferred process to conduct identification and evaluation of historic properties, and for application of the criteria of adverse effect and, as appropriate, resolution of adverse effects, respectively, because the scope and programmatic nature of the Study undertakings make it unreasonable to identify historic properties or determine the effects of the Study undertakings at this time; and

WHEREAS, 36 C.F.R. § 800.14(b)(3) allows USACE to negotiate a programmatic agreement (PA) for dealing with the potential adverse effects of a complex project or multiple undertakings; and

WHEREAS, the Study is subject to the National Environmental Policy Act (NEPA) and other environmental laws; and

WHEREAS, in this PA, “Signatories” is defined and “Invited Signatories” are defined in Attachment B consistent with their definitions in 36 C.F.R. § 800.6(c)(1)–(2); and

WHEREAS, in accordance with 36 C.F.R. § 800.6(a)(1)(i)(C), the Advisory Council on Historic Preservation (ACHP) has been provided the required documentation and invited to participate as a signatory to this PA, and has accepted in a letter dated August 24, 2023; and

WHEREAS, USACE has consulted with the Kansas and Missouri State Historic Preservation Officers (SHPOs) on the development of this PA, and the SHPOs are Signatories to this PA; and

WHEREAS, USACE in accordance with 36 C.F.R. § 800.2(c)(2)(ii), 800.3(f)(2), and 800.14(b)(3), USACE, in a letter dated 20 January 2022, initiated consultation with 43 Federally recognized Indian tribes (collectively, “Indian Tribes”), that may ascribe religious or cultural significance to historic properties that have the potential to be affected by the Study undertakings and need to be consulted about the identification and assessment of effects on historic properties, to consult on the development of this PA and these Indian Tribes are listed in Attachment C; and

WHEREAS, of those Indian Tribes invited to participate, the Iowa Tribe of Kansas and Nebraska, the Miami Tribe of Oklahoma, The Osage Nation, and the Pawnee Nation have chosen to participate in Section 106 consultation in accordance with 36 C.F.R. 800.2 and 800.6; and

WHEREAS, the Iowa Tribe of Kansas and Nebraska, having tribal lands that may be affected by a Study undertaking, is participating as a Signatory to the PA; and

WHEREAS, the Miami Tribe of Oklahoma, The Osage Nation, and Pawnee Nation, will participate as Invited Signatories; and

WHEREAS, USACE provided opportunities for public review and comment on this PA by publishing online information, including a Public Notice posted on December 21, 2023 and again on December 15, 2024 following the change in scope of the PA from the entire Lower Missouri River to those portions within the Kansas City District, and receiving comments through online platforms and will continue to engage the public, as appropriate, during Section 106 review of the Study under the terms of this PA; and

NOW THEREFORE, USACE, ACHP, Kansas SHPO, Missouri SHPO, the Iowa Tribe of Kansas and Nebraska (Signatories), and the Miami Tribe of Oklahoma, The Osage Nation, and Pawnee Nation (Invited Signatories)¹, agree that applicable undertakings conducted under the Study shall be implemented in accordance with the following stipulations in order to take into account their effects on historic properties.

¹ In this Programmatic Agreement, the term “Consulting Parties” includes the SHPO, Indian Tribes, and other appropriate Consulting Parties (see Section I.A.2. below). When the terms “Consulting Party” or “Consulting Parties” are used in this Programmatic Agreement without reference to the Invited Signatories, the terms shall include the Invited Signatories.

STIPULATIONS

USACE shall ensure that the following measures are carried out:

I. SCOPE AND APPLICABILITY

- A. This PA shall apply to all Study undertakings that have the potential to cause effects to historic properties per 36 C.F.R. §§ 800.3(a) and require Section 106 review after the execution of this PA, and are not otherwise already covered by a separate memorandum of agreement (MOA) or PA.
 1. all undertakings to which this PA is applicable shall be reviewed in accordance with the stipulations in this PA.
 2. USACE shall identify and consult with the SHPO, Indian Tribes, and other appropriate Consulting Parties (collectively “Consulting Parties”) for each Study undertaking as defined below:
 - a. The SHPO who reflect the interests of the State that overlaps with the Area of Potential Effect (APE), as defined under Stipulation IV.B and Attachment B, for the individual undertaking; and,
 - b. Indian Tribes that attach religious or cultural significance to historic properties within the APE, as defined under Stipulation IV.B and Attachment B, that may be affected by the Study undertaking.
 - (1) USACE shall maintain updated lists of all Indian Tribes consulted for the Study (Attachment C).
 - (2) An Indian Tribe may come forward at any time and be added to the list of Consulting Parties; and,
 3. Additional consulting parties with a demonstrated interest, including but not limited to local governments and local preservation organizations, that may be affected by the Study undertaking.
 4. USACE shall only involve the ACHP in consultation on an individual study undertaking where explicitly called out in the stipulations or as required by law or regulation.
 5. As contacts and consultation interests may change over time, USACE shall maintain an updated list of Consulting Indian Tribes (Attachment C). An updated contact list for all Consulting Parties’ points of contact at the time of execution of this PA is provided in Attachment D.
 - a. The Consulting Parties will each designate a primary and secondary point of contact. The primary contact is the contact to which all initial and formal correspondence is sent. If the individual designated as the primary point of contact is not available, communications shall be directed to the secondary contact as listed in Attachment D.

- b. Consulting Parties to this PA shall provide all parties to the PA with the phone numbers, email addresses, and mailing addresses for the primary and secondary contacts (Attachment D). Similarly, when a point of contact changes, all Signatories and Invited Signatories shall be notified via email within thirty (30) business days of the change. Such changes shall not require an amendment to this PA.
- B. USACE shall seek ways through design measures to identify and preserve historic properties and to avoid, minimize, or mitigate any adverse effects on historic properties, listed on or eligible for inclusion in the NRHP. USACE shall also attempt to protect burials, cemeteries, or sites likely to contain human remains/artifacts and objects associated with interments or religious activities, and provide this information, studies, and/or reports to the Consulting Parties through the implementation of historic property surveys and the treatment of historic properties.
- C. For each Study undertaking, USACE shall achieve compliance with all relevant terms of this PA prior to initiating physical construction or construction related on site activities such as staging areas, access roads, and other areas of ground disturbance for each Study undertaking.

II. STANDARDS

- A. All cultural resource investigations, reporting, and documentation including site identification, NRHP eligibility evaluations and, as appropriate, mitigation measures for adverse effects to historic properties required under the terms of this PA shall be carried out by or under the direct supervision, including direct in-field supervision, of appropriate professional(s) or by contractors who meet, at a minimum, the Secretary of the Interior's Historic Preservation Professional Qualification Standards (48 FR 44716, September 29, 1983). All archaeological fieldwork conducted by contractors shall have in-field supervision by SOI qualified archaeologists.
- B. In developing scopes of work for identification, evaluation studies, treatment measures, and stewardship activities required under the terms of this PA, USACE shall take into account the following guidance, as appropriate:
 - 1. ACHP's guidance on conducting archaeology under Section 106 (2009);
 - 2. ACHP's Policy Statement Regarding the Treatment of Burial Sites, Human *Remains and Funerary Objects* (2023);
 - 3. Guidance from The Osage Nation (Attachment E);
 - 4. The Miami Tribe of Oklahoma's Inadvertent Discovery Policy (Attachment F);
 - 5. Kansas State Unmarked Burial Statutes and Regulations K.S.A.75-2741 through 75-2754;
 - 6. Guidance from the Kansas SHPO (Available on their website at

<https://www.kansashistory.gov/p/shpo-s-guide-to-archeological-survey-assessment-reports/15783>);

7. Guidance from the Missouri SHPO (Attachment G);
8. Secretary of the Interior's *Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-42, September 29, 1983); and
9. ACHP Policy Statement on Indigenous Knowledge and Historic Preservation (2024)

III. CONFIDENTIALITY

A. USACE shall keep the nature and location of archaeological sites and other cultural resource sites covered by this PA confidential as provided for in 36 C.F.R § 800.11(c) and in a manner that observes confidentiality requirements pursuant to Section 304 of the NHPA (54 U.S.C. § 307103); Section 9 of the Archaeological Resources Protection Act (16 U.S.C. § 470hh); and Section 552(b) of the Freedom of Information Act (5 U.S.C. § 552); and applicable state laws.

B. UNDERTAKING REVIEW PROCESS

C. USACE INTERNAL REVIEW PROCESS

1. USACE shall identify all Study projects, actions, and activities to determine if they are applicable Study undertakings as described in Stipulation I. A.
2. In the earliest stages of a Study undertaking, USACE shall assign an SOI- qualified staff member that meets the Secretary of Interior's Standards as outlined in Stipulation II. A, to ensure cultural resources and historic properties are identified and considered in the USACE planning process.
3. USACE shall further refine the APE for the Study undertakings in the development of the Recommended Plan, as defined in Attachment B, and carry out initial efforts to identify historic properties as stated under Stipulation IV.A.4, and initiate an assessment of the undertaking's potential effects to historic properties.
4. Before the selection of the Recommended Plan for a Study undertaking, USACE shall complete initial background research of the study area to include reviewing available investigations and using as appropriate the applicable state historic preservation databases and/or inventories information to determine and direct adequate survey coverage for historic properties
5. Before the selection of the Recommended Plan for a Study undertaking, USACE shall also consult with Consulting Tribes to identify significant historic properties, burials, and traditional cultural properties not listed in the SHPO's database to determine and direct adequate survey coverage for historic properties.
6. At any given time during the development of the Recommended Plan for the Study, USACE may seek input from the Consulting Parties.

D. DEFINE AND DOCUMENT THE AREA OF POTENTIAL EFFECTS

1. USACE shall identify and document the APE, as defined in Attachment B, appropriate to the scope and scale of the Recommended Plan, for Study undertakings as identified through Stipulation IV.A. The APE information will include but is not limited to, the following:
 - a. The vertical and horizontal extents (i.e., breadth and depth), if available, of all construction activities required to complete the Study undertaking, including staging areas, access routes, borrow areas, and areas of anticipated erosion.
 - b. Areas outside of the construction areas of the Study undertaking where the undertaking's potential direct, indirect, or cumulative effects to historic properties may be reasonably anticipated and will include areas of auditory and visual effects.
2. USACE shall provide the Consulting Parties an electronic copy of the APE documentation described in Stipulation IV. B.1 and results of the USACE background review as described in Stipulation IV.A via e-mail for a forty-five (45) business day review period.
 - a. USACE will take into account comments on the scope of the APE from Consulting Parties and incorporate those comments, as appropriate, in development of the final APE.
3. USACE is responsible for defining and documenting a final APE, including any modification to the APE resulting from a change in scope and scale of the Recommended Plans, for Study undertakings.
 - a. USACE shall notify Consulting Parties of any changes to the scope and scale of Recommended Plans for any Study undertaking.
 - b. USACE shall complete the steps in Stipulations IV.A 1-6 and B. 1-2 for all changes to the scope and scale of Recommended Plans for any Study undertaking.

E. HISTORIC PROPERTY IDENTIFICATION

1. USACE shall complete and document historic property identification efforts and NRHP-eligibility determinations for all properties within the APE for each Study undertaking as follows.
2. USACE shall complete a literature review of the APE.
 - a. The literature search shall include consulting the applicable state historic preservation databases and/or inventories, information provided by consulting tribes, previous survey reports, and other pertinent documents for information on previously developed historic contexts, recorded historic properties, documentation provided by Indian tribes, and previously surveyed areas.
 - b. USACE shall determine the adequacy of existing documentation and determine the scope of any additional research or surveys within the Study undertaking's APE, including the need for additional historic context development and/or re-evaluation

- of any previously identified historic properties or properties previously determined to be eligible for listing on the NRHP.
- c. USACE shall provide the Consulting Parties the results of the literature review, including cultural resource reports, maps, and pertinent documents for a review and comment period of forty-five (45) business days prior to the initiation of archaeological fieldwork. Submissions will conform to the requirements of each Consulting Party in accordance with Stipulation II.B.
3. In consultation with the Consulting Parties, archaeological surveys may appropriately exclude land shown to be recently accreted or disturbed to an extent that it is unlikely that intact cultural resources would be present in the area.
 - a. Documentation for excluding such land will be provided to Consulting Parties in advance of the cultural resource survey report.
 - b. If a Consulting Party disagrees with the determination on lands that are excluded from survey, USACE shall consult with the Consulting Party for no more than forty-five (45) business days to reach resolution.
 - c. If resolution cannot be reached, USACE shall follow the dispute resolution procedures in Stipulation IX.
 4. Following consultation on the literature review results, USACE shall also take appropriate measures necessary to identify and record historic properties in accordance with appropriate state and tribal survey guidelines through implementation of historic property surveys and evaluation.
 - a. USACE shall ensure all properties are recorded in a manner meeting minimum criteria for recordation, such as buildings, structures, objects, linear resources, landscapes, districts, Traditional Cultural Properties/Places, and archaeological/historical and burial sites.
 - b. Recordation of structures, buildings, objects, districts, and sites shall be prepared using the Kansas or Missouri state recordation forms, as appropriate.
 5. Pursuant to 36 C.F.R. § 800.4(a)(4), historic property identification efforts shall include contacting the Tribal Historic Preservation Offices (THPOs), or other Tribal representative of Consulting Indian Tribes for the Study undertaking, to assist in identifying properties within the APE that may be of religious and cultural significance and may be eligible for listing on the NRHP.
 6. USACE shall ensure that all surveys and field studies are conducted in a manner consistent with the Secretary of the Interior's Standards and Guidelines for Identification and Evaluation (https://www.nps.gov/history/local-law/arch_stnds_0.htm); the National Park Service publication "The Archeological Survey: Methods and Uses" (National Park Service 1978); applicable state guidelines, and The Osage Nation's guidelines (see Stipulation II.B).
 7. USACE shall ensure that the results of these identification efforts, including reports

and supporting documentation, are prepared in accordance with Stipulation II.B.

8. In consultation with Consulting Parties, USACE shall evaluate cultural resources that are within the APE of each Study undertaking area for eligibility for the NRHP pursuant to NRHP criteria (36 C.F.R. Part 60.4). Such evaluation includes consultation with Consulting Parties to ensure the evaluation takes into account the significance of the potential historical property from the perspective of the Consulting Parties.

F. ASSESSMENT OF EFFECTS TO HISTORIC PROPERTIES

USACE shall assess potential adverse effects caused by a Study undertaking on all identified historic properties within the APE. This assessment shall include consideration of all direct, indirect, and cumulative effects caused by the Study undertaking, and shall use the criteria of adverse effects (36 C.F.R. § 800.5(a)(1)). USACE shall make one of the following determinations:

1. “No Historic Properties Affected.”
 - a. If USACE finds that either there are no historic properties identified within the APE or there are historic properties within the APE and the Study undertaking will have no effect upon them as defined in 36 C.F.R. § 800.16(i) then the USACE shall make a “No Historic Properties Affected” finding and provide this finding, along with supporting documentation, in accordance with 36 CFR § 800.11(d), to the Consulting Parties for review and comment period of forty-five (45) business days.
 - b. USACE shall provide the Consulting Parties with the following supporting documentation:
 - (1) A full description of the Study undertaking, to include depth and amount of ground disturbance, as well as above-ground impacts, anticipated.
 - (2) An APE map and narrative description of the APE for the Study undertaking.
 - (3) A description of the steps taken, and justification for the level of effort, to identify historic properties within the APE.
 - (4) Results of historic property identification efforts completed by USACE or its contractors, including an appropriate level of documentation, to include reports, forms, evaluations, eligibility determinations, or other documents supporting NRHP eligibility determinations.
 - (5) Any photos, additional maps, images, or plans, as appropriate.
 - (6) A stated finding of effects determination for the Study undertaking and request for comment on said finding from the Consulting Parties.
 - (7) The Consulting Parties shall be afforded a response to a USACE finding within forty-five (45) business days of receipt of a fully documented “No

Historic Properties Affected” finding. If no comment or request for an extension are received from the Iowa Tribe of Kansas and Nebraska, the Miami Nation of Oklahoma, The Osage Nation, the Pawnee Nation of Oklahoma, or appropriate SHPO within forty (40) business days, USACE shall contact these Consulting Parties to obtain their intent to respond before USACE assumes they have no objection with the finding. If no comments or requests for an extension are received from the other Consulting Parties within the forty-five (45) business day review period, USACE shall assume the other Consulting Parties have no objection with the finding.

- c. If a Consulting Party objects to the finding of “No Historic Properties Affected” whether due to identification efforts, finding of effect, or both within the forty-five (45) business day review period or agreed upon specified time period, USACE shall notify all Consulting Parties and consult with the objecting party, to attempt to resolve concerns as identified by the objecting party.
 - (1) If at the end of the forty-five (45) business day review period, or agreed to specified time period, the objecting Consulting Party(ies) concur or have no objection with the finding of “No Historic Properties Affected,” USACE shall document this response, and USACE has no further obligations for the Study undertaking under this stipulation.
 - (2) USACE may, based on comments received from Consulting Parties, revise its finding of “No Historic Properties Affected.” If USACE revises its finding to “No Adverse Effect to Historic Properties Affected” for the Study undertaking, then the USACE shall continue consultation pursuant to either Stipulation IV.D.2 or “Adverse Effect on Historic Properties” pursuant to Stipulation IV.D.3.
 - (3) If at the end of the forty-five (45) business day review period, or agreed to specified time period, the party(ies) object to the finding of “No Historic Properties Affected” and USACE has not altered its effects determination, USACE shall seek the ACHP’s opinion in accordance with 36 C.F.R § 800.4(d)(ii-v).
 - (4) If there is a disagreement between USACE and a SHPO regarding NRHP eligibility of a property after consultation between consulting parties, USACE shall forward the determination to the Keeper of the NRHP, pursuant 36 CFR § 800.4(c)(2), for a formal determination of eligibility. If an Indian Tribe that attaches religious and cultural significance to a property off tribal lands does not agree with USACE’s determination eligibility, following consultation with USACE, it may ask the Council to request the agency official to obtain a determination of eligibility from the Keeper.

2. “No Adverse Effect to Historic Properties.”

- a. If USACE determines that historic properties present in the APE will be affected by a Study undertaking but the characteristics of the historic properties that qualify the properties for inclusion in the NRHP are not diminished or altered, then USACE shall make a “No Adverse Effect to Historic Properties” finding and provide this finding, along with supporting documentation, in accordance with 36 C.F.R. § 800.11(e), to the Consulting Parties for review and comment period of forty-five business days in accordance with Stipulations IV.D.1.C.
- b. USACE shall provide the Consulting Parties with the following information for review.
 - (1) A full description of the Study undertaking, to include depth and amount of ground disturbance, as well as above-ground impacts, anticipated.
 - (2) An APE map and narrative description of the APE for the undertaking.
 - (3) A description of the steps taken, and justification for the level of effort, to identify historic properties within the APE.
 - (4) Results of historic property identification efforts completed by USACE, including an appropriate level of documentation to include reports, forms, evaluations, eligibility determinations, or other documents supporting NRHP eligibility determinations.
 - (5) A description of the affected historic properties including information on the characteristics that qualify them for the NRHP.
 - (6) A description of the undertaking’s potential effects on the identified historic properties and explanation of why the criteria of adverse effect were found applicable.
 - (7) Any photos, additional maps, images, or plans, as appropriate.
 - (8) A stated finding of “No Adverse Effect to Historic Properties” for the Study undertaking and request for comment for said finding from the Consulting Parties.
- c. If consulting parties have no objection with the “No Adverse Effect to Historic Properties: determination, finding for a project undertaking, USACE has no further obligations under this Stipulation.
- d. If a Consulting Party(ies) object to the finding of “No Adverse Effect to Historic Properties,” USACE shall consult with the objecting party(ies), and include other Consulting Parties as appropriate, for no more than a total of forty-five (45) business days, upon receipt of the notification of the objection to attempt to resolve concerns as identified by the objecting party.
 - (1) USACE may, based on the comments provided by Consulting Parties, revise its finding of “No Adverse Effect to Historic Properties.” to “Adverse Effect on Historic Properties.” If USACE revises its finding to “Adverse Effect on Historic Properties,” then USACE shall continue consultation pursuant to

Stipulation IV.D.3.

- (2) If at the end of the forty-five (45) business days, the objecting party(ies) concur with the finding of “No Adverse Effect to Historic Properties,” USACE shall document this concurrence, and USACE, then USACE has no further obligations under this Stipulation.
- (3) If at the end of the forty-five (45) business days, the Consulting Party(ies) continue to object to the finding of “No Adverse Effect to Historic Properties,” and USACE has not altered its effects determination, USACE shall seek the ACHP’s opinion in accordance with 36 C.F.R. § 800.4(d)(ii-v).
- e. Avoidance of adverse effects to historic properties is the preferred treatment approach. USACE shall consider redesign of components of Study undertakings to avoid potential adverse effects to historic properties. However, there may be instances where it is not feasible for the USACE to redesign a Study undertaking to avoid adverse effects to historic properties.
3. “Adverse Effect to Historic Properties.”
 - a. If USACE determines that historic properties present in the APE cannot be avoided and will be affected by the Study undertaking and the characteristics of the historic properties that qualify them for inclusion will be diminished or altered, then USACE shall make an “Adverse Effect to Historic Properties” finding and provide this finding, along with supporting documentation, in accordance with 36 C.F.R. §§ 800.6(a)(3), 800.11(e), to the Consulting Parties for review and comment period of forty-five (45) business days.
 - b. USACE shall provide the Consulting Parties with the following:
 - (1) A full description of the Study undertaking, to include depth and amount of ground disturbance, as well as above-ground impacts, that is anticipated.
 - (2) An APE map and narrative description of the Study undertaking.
 - (3) A description of the steps taken, and justification for the level of effort, to identify historic properties within the APE.
 - (4) Results of historic property identification efforts completed by USACE, including an appropriate level to include reports, forms, evaluations, eligibility determinations, or other documents of documentation supporting NRHP eligibility determinations.
 - (5) A description of the affected historic properties including information on the characteristics that qualify them for the NRHP.
 - (6) A description of the Study undertaking’s potential effects on the historic properties and an explanation of why the criteria of adverse effect were found applicable.
 - (7) Any photos, additional maps, images, or plans, as appropriate.

- (8) A stated finding of “Adverse Effect to Historic Properties.” and request for comment for said finding from the Consulting Party(ies).
- c. If a Consulting Party(ies) object to the finding of “Adverse Effect to Historic Properties,” USACE shall consult with the objecting party(ies), and include other Consulting Parties as appropriate, for no more than a total of forty-five (45) business days, upon receipt of the notification of the objection to attempt to resolve concerns as identified by the objecting party.
- d. If no comments or requests for an extension are received from the Consulting Parties within the 45-business day review period If no comment or request for an extension are received from the Consulting SHPO or Indian Tribes, USACE shall contact these Consulting Parties to obtain their intent to respond before USACE assumes they have no objection with the finding. If no comments or requests for an extension are received from the other Consulting Parties within the forty-five (45) business day review period, USACE shall assume the other Consulting Parties have no objection with the finding.
- e. If Consulting Parties have no objection with the “Adverse Effect to Historic Properties” finding for a project undertaking, USACE shall consult with the Consulting Parties to resolve the “Adverse Effect to Historic Properties.” pursuant to Stipulation IV.E below.

G. RESOLUTION OF ADVERSE EFFECTS

1. USACE shall notify the Consulting Parties and the public on a finding of “Adverse Effect to Historic Properties” for a Study undertaking using the following process:
 - a. For public awareness, and consistent with Stipulation III (Confidentiality), the USACE shall post a notice of the “Adverse Effect to Historic Properties” finding on the official Kansas City District USACE website, as appropriate, to include a description of the Study undertaking, a list of identified historic properties, the explanation for the finding of adverse effects, steps taken or considered by USACE to avoid or minimize the adverse effects, any Consulting Party comments received by USACE regarding the Study undertaking, and an invitation to provide written comment within thirty (30)-business days of posting to the website.
 - b. USACE shall seek approval from Consulting Parties prior to including their comments on the USACE public web site. USACE will not include any comments from Consulting Parties who object to their comments being included on the USACE public web site. If a Consulting Party objects to their comments being included in a public website, USACE may still publicly state whether comments were received and generally characterize the comments as objecting, not objecting, or concurring.
 - c. USACE shall take any comments received from the Consulting Parties into consideration before concluding the consultation and shall notify the Consulting

Parties of any concerns and USACE response to those concerns.

2. USACE shall notify the ACHP of adverse effects and invite the ACHP to participate in their resolution of adverse effects pursuant to 36 C.F.R. § 800.6(a)(1), and if requested by another Consulting Party.
3. Following the review as outlined in Stipulation IV.E.1.i, USACE shall consult with the Consulting Parties, and the ACHP if participating, to determine appropriate avoidance, minimization, and/or mitigation measures to resolve the adverse effect. USACE shall offer to facilitate a consultation meeting, to include Consulting Parties, within thirty (30) business days after notification of an adverse effect finding, to discuss Study undertaking alternatives to avoid, minimize, or mitigate the adverse effects, and may schedule additional meetings at its discretion.
4. If through consultation with Consulting Parties, and the ACHP if participating, USACE modifies the Study undertaking to avoid adverse effects to historic properties within the APE, USACE shall document the alternatives and procedures utilized to eliminate the adverse effects of the proposed undertaking resulting in a revised finding of “No Adverse Effect to Historic Properties,” which must receive concurrence or non-objection from the Consulting Parties pursuant to Stipulation IV.D.3. Once concurrence or non-objection is achieved, USACE has no further obligations under this stipulation for the specific undertaking.
5. If through consultation with the Consulting Parties USACE reaches agreement to appropriately resolve the adverse effects through minimization and/or mitigation measures, then the measures agreed to by USACE and the Consulting Parties shall be specified in a Memorandum of Agreement (MOA) developed and executed for the Study undertaking in accordance with 36 CFR § 800.6(b)(1) and 800.6(c) and filed by USACE with the ACHP upon execution, if the ACHP is not participating.

IV. TREATMENT OF HUMAN REMAINS AND ITEMS OF RELIGIOUS AND CULTURAL IMPORTANCE

- A. USACE shall follow ACHP, State, and Tribal policy and guidance for human remains, funerary objects, sacred objects, or objects of cultural patrimony as listed in Stipulation II(B).
- B. Under this PA, no investigative surveys or construction activities will be planned to knowingly disturb human remains, funerary objects, sacred objects, or objects of cultural patrimony. If any potential unmarked human burials or skeletal remains are encountered during construction activities, all ground-disturbing activities shall cease. Should any potential findings be made, field personnel shall follow instructions provided by USACE for each project to initiate identification, evaluation, and consultation efforts as outlined below.

- C. If suspected human remains, funerary objects, sacred objects, or objects of cultural patrimony are encountered during Study undertaking, field investigations, laboratory work, or during construction activities, USACE shall comply with the provisions below based on the nature of the land ownership at the time remains or objects are encountered.
1. USACE shall immediately notify appropriate law enforcement, appropriate medical examiner or coroner, appropriate SHPO, Consulting Indian Tribes, the Kansas State Archaeologist (for any remains in the state of Kansas), and the landowner within twenty-four (24) hours via email or telephone.
 2. USACE shall require that all work shall immediately cease within a 300-foot radius from the point of discovery and require that the contractor secure the area by flagging the area as an exclusion zone without making the location too conspicuous that human remains or cultural objects have been discovered.
 3. USACE shall implement measures to protect the discovery from looting and vandalism. Any human remains or other items in the immediate vicinity of the discovery must not be removed or otherwise disturbed. Human remains must be covered with canvas or other natural material. Should the situation be appropriate, plastic tarping may be used on top of natural materials for protection.
 4. Following other appropriate measures directed by USACE to protect the discovery from further disturbance. USACE shall consult with the Consulting Parties regarding additional steps to be followed. All human remains, regardless of ancestry, shall be treated with dignity and respect.
 5. If the human remains, funerary objects, sacred objects, or objects of cultural patrimony appear to be Native American, USACE shall comply with all applicable Federal, tribal, and state burial laws and ordinances.
 6. At no time shall human remains be allowed to be viewed or photographed by the public or project contractors, or excavated, collected, or removed (except by County coroner and/or law enforcement) without approval from the appropriate SHPO and USACE; and, in the event that human remains are determined to be Native American, in consultation with Consulting Tribes, USACE shall request the coroner and/or law enforcement to destroy all photographs immediately following identification. No further research or analyses shall be performed on the remains, including if the remains are required to be removed by a physical anthropologist prior to eventual reburial.
 7. Contractors, or their agents, representatives, and subcontractors, shall not contact or interact with members of the print, broadcast, digital, or other media or post, upload, or otherwise communicate via digital or social media matters or details concerning human graves or locations containing, or that are likely to contain, human graves and/or remains absent prior coordination and in consultation and concurrence with

the appropriate SHPO and Consulting Tribes. Access to these areas by unapproved visitors and media will not be permitted.

8. Further steps and/or additional guidelines for the treatment of Native American human remains and associated grave materials will be established in consultation and concurrence with Consulting Tribes and pursuant to laws and statutes pertaining to cemetery and burial sites and the handling of archaeological sites in the state of Missouri, and all other relevant Federal, state, and local laws, the terms of this PA notwithstanding. Neither Contractor nor USACE employees will conduct excavation, handling, or removal of any Native American human remains without consultation and concurrence from the Consulting Tribes.
9. When on Federal or tribal lands, USACE will meet the requirements of the Native American Graves Protection and Repatriation Act for all Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony on a case-by-case basis, in accordance with 43 C.F.R. Part 10.
10. If not on Federal or tribal lands, USACE shall notify appropriate authorities and follow all appropriate state laws including:
 - a. Kansas Unmarked Burial Sites Statute and Regulations K.S.A. 75-2741 through 75-2754.
 - b. Revised Statutes of Missouri Chapters 194 and 214.
11. Measures to protect the human remains and any associated artifact(s) will remain in effect until an appropriate treatment plan for the discovery (if applicable) has been completed for the remains and associated artifacts.
12. USACE shall consider redesign of undertakings to avoid effects to human remains and any associated artifacts(s). Work shall not resume in the vicinity of the find until the USACE has granted clearance to do so.
13. Where suspected burial sites in the absence of human remains are encountered, the USACE or its contractor shall comply, as applicable, with:
 - a. Kansas Unmarked Burial Sites Statute and Regulations K.S.A. 75-2741 through 75-2754.
 - b. Revised Statutes of Missouri Chapters 194 and 214.

V. REPORTS

USACE shall ensure that all reports and other documents resulting from the actions pursuant to this PA shall be provided in a format acceptable to the Consulting Parties. USACE shall ensure that all such reports (e.g., identification surveys, evaluation reports, treatment plans, and data recovery reports) meet or exceed the Department of the Interior's Format Standards for Final Reports of Data Recovery (42 FR 5377-79) and the standards identified in Stipulation II.B.

VI. CURATION

- A. All records resulting from the actions required by this PA shall be curated to the extent provided by law in accordance with 36 CFR Part 79, Curation of Federally Owned or Administered Archaeological Collections, except those materials identified as Native American human remains and items associated with Native American burials, which would be subject to Stipulation V.
- B. It is USACE policy that archaeological items and materials not associated with human remains or burials recovered from lands other than USACE fee-title, are the property of the respective landowner including private, state, Federal, and other locally owned lands. Therefore, USACE discourages the collection of any material, outside of human remains or burials, resulting from the actions required by this PA or from operations and maintenance.

VII. PROVISIONS FOR POST-REVIEW DISCOVERIES

- A. The following procedures shall be used in the event that new historic properties are discovered or new effects to historic properties occur during the construction or maintenance activities. The procedures below are intended to ensure that the Study undertaking is in full compliance with all applicable Federal and state laws and regulations, including Section 106 of the NHPA. USACE shall inform all construction contractors and appropriate personnel of the following procedures.
 - 1. All work within a 300-foot radius must stop immediately. USACE shall notify the SHPO and Consulting Tribes, pursuant to 36 C.F.R. § 800.13 as well as any other affected party, within forty-eight (48) hours of the discovery, and implement interim measures to protect the discovery from looting and vandalism. Construction may continue outside the 300-foot radius. Within forty-eight (48) hours of receipt of notification of the discovery or as soon as practicable, a USACE archaeologist shall:
 - a. inspect the work site to determine the extent of the discovery and ensure that work activities have halted within the 300-foot radius buffer zone;
 - b. clearly mark the area of the discovery;
 - c. implement additional measures, as appropriate, to protect the discovery from looting and vandalism; and
 - d. provide an initial assessment of the site's condition and NRHP eligibility to the Consulting Parties.
 - 2. The Consulting Parties have seven (7) business days following notification to concur or disagree with USACE's determination of the NRHP eligibility of the discovery.
 - 3. If USACE determines that the cultural resource site is or may be eligible for the NRHP, USACE shall consult with the Consulting Parties regarding appropriate measures for site treatment pursuant to 36 C.F.R. § 800.6(a). Consulting Parties will

have seven (7) business days to provide their objections or concurrence on the proposed actions. These measures may include:

- a. A formal archaeological evaluation of the site.
 - b. Invitation to Consulting Tribes and/or SHPO to visit the site.
 - c. Exploration of potential alternatives to avoid the site.
 - d. Preparation and implementation of a treatment plan by USACE in consultation and concurrence or non-objection with the Consulting Parties.
4. If USACE, after consultation with the Consulting Parties, determines the site is either an isolated find, completely disturbed by construction activities, or will not be further disturbed by construction activities, construction may resume within the 300-foot radius buffer zone.
- B. In the event that human remains, funerary objects, sacred objects, and objects of cultural patrimony are encountered during construction or maintenance activities, USACE shall follow all procedures as described in Stipulation V.

VIII. DISPUTE RESOLUTION

- A. Should a Consulting Party to this PA object at any time to any actions proposed or the manner in which the terms of this PA are implemented, USACE shall consult with such party for no more than thirty (30) business days to resolve the objection. USACE shall provide copies of the written objection to other Consulting Parties within five (5) business days of receipt of the written objection. Upon request, USACE shall make every effort to extend the consultation period, subject to mission requirements.
1. USACE shall take into account the reasons for the objection and evaluate the solutions suggested by the objecting party.
 2. If, after the thirty (30) business days review period, USACE determines that such objection cannot be resolved, USACE shall forward all documentation relevant to the dispute, including USACE's proposed resolution, to the ACHP.
 3. The ACHP shall provide USACE with its advice on the resolution of the objection within thirty (30) business days of receiving adequate documentation. Prior to reaching a final decision on the dispute, USACE shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP and other Consulting Parties to the PA and provide them with a copy of this written response. USACE shall then proceed according to its final decision.
 4. If the ACHP does not provide its advice regarding the dispute within the thirty (30) day period, USACE may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, USACE shall prepare a written response that takes into account any timely comments regarding the dispute from the Consulting Parties to the PA and provide them and the ACHP with a copy of such

written response.

5. USACE's responsibility to carry out all other actions subject to the terms of this PA that are not the subject of the dispute remain unchanged.

IX. SEVERABILITY

- A. If any section, subsection, paragraph, sentence, clause, or phrase in this PA, for any reason, is held to be unconstitutional or invalid or ineffective, such decision shall not affect the validity or effectiveness of the remaining portions of this PA.
- B. If any section, subsection, paragraph, sentence, clause, or phrase in this PA, for any reason, is held to be unconstitutional or invalid or ineffective, the Consulting Parties shall consult to determine whether an amendment to this PA is needed.

X. TERMINATION

- A. If any Signatory or Invited Signatory to this PA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other Signatories and Invited Signatories to attempt to develop an amendment per Stipulation XIV, below. If within thirty (30) business days (or another time period agreed to by all Signatories and Invited Signatories) an amendment cannot be reached, any Signatory or Invited Signatory may terminate the PA upon written notification to the other Signatories and Invited Signatories.
- B. Once the PA is terminated, and prior to work continuing on undertakings covered by the PA, USACE must either (a) execute a new PA pursuant to 36 C.F.R. § 800.14(b)(3) or (b) comply with 36 C.F.R. part 800.4 through part 800.6 for all undertakings that would otherwise be reviewed under this PA. USACE shall notify the Consulting Parties as to the course of action it will pursue.

XI. AMENDMENTS

Any Signatories or Invited Signatories to this PA may at any time propose amendments, whereupon all Signatories and Invited Signatories shall consult to consider such amendment for no more than ninety (90) days. An amendment will be effective on the date a copy signed by all Signatories and Invited Signatories is filed with the ACHP.

XII. PERIODIC REVIEW AND DURATION

- A. USACE shall provide the Consulting Parties evidence of compliance with this PA in site-specific annual reports. This documentation shall contain updates to Attachment D, the name of the project, historic properties identified, determinations of effect, avoidance procedures, and level of investigation and/or mitigation conducted with titles

of all project reports related to such investigation and/or mitigation which have been completed. USACE shall submit the annual report on or before December 31 of each year following execution of the PA for the duration of the PA.

- B. The PA shall expire ten (10) years from the date of the last signature. Five (5) years after the execution of the PA Consulting Parties will be invited to a virtual meeting to determine if the PA is working as intended. One (1) year prior to the expiration of the PA, the Consulting Parties shall review the PA in order to determine whether it should be reissued or allowed to expire. If the PA requires reissue, USACE shall consult with the Consulting Parties, as well as amend the PA in order to ensure compliance with the most current version of the Federal regulations implementing the NHPA.

XIII. ANTI-DEFICIENCY PROVISION

USACE's obligations under this PA are subject to the availability of appropriated funds, and the stipulations of this PA are subject to the provisions of the Anti-Deficiency Act. All parties to this PA acknowledge the USACE fiduciary responsibilities pursuant to the Anti-Deficiency Act (31 USC 1341). USACE shall make reasonable and good faith efforts to secure the necessary funds to implement this PA in its entirety. If compliance with the Anti-Deficiency Act alters or impairs USACE's ability to implement the stipulations of this PA, USACE shall consult in accordance with the amendment procedures found at Stipulation XII and termination procedures found at Stipulation XI.

XIV. COMMUNICATION

USACE shall provide the Consulting Parties with public meeting announcements, special releases, and notifications of the availability of report(s); comments received by USACE will be taken into account in finalizing plans for Study undertakings.

XV. EXECUTION AND IMPLEMENTATION

- A. Nothing in this PA is intended to prevent USACE from consulting more frequently with the Consulting Parties concerning any questions that may arise or on the progress of any actions falling under or executed by this PA.
- B. This PA may be executed in counterparts. Executed in counterparts means each party signs their own separate duplicate copy of the PA, rather than signing together on the same page of the same document.
- C. Each party agrees a person may execute this document by electronic symbol or process attached to or logically associated with the document, with an intent to sign the document and by a method that must include a feature to verify the identity of the signer and the authenticity of the document, commonly referred to as verified electronic

signature. Each party further agrees to accept in-person signature with ink for such party who agrees but does not wish to or have access to adequate technology to sign electronically.

Execution of this PA by USACE, Kansas SHPO, Missouri SHPO, Iowa Tribe of Kansas and Nebraska, Miami Tribe of Oklahoma, The Osage Nation, Pawnee Nation, and ACHP and implementation of its terms evidence that USACE has taken into account the effects of the undertakings to which this agreement applies on historic properties and afforded the ACHP an opportunity to comment.

PROGRAMMATIC AGREEMENT

AMONG THE

U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT;

KANSAS STATE HISTORIC PRESERVATION OFFICER;

MISSOURI STATE HISTORIC PRESERVATION OFFICER;

IOWA TRIBE OF KANSAS AND NEBRASKA;

MIAMI TRIBE OF OKLAHOMA;

THE OSAGE NATION;

PAWNEE NATION;

AND

THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

**REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY
GENERAL INVESTIGATION STUDY**

SIGNATORY

U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT

By:  Date: 1/9/2026

Andrew T. Niewohner

Colonel, Corps of Engineers

District Commander

PROGRAMMATIC AGREEMENT AMONG THE U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT; KANSAS STATE HISTORIC PRESERVATION OFFICER; MISSOURI STATE HISTORIC PRESERVATION OFFICER; IOWA TRIBE OF KANSAS AND NEBRASKA; MIAMI TRIBE OF OKLAHOMA; THE OSAGE NATION; PAWNEE NATION OF OKLAHOMA; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY GENERAL INVESTIGATION STUDY IN THE STATES OF KANSAS AND MISSOURI

PROGRAMMATIC AGREEMENT

AMONG THE

U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT;

KANSAS STATE HISTORIC PRESERVATION OFFICER;

MISSOURI STATE HISTORIC PRESERVATION OFFICER;

IOWA TRIBE OF KANSAS AND NEBRASKA;

MIAMI TRIBE OF OKLAHOMA;

THE OSAGE NATION;

PAWNEE NATION;

AND

THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

**REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY
GENERAL INVESTIGATION STUDY**

SIGNATORY

KANSAS STATE HISTORIC PRESERVATION OFFICE

By: Patrick Zolner Date: 1-15-26

Mr. Patrick Zolner, Executive Director, Kansas State Historical Society

PROGRAMMATIC AGREEMENT AMONG THE U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT; KANSAS STATE HISTORIC PRESERVATION OFFICER; MISSOURI STATE HISTORIC PRESERVATION OFFICER; IOWA TRIBE OF KANSAS AND NEBRASKA; MIAMI TRIBE OF OKLAHOMA; THE OSAGE NATION; PAWNEE NATION OF OKLAHOMA; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY GENERAL INVESTIGATION STUDY IN THE STATES OF KANSAS AND MISSOURI

PROGRAMMATIC AGREEMENT

AMONG THE

U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT;

KANSAS STATE HISTORIC PRESERVATION OFFICER;

MISSOURI STATE HISTORIC PRESERVATION OFFICER;

IOWA TRIBE OF KANSAS AND NEBRASKA;

MIAMI TRIBE OF OKLAHOMA;

THE OSAGE NATION;

PAWNEE NATION;

AND

THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

**REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY
GENERAL INVESTIGATION STUDY**

SIGNATORY

MISSOURI STATE HISTORIC PRESERVATION OFFICE

By:  Date: 1/26/26

**Ms. Laura Hendrickson, Deputy Director Division of State Parks and
Deputy Missouri State Historic Preservation Officer**

PROGRAMMATIC AGREEMENT AMONG THE U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT; KANSAS STATE HISTORIC PRESERVATION OFFICER; MISSOURI STATE HISTORIC PRESERVATION OFFICER; IOWA TRIBE OF KANSAS AND NEBRASKA; MIAMI TRIBE OF OKLAHOMA; THE OSAGE NATION; PAWNEE NATION OF OKLAHOMA; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY GENERAL INVESTIGATION STUDY IN THE STATES OF KANSAS AND MISSOURI

PROGRAMMATIC AGREEMENT

AMONG THE

U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT;

KANSAS STATE HISTORIC PRESERVATION OFFICER;

MISSOURI STATE HISTORIC PRESERVATION OFFICER;

IOWA TRIBE OF KANSAS AND NEBRASKA;

MIAMI TRIBE OF OKLAHOMA;

THE OSAGE NATION;

PAWNEE NATION;

AND

THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY

GENERAL INVESTIGATION STUDY

SIGNATORY

THE IOWA TRIBE OF KANSAS AND NEBRASKA

BY: Alan Kelley Date: 12/31/25
Alan Kelley, Tribal Historic Preservation Officer

PROGRAMMATIC AGREEMENT AMONG THE U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT; KANSAS STATE HISTORIC PRESERVATION OFFICER; MISSOURI STATE HISTORIC PRESERVATION OFFICER; IOWA TRIBE OF KANSAS AND NEBRASKA; MIAMI TRIBE OF OKLAHOMA; THE OSAGE NATION; PAWNEE NATION OF OKLAHOMA; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY GENERAL INVESTIGATION STUDY IN THE STATES OF KANSAS AND MISSOURI

PROGRAMMATIC AGREEMENT

AMONG THE

U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT;

KANSAS STATE HISTORIC PRESERVATION OFFICER;

MISSOURI STATE HISTORIC PRESERVATION OFFICER;

IOWA TRIBE OF KANSAS AND NEBRASKA;

MIAMI TRIBE OF OKLAHOMA;

THE OSAGE NATION;

PAWNEE NATION;

AND

THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

**REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY
GENERAL INVESTIGATION STUDY**

SIGNATORY

ADVISORY COUNCIL ON HISTORIC PRESERVATION

By:  Date: February 23, 2026

Reid Nelson, Executive Director

PROGRAMMATIC AGREEMENT

AMONG THE

U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT;

KANSAS STATE HISTORIC PRESERVATION OFFICER;

MISSOURI STATE HISTORIC PRESERVATION OFFICER;

IOWA TRIBE OF KANSAS AND NEBRASKA;

MIAMI TRIBE OF OKLAHOMA;

THE OSAGE NATION;

PAWNEE NATION;

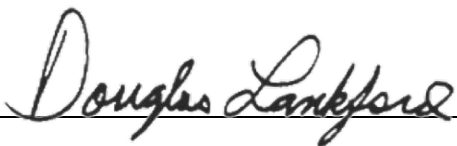
AND

THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

**REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY
GENERAL INVESTIGATION STUDY**

INVITED SIGNATORY

MIAMI TRIBE OF OKLAHOMA

By:  Date: 1/15/2026

Douglas Lankford

Chief, Miami Tribe of Oklahoma

PROGRAMMATIC AGREEMENT

AMONG THE

U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT;

KANSAS STATE HISTORIC PRESERVATION OFFICER;

MISSOURI STATE HISTORIC PRESERVATION OFFICER;

IOWA TRIBE OF KANSAS AND NEBRASKA;

MIAMI TRIBE OF OKLAHOMA;

THE OSAGE NATION;

PAWNEE NATION;

AND

THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

**REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY
GENERAL INVESTIGATION STUDY**

INVITED SIGNATORY

THE OSAGE NATION

BY:  Date: 2/12/26

Geoffrey M. Standing Bear

Principal Chief

PROGRAMMATIC AGREEMENT AMONG THE U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT; KANSAS STATE HISTORIC PRESERVATION OFFICER, MISSOURI STATE HISTORIC PRESERVATION OFFICER, IOWA TRIBE OF KANSAS AND NEBRASKA; MIAMI TRIBE OF OKLAHOMA; THE OSAGE NATION; PAWNEE NATION OF OKLAHOMA; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY GENERAL INVESTIGATION STUDY IN THE STATES OF KANSAS AND MISSOURI

PROGRAMMATIC AGREEMENT

AMONG THE

U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT;

KANSAS STATE HISTORIC PRESERVATION OFFICER;

MISSOURI STATE HISTORIC PRESERVATION OFFICER;

IOWA TRIBE OF KANSAS AND NEBRASKA;

MIAMI TRIBE OF OKLAHOMA;

THE OSAGE NATION;

PAWNEE NATION;

AND

THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

**REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY
GENERAL INVESTIGATION STUDY**

INVITED SIGNATORY

THE PAWNEE NATION OF OKLAHOMA

By: _____ Date: _____

Misty M. Nuttle

Madam President

Attachment A

THE LOWER MISSOURI RIVER FLOOD RISK AND RESSILIENCY GENERAL INVESTIGATION STUDY AREA IN THE STATES OF KANSAS AND MISSOURI



PROGRAMMATIC AGREEMENT AMONG THE U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY DISTRICT; KANSAS STATE HISTORIC PRESERVATION OFFICER; MISSOURI STATE HISTORIC PRESERVATION OFFICER; IOWA TRIBE OF KANSAS AND NEBRASKA; MIAMI TRIBE OF OKLAHOMA; THE OSAGE NATION; PAWNEE NATION OF OKLAHOMA; AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION REGARDING THE LOWER MISSOURI RIVER FLOOD RISK AND RESILIENCY GENERAL INVESTIGATION STUDY IN THE STATES OF KANSAS AND MISSOURI

Attachment B: Definitions

Recommended Plan	Under Engineer Regulation ER_1105-2-100, the recommended plan is the plan proposed in the final decision document for implementation.
Area of Potential Effects (APE)	Under 36 CFR § 800.16(d) the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.
Signatory	In accordance with 36 CFR § 800.6(c)(1), a Signatory has the authority to execute, amend, or terminate the Programmatic Agreement.
Invited Signatory	In accordance with 36 CFR § 800.6(c)(2), Invited Signatories who sign the Programmatic Agreement are signatories with the authority to amend and terminate the Programmatic Agreement.
Concurring Party	In accordance with 36 CFR § 800.6(c)(3), a Concurring Party is a Consulting Party invited to concur in the Programmatic Agreement but does not have the authority to amend or terminate the Programmatic Agreement.
Study Undertaking	Any action completed under the Lower Missouri River Flood Risk and Resiliency General Investigation Study that has the potential to effect historic properties

Attachment C

CONSULTING INDIAN TRIBES TO PROGRAMMATIC AGREEMENT

Chairman Justin Gray Hawk, Jr.
Assiniboine and Sioux Tribes of Fort Peck
P.O. Box 1027
Poplar, MT 59255

Chairman Iliff "Scott" Kipp Sr.
Blackfeet Nation
P.O. Box 850
Browning, MT 59417

Chairman Ryman LeBeau
Cheyenne River Sioux Tribe
P.O. Box 590
Eagle Butte, SD 57625

Chairman Harlan Baker
Chippewa Cree Tribe of the Rocky Boys'
Reservation
P.O. Box 850
Box Elder, MT 59521-8849

Chairman Peter Lengkeek
Crow Creek Sioux Tribe

P.O. Box 50
Fort Thompson, SD 57339

Chairman Frank White Clay
Crow Tribe of Montana
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Crow Agency, MT 59022

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Delaware Nation
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Chief Brad Killscrow
Delaware Tribe of Oklahoma
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Bartlesville, OK 74006

Chairman John St. Clair
Eastern Shoshone Tribe
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Fort Washakie, WY 82514

President Anthony Reider
Flandreau Santee Sioux Tribe
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Flandreau, SD 57028

President Jeffrey Stiffarm
Fort Belknap Indian Community
Gros Ventre and Assiniboiné Tribes
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Harlem, MT 59526-9705

President Jon Greendeer
Ho-Chunk Nation
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Black River Falls, WI 54615

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Iowa Tribe of Kansas and Nebraska
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White Cloud, Kansas 66094

Chairman Jake Keyes
Iowa Tribe of Oklahoma
335588 E. 750 Rd.
Perkins, OK 74059

Chairperson Kim Jenkins
Kaw Nation

Drawer 50
Kaw City, Oklahoma 74641

Chairperson Gail Cheatham
Kickapoo Tribe of Kansas
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Horton, Kansas 66439

Chairman Gerald Gray
Little Shell Chippewa Tribe
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Chairman Clyde Estes
Lower Brule Sioux Tribe
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Chairman Mark Fox
Mandan, Hidatsa, & Arikara Nation
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74355

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Northern Cheyenne Tribe
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Lame Deer, MT 59043

President Frank Star Comes Out
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Pine Ridge, SD 57770

Chairman Leander Merrick
Omaha Tribe of Nebraska
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Macy, NE 68039-0368

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627 Grandview
Pawhuska, Oklahoma 74056

Chairman John R. Shotton
Otoe-Missouria Tribe
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Pawnee, OK 74058

Chairwoman Candace Schmidt
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Niobrara, NE 68760

Chairman Oliver Little Cook
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Chairperson Joseph Rupnick
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President Scott Herman
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Sac and Fox Nation of Missouri in Kansas and
Nebraska

305 N. Main Street
Reserve, Kansas 66434

Chairman Vernon Jefferson
Sac and Fox Tribe of Mississippi in Iowa
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Principal Chief Randle Carter
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Agency Village, SD 57262-0509

Chairperson Lonna Jackson-Street
Spirit Lake Sioux Tribe
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Fort Totten, ND 58335
Chairwoman Janet Alkire

Standing Rock Sioux Tribe
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Fort Yates, ND 58538

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Turtle Mountain Band of Chippewa Indians
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Belcourt, ND 58316

Chairwoman Victoria Kitcheyan
Winnebago Tribe of Nebraska
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Winnebago, NE 68071-0687

Chief Billy Friend
Wyandotte Nation
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Wyandotte, OK 74370

Chairman Robert Flying Hawk
Yankton Sioux Tribe
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Wagner, SD 57380

Attachment D

LOWER MISSOURI RIVER CONSULTING PARTY CONTACT LIST

U.S. ARMY CORPS OF ENGINEERS-KANSAS CITY DISTRICT

Primary contact:

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District Archaeologist/Tribal Liaison

U.S. Army Corps of Engineers

Kansas City District

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601 E. 12th Street

Kansas City, MO 64106-2896

P: (816) 389-3138

Cell: (816) 492-0324

Timothy.M.Meade@usace.army.mil]

Method of contact for project notification and documentation: [email]

Method of contact for other communication: [email or phone call]

Secondary contact:

Michael Snyder

PMP-R Environmental Resources Section Chief

U.S. Army Corps of Engineers

Kansas City District

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Kansas City, MO 64106-2896

P: (816) 389-3258

Michael.V.Snyder@usace.army.mil]

Method of contact for project notification and documentation: [email]

Method of contact for other communication: [email or phone call]

ACHP

Primary contact:

Office of Federal Agency Programs

Advisory Council on Historic Preservation

401 F Street NW, Suite 308, Washington, DC 20001

OFAP_Help@achp.gov

Method of contact for project notification and documentation: []

Method of contact for other communication: [email]

KANSAS STATE HISTORIC PRESERVATION OFFICER

Primary contact:

Katrina Ringler

Deputy State Historic Preservation Officer

Director, Cultural Resources Division

Kansas Historical Society

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Topeka, KS 66615-1099

785-272-8681 ext. 217

Katrina.Ringler@ks.gov

Method of contact for project notification and documentation: [email]

Method of contact for other communication: [email or phone call]

Secondary contact:

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State Archeologist

Kansas Historical Society

6425 SW 6th Avenue ·

Topeka, KS 66615-1099

785-272-8681 ext. 269

Nikki.Klarmann@ks.gov

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Method of contact for other communication: [email or phone call]

MISSOURI STATE HISTORIC PRESERVATION OFFICER

Primary contact:

Amy Rubingh

Review, Compliance, and Records Coordinator

[Division of State Parks, Missouri Department of Natural Resources](#)

PO Box 176

1101 Riverside Drive

Jefferson City, MO 65101

573-751-4589

Any.rubingh@dnr.mo.gov

Method of contact for project notification and documentation: [[postal mail/courier](#)]

Method of contact for other communication: [[email, phone call](#)]

Secondary contact:

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Architectural Historian

Review, Compliance, and Records Unit

[Division of State Parks, Missouri Department of Natural Resources](#)

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Jefferson City, MO 65101

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Tribal Historic Preservation Officer

Iowa Tribe of Kansas and Nebraska

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(785) 595- 3258

akelley@iowas.org

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Method of contact for other communication: phone call

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Primary contact:

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Tribal Historic Preservation Officer

Miami Tribe of Oklahoma

P.O. Box 470

Miami, OK 74355-1326

(918) 541- 1366

lyork@miamination.com

Method of contact for project notification and documentation: email

Method of contact for other communication: phone call

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THE OSAGE NATION

Primary contact:

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Tribal Historic Preservation Officer/Director

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918-287-5671

ahunter@osagenation-nsn.gov

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Archaeologist

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Method of contact for other communication: [phone call](#)

NAGPRA/Inadvertent Discovery contact:

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NAGPRA Coordinator

Osage Nation

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918-287-5522

sodonnell@osagenation-nsn.gov

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THE PAWNEE NATION OF OKLAHOMA

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Pawnee, OK 74058-0470

(918) 762- 2180

jreed@pawneenation.org

Method of contact for project notification and documentation: email

Method of contact for other communication: email

Secondary contact: none

Attachment E

GUIDANCE FROM THE OSAGE NATION



OSAGE NATION

Historic Preservation Office

National Historic Preservation Act Section 106 Protocol and Standards

The Osage Nation Historic Preservation Office (ONHPO) has developed the following procedures for Section 106 consultation required by the Historic Preservation Act, (NHPA) [54 U.S.C. § 300101 et seq.] 1966.

Please submit all of the following information for all NHPA Section 106 consultation requests (additional formatting and information requested in standards for cultural resource survey reports below):

- A. To initiate consultation with the Osage Nation Historic Preservation Office submit a 1-page cover letter with the following included:
- Federal agency name, district, or department
 - Point of contact information: individual's name, address, phone, fax, and email
 - Project name and number, or other designation (if for tracking)
 - Project location information: **USPLSS** (quadrangle, quarter section, section, township, and range) and **UTM (WGS84) coordinates are required**
- Projects will not be reviewed until both USPLSS and UTM coordinates are submitted
- Total area surveyed in acres

- B. Professional cultural resource survey report. At a minimum, **all field surveyors** must possess a **BA or BS in anthropology** with an emphasis in archaeology (exception- see page 4). At a minimum, the **supervisor who is in the field and supervises the field survey**, interprets the results of the field survey, determines the cultural resource recommendation, and produces the cultural survey report **must possess an MA or MS in anthropology** with an emphasis in archaeology. **Supervisors must accompany and oversee all field surveyors during the fieldwork.** With the first cultural resource survey report, include curriculum vitae for all project archaeologists and identify work performed. See page 3 for an outline of the documentation required in a standard cultural resource survey report.
- C. USGS topographic and/or aerial maps locating project area within the: 1) state, 2) county, 3) quadrangle, and 4) section.
- D. USGS topographic and/or aerial maps specifically locating: 1) project APE, 2) project staging areas outside of APE, 3) access road, and 4) location of all archaeological and historic sites in and in close vicinity of the project APE. Please do not submit hand drawn or hand annotated maps.
- E. GLO maps for project area, please include both late 19th century and early 20th century maps and identify project APE on maps.
- F. Project site plan map indicating location of screened shovel tests (please label shovel tests with identification number on maps). Please do not submit hand drawn or hand annotated maps. **Shovel test minimum width is 30 cm. Shovel test minimum depth is 20 cm beyond sterile soil. If terminated before sterile soil is reached, please provide an explanation either in the text or in the shovel test log. Excavated shovel tests must be screened using a 0.25 in mesh screen, dug in stratigraphic or 10 cm levels, and measurements must be recorded in centimeters. Please refer to the Archaeological Survey Standards for density of shovel testing.**
- G. Table listing shovel test locations, width (cm), actual depth (cm) of each level, soils of each level, and results.
- H. Shovel test map with all shovel test locations labeled by their field identification number.
- I. Site photographs in color, specifically images depicting exact location of 1) project marked by stakes or flagging (if possible), 2) access roads, 3) utility easement (if applicable), 4) staging areas, and 5) identified archaeological/historic sites.
- J. Copy of the review letter from the State Historic Preservation Office. For projects in Oklahoma, letters from both SHPO components, the Oklahoma Archaeological Survey and the Oklahoma Historical Society are required.

Please do not email documentation; it will be deleted without being opened. Mail one printed color copy of all documentation accompanied with a CD version.

Please use only the following contact and address information:

Dr. Andrea A. Hunter, THPO
Osage Nation Historic Preservation Office
627 Grandview
Pawhuska, OK 74056

Phone: 918-287-5328
Fax: 918-287-5376

Standards for Cultural Resource Survey Reports

The following outlines the documentation required in a cultural resource survey report that will enable the Osage Nation Tribal Historic Preservation Office to efficiently evaluate the information gathered for a proposed project in a coherent, standardized format. Please include in all reports:

1. Abstract

Executive summary of project, survey results, and recommendations

2. Introduction

Introduce project and project design

3. Environmental Setting

Specific location, legal description, composition of project site

General location, geomorphology, landform, soils, vegetation, hydrology

4. Cultural History

Brief overview of cultural occupation represented in locale

5. File Search and Previous Research

Results of file search in state database for previously recorded archaeological sites and review of previous archaeological investigations, NRHP listings, GLO records and maps, late 19th and early/mid-20th century maps, and mid-20th and current aerial photographs. For projects in Osage County, OK include: Osage tribal allotment records and maps, late 19th and early/mid-20th century maps such as the Oklahoma State Highway Department's General Highway and Transportation Map of Osage County, and mid-20th and current aerial photographs such as those at the Oklahoma Petroleum Research Library in Norman, Oklahoma.

6. Field Methods and Analytical Techniques

How field survey and analysis were conducted

7. Results of Archaeological Field Investigations

Review findings and identification of National Register of Historic Places

8. Recommendations

Summarize archaeological sites identified, NRHP determinations, and project recommendations

9. References Cited

Minimum Qualifications for Archaeology Personnel*

The minimum professional qualifications for archaeology field survey assistants are:

- BA or BS in anthropology with an emphasis in archaeology

Or with prior approval from the ONHPO by providing the following documentation:

- BA or BS in Applied Indigenous Studies, Native American Studies, Geology, Geography, History, Architectural History, Historic Preservation plus:
 - at least one year of full-time professional archaeology experience or equivalent specialized training in archaeological research, administration, or management;
 - at least four months of supervised field experience in general North American archaeology; and
 - demonstrated ability to carry fieldwork to completion.

The minimum professional qualifications for personnel who supervises and conducts the archaeological field survey, interprets the results of the field survey, determines the cultural resource recommendation, and produces the cultural survey report are:

- Graduate degree in archaeology or anthropology with an emphasis in archaeology; and
- One year of full-time professional experience at a supervisory level in the study of archaeological resources of the prehistoric period.

* With the first cultural survey report, please submit the curriculum vitae for the field survey personnel and for the archaeological supervisor. When personnel change, please submit their curriculum vitae.



OSAGE NATION

HISTORIC PRESERVATION OFFICE

ARCHAEOLOGICAL SURVEY STANDARDS

The following archaeological survey standards are the minimum amount of work acceptable for archaeological surveys conducted on the Osage Nation Reservation/Osage County and throughout Osage Nation ancestral territory as determined by the Osage Nation Historic Preservation Office (ONHPO). Additional archaeological work (i.e. more shovel tests or transects) or methods (backhoe trenches) can always be incorporated into the research design to help locate and identify archaeological sites depending on the area or potential for encountering significant cultural resources. Alternative, project-specific, standards may be developed in conjunction with the ONHPO for projects with unique or unusual circumstances as appropriate.

Professional Qualifications:

Archaeological investigations must be conducted by an archaeologist who meets the U.S.

Secretary of the Interior's *Professional Qualification Standards for Archeology* (36 CFR Part 61; 48 FR 44716). At a minimum, all field surveyors must possess a BA or BS in anthropology with an emphasis in archaeology. At a minimum, the supervisor who is in the field and supervises the field survey, interprets the results of the field survey, determines the cultural resource recommendation, and produces the cultural survey report must possess an MA or MS in anthropology with an emphasis in archaeology. Supervisors must accompany and oversee all field surveyors during the fieldwork. With the first cultural resource survey report, include curriculum vitae for all project archaeologists and identify work performed.

Background Research:

Archaeologists must conduct a background literature search prior to field investigations. At a minimum this shall include searches of the SHPO's databases for previously recorded archaeological sites and historic properties, and previous archaeological work in the vicinity. For projects in Osage County, OK, the archaeologists would also include searches of the Osage

Allotment Maps, Oklahoma Geological Survey Archives (Norman, Oklahoma) for early USGS 7.5 and 15-minute topographic maps and aerial photographs, plus the GLO map archive available online (www.glorerecords.blm.gov).

Deeply Buried Cultural Deposits:

Archaeologists must assess the potential for deeply buried cultural deposits within the block area prior to starting field investigations. At a minimum, this shall include a review of the USDA soil surveys and geologic maps. If there is a potential for deeply buried cultural deposits within the block survey area, deeper subsurface investigations (to be determined in consultation with the ONHPO) will be required.

Survey Report:

Archaeologists must submit the results of their investigation in a report to the ONHPO that follows the Secretary of the Interior's *Standards for Archeological Documentation*. The ONHPO will complete its review within 30 days of receipt of the archaeology survey report and the SHPO review letters. For Oklahoma this would include review letters by the Oklahoma Archaeological Survey and the Oklahoma Historical Society.

Fieldwork:

Unless otherwise determined in conjunction with the ONHPO, all areas of a project's Area of Potential Effects (APE) should be subjected to subsurface investigations via systematic shovel testing. No area of the project's APE should be omitted from shovel testing due to surface visibility. The omission of areas from subsurface testing in an archaeological survey due to ground visibility is neither effective nor ethical. While the presence of artifacts on the surface of the ground can be an indication for the presence of a site, the absence of artifacts on the surface of the ground, even in conditions of 100 percent surface visibility, is not a confirmation for the absence of an archaeological site which may be buried beneath the ground's surface. Additionally, it should not be assumed that previously disturbed areas contain no significant archaeological sites or buried human remains. Those areas known to be, or thought to be, previously disturbed should also be subjected to survey in order to identify archaeological sites and to evaluate the level of disturbance which may or may not have impacted buried archaeological sites.

A. Shovel Testing

The entire APE must be subject to systematic shovel testing. Shovel tests must be conducted in intervals no greater than 30 meters in transects no wider than 30 meters. A smaller or reduced shovel test interval may be appropriate in areas with particularly high probability or potential for significant, intact archaeological deposits. Additionally, the ONHPO may require shovel test intervals be reduced to 15 meters in areas known to have a higher probability for archaeological sites or areas of significance to the Osage Nation. Shovel tests must be a minimum of 30 cm in diameter and must be dug to 20 cm beyond sterile subsoil. If portions of the APE are believed to contain subsoil at the surface of the ground, then shovel tests are to be dug to 20 cm below the surface to confirm that it is subsoil and to determine that the subsoil is sterile of artifacts and/or features. Shovel tests should be dug in stratigraphic or 10 cm levels with sediments screened through ¼-inch mesh unless high clay or water content requires that they be troweled through.

If sterile subsoil is too deep to reach via shovel testing, then selective coring/auguring should commence to determine the need for more appropriate methods to survey for deeply buried archaeological deposits. In seasonally inundated areas where the soil is very poorly drained, shovel testing should be conducted to verify soil conditions (i.e. hygroscopic soils), but shovel test intervals may be extended to a maximum of 50 meters in those areas.

Unless previously determined in conjunction with the ONHPO, the only areas within the APE in which shovel testing may be omitted are areas of a 20 percent or greater slope. Areas known to be, or believed to be previously disturbed, including but not limited to previously developed lands, agricultural fields, and buried utilities, are not to be omitted from subsurface testing. Systematic shovel testing in the manner stated above is required in those areas to establish the presence of archaeological sites, to determine the level of ground disturbance, and to evaluate the impact of previous ground disturbance on any archaeological sites located in the area.

Notes should be kept on each shovel test documenting the shovel test location (including GPS coordinates), soil stratigraphy referencing USDA soil descriptions and actual soils encountered, soil color description (Munsell color codes if possible), depth, and the presence or absence of artifacts. A representative sample of shovel tests should be documented with photographs and profile drawings all of which should be incorporated into the survey report. The survey report will also include a shovel test log and a shovel test map that clearly depicts each labeled shovel test location.

B. Pedestrian Survey

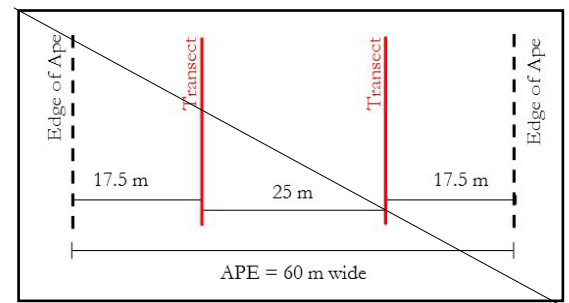
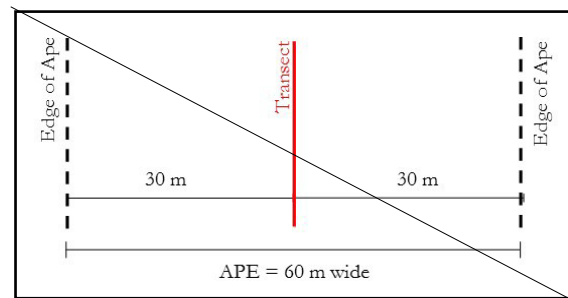
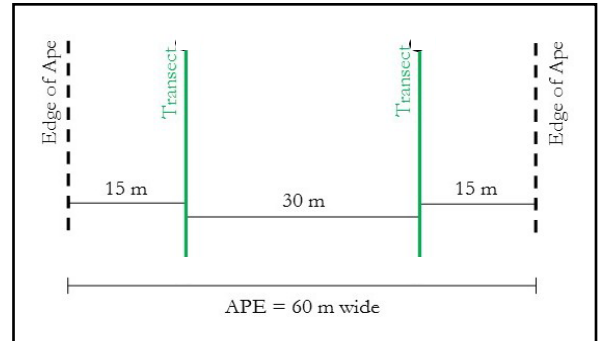
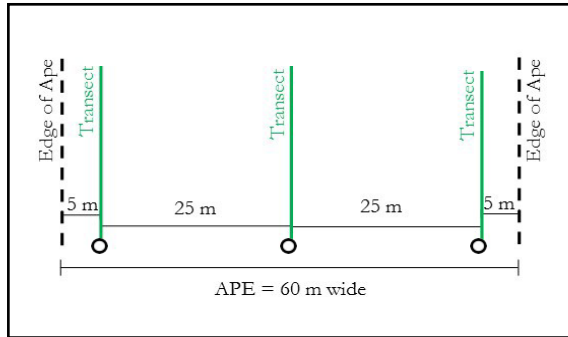
While pedestrian survey may be used in addition to systematic shovel testing, it may not be used in lieu of shovel testing in any area, except for those areas consisting of a slope 20 degrees or greater. Sloped areas exceeding 20 degrees should be investigated via pedestrian survey at intervals no wider than 10 meters.

C. Linear Projects

For linear projects exceeding 1 mile, such as power line corridors, shovel test intervals may be extended to a maximum of 100 meters. A linear project is defined as an undertaking with an APE width no greater than 30 m. Additional judgmental shovel tests, as appropriate, should be placed in areas with particularly high probability or potential for significant, intact archaeological deposits.

If shovel test transects parallel the edge of the APE, the transect nearest the edge of the APE should be no further than half a standard shovel test interval as defined for the project from the edge of the APE. For example, if the shovel test interval being used for a particular project is 25 m, the transects nearest the edges of the APE should be no further than 12.5 m from the edge of the APE. If the APE is 60 m wide and shovel tests are being excavated at 25 m intervals, there should be three shovel test transects, and the transects nearest the edges of the APE would be 5 m from the edge of the APE. If shovel tests were excavated on only two transects, the distance from the transects to the edge of the APE would be 17.5 m, which is greater than half of a standard shovel test interval as defined for the project, and not deemed adequate coverage for a high probability area.

Examples of Shovel Test Transect Placements (Across 60-Meter Wide Survey Corridor)



Insufficient Coverage

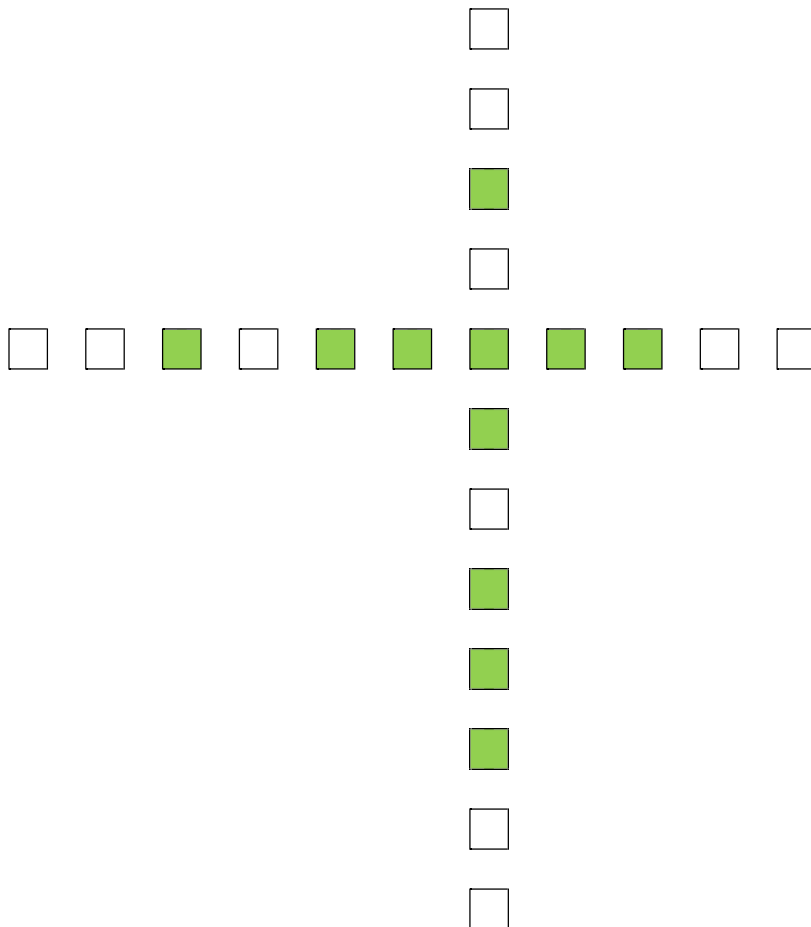
Two Shovel Test Transects Spaced 25 m Apart on 60-m Wide Corridor, with Shovel Tests Excavated at 25-m Intervals.

Determining Site Boundary:

Shovel testing is required to determine site boundaries.

A minimum of nine (9) shovel tests must be placed in a + pattern that is perpendicular extending from the center of the artifact discovery location.

A shovel test must be placed every five (5) meters until two (2) negative shovel tests are sequentially excavated in each direction. All surface finds and positive shovel tests must be bounded by radial shovel tests in this manner.



Positive shovel test



Negative shovel test



Osage Nation Historic Preservation Office

HAZAZA KOSU KUPA

Archaeological Resources Protection Act Violation Procedures

Federal agencies must conduct consultation and cooperation with Federally-recognized Tribes (Tribes) regarding Federal Acts and Orders including, but not limited to the Archaeological Resources Protection Act of 1979 (ARPA), as amended (16 U.S.C. §470aa-470mm), the Native American Graves Protection and Repatriation Act (NAGPRA, 25 U.S.C. §3001 et seq.), Presidential Executive Order 13007 ("Indian Sacred Sites"), Presidential Executive Order 13175 ("Consultation and Coordination with Indian Tribal Governments"), and the American Indian Religious Freedom Act, 42 U.S.C. § 1996 (AIRFA). Further, Federal agencies are required to use staff who meet the Secretary of Interior's *Professional Qualifications Standards* for archaeology (48 FR 44738k-9).

The Osage Nation has a deep concern for the identification, treatment, and protection of its properties of cultural, historic, and religious significance throughout its Ancestral Territory. Of particular concern to the Osage Nation are its sacred sites. Federal agencies with land-management responsibilities have a responsibility to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of sacred sites (Executive Order 13007). Sacred sites may be further endangered during ARPA investigations particularly when sites are assessed for damages and also by public outreach activities conducted by law enforcement personnel. Although the Osage Nation understands the lands owned by the Federal government are managed for the benefit of the American people, places of significance to the Osage people belong to the Osage people. The treatment of sacred sites is of grave concern to the Osage Nation, particularly when they have been desecrated and are subject to investigations pursuant to ARPA. Federal agencies are encouraged to coordinate with the Osage Nation in developing specific protocols in response to violations of ARPA (looting, vandalism, etc.) as well as providing support in the investigation, trying, and, if a conviction is obtained, sentencing of parties responsible for these abhorrent acts. Federal agencies do not know what is culturally sensitive and must consult with Tribes so that they may interpret these places while respecting its concerns. Federal agencies must work with the Osage Nation as partners in increasing their capacity for, and compliance with, Section 10(c) of ARPA, as codified at 16 U.S.C. 470ii(c); Section 14 of ARPA, as codified at 16 U.S.C.

470mm; and Section 14(c) of ARPA, as codified at 16 U.S.C. 470mm(c). It is, perhaps, not possible to prevent such crimes entirely, but the Osage Nation contends that, through

coordination, we can mitigate the risk of and appropriately address such crimes when they do occur. The Osage Nation considers these places to be invaluable and irreplaceable; no assessment of the damage will appropriately reflect the true damage that has been done. The Osage Nation anticipates consulting with each of its Federal partners on this matter.

It is the responsibility of each Federal agency to identify and maintain persistent relationships with Tribes that have an interest in the lands they manage and communicate with those Tribes through their identified representatives. The Osage Nation and each Federal Agency shall designate a primary and secondary point of contact for ARPA-related matters. Each party shall provide the other parties with the phone numbers, email addresses, and mailing addresses for the primary and secondary point of contact. Each party shall notify the other parties in writing when the primary point of contact changes. All inquiries and correspondence shall be directed to the primary point of contact. If the individual designated as the primary point of contact is not available, communications should be directed to the secondary point of contact. Please note, in light of the confidential nature of criminal investigations, representatives of the Osage Nation are subject to Tribal confidentiality law, specific Non-Disclosure Agreements entered into as a condition of their employment, Federal confidentiality laws, professional ethical codes governing their behavior, and their own personally held beliefs, morals, and convictions concerning the dissemination of information that may endanger places of sacred and historical significance to the people of the Osage Nation.

The Archeological Resource Protection Act (ARPA), as well as other laws, protect and provide for consultation procedures on Federal lands. The respectful treatment of these sites is of paramount concern to the Osage Nation. The purpose of these procedures is to ensure the respectful treatment of these sites and to ensure that views of affiliated Tribes are fully considered in the decision-making process. The treatment of human remains, graves, and funerary objects shall be conducted according to the provisions of NAGPRA and previously executed agreements between the Osage Nation and Federal agencies. In the event of a violation of ARPA, Federal agencies shall do the following:

- 1) Upon the discovery that a violation of ARPA has occurred, Federal agency (Agency) personnel will immediately notify the Agency Archaeologist and appropriate Law Enforcement official of the discovery. This will initiate a criminal investigation under the management of the Agency.
- 2) The responding Agency official will implement interim measures to protect the site from additional looting and vandalism as well as inadvertent disturbance to the crime scene.
- 3) Following notification of the discovery, the Agency Archaeologist will immediately, within twenty-four (24) hours inspect the site and ensure that no further disturbance will occur.
- 4) If deemed necessary, immediate surveillance measures, including persistent physical presence by Agency Law Enforcement personnel, will be taken.
- 5) Treatment of the crime scene and evidence will proceed as stipulated by the Agency's ARPA plan, as approved and established in consultation with the Osage Nation.
- 6) Prior to dissemination of information regarding the violation and the location of the violation, the Osage Nation must be afforded the opportunity to provide input on the content of that

information.

- 7) Artifacts that have been removed from their primary context and where that context may be in question may be retained in a secure location, pending further decisions on treatment and disposition. Artifacts held as evidence in an ARPA or other legal cases will remain in the chain of custody until released by the Agency Law Enforcement official to the Agency Archaeologist.
- 8) If the Agency Archaeologist determines that the site is affiliated or potentially affiliated with the Osage Nation or the Osage Nation has elected to take responsibility for earlier period cultures, the Agency Official will notify the Osage Nation within twenty-four (24) hours. The notification shall include law enforcement findings, if applicable and permissible, along with general location information, and other details or written descriptions of the artifacts. The Osage Nation will respond verbally within seventy-two (72) hours, followed by response via U.S. mail or electronic mail. The response will specify the Tribe's intention to conduct or decline further consultation and coordination.
- 9) Once an initial consultation meeting is established, a mutually-agreed upon agenda will be provided to all anticipated participants. Through consultation between the Agency and the Osage Nation, a determination of cultural affiliation of the site should be made, if possible, and a draft treatment plan developed. The Osage Nation shall be able to visit the site with the Agency Archeologist.
- 10) At the completion of consultation, a draft treatment plan shall be completed to clearly designate the decisions that have been agreed upon by each party. The treatment plan will outline procedures, restrictions, and timelines. Said plan will be submitted by the Agency to the Osage Nation for comment and shall be approved by the Osage Nation prior to implementation. The final treatment plan will be signed by the Osage Nation and the Agency.
- 11) Treatment plan elements may include but are not limited to:
 - a) Future monitoring of the site(s);
 - b) Periodic access to the site by the Osage Nation;
 - c) Restrictions including, but not limited to, proposed changes from current land use in the area, maintenance activities, restrictions regarding marking the site, and public access;
 - d) Additional, long-term security measures including signage and electronic surveillance;
 - e) Long-term coordination with the Osage Nation;
 - f) A confidentiality agreement stipulating that the location and Tribal significance of the site not be disclosed to the public or to Agency personnel without a demonstrated need to know;
 - g) Travel and Per Diem for Agency personnel and Tribal representatives;
 - h) Public outreach, as appropriate; and
 - i) The opportunity to conduct religious ceremonies with regard to the site itself.
- 12) Additional considerations made in the development of the Treatment Plan may include but are not limited to:

- a) A map of the area;
- b) A description of the site area including topography, soil type, flora, fauna, and distance to roads and public areas;
- c) Known historic properties and other cultural resources in the general vicinity of the site;
- d) Need for field investigations;
- e) Accounts of any Tribal consultation or coordination regarding the violations that may have already occurred;
- f) Flood susceptibility and location above the flood pool level;
- g) Current restrictions on public access;
- h) Current land use;
- i) Anticipated future land use;
- j) Access potential;
- k) Viewshed;
- l) Photographs and/or other media, as appropriate; and
- m) Proximity to areas with a history of ARPA violations.

- 13) The Agency shall maintain a current list of monitoring attempts, reports on observations made during those monitoring attempts, and additional consultation between the Osage Nation and the Agency. As this list is updated, it will be forwarded to the Osage Nation. This information will be housed with the Agency Archaeologist in a secure location protected from public access. The list and its contents shall be disclosed only to authorized Osage Nation representatives and, upon prior notification to the Osage Nation, to other Federally recognized Tribes and Agency personnel who have a need to know the information.
- 14) No photography of human remains will be permitted except in cases in which criminal activity is involved and photographic documentation is essential for investigative and prosecutorial needs. Associated photographs, drawings, and other records will be held at the Agency and made available only to those involved with the case, including Special Agents, Law Enforcement Specialists, Law Enforcement Rangers, Assistant United States Attorney, and Archaeologists assigned to this case, and as necessary by direction of the court to the defense and jury. Photographs and drawings cannot be published in any form or shown as part of scholarly presentations without the written permission of the Osage Nation. Subsequent to the closure of a case, any photographs taken in the course of the investigation will be destroyed if the human remains are unrelated to a crime and they can be identified as Native American or potentially Native American. It is understood that some photographs will become part of a permanent record as they pertain to the case and retained by the courts and Agency as documentation of the case. Archaeological Damage Assessment reports that include images of human remains or other culturally sensitive objects will contain a page identifying the sensitive nature of the images with any stipulations necessary to protect and preserve their integrity.
- 15) Additional requests and comments may be provided through subsequent consultation between the Osage Nation and Federal agencies including but not limited to:
 - a) Damage assessment;
 - b) Forensic testimony; and
 - c) Letters of support for submission to the court.



Osage Nation Historic Preservation Office

HAZAZA BOSN KNEPA

Procedures for Handling Human Remains during Authorized Intentional Excavations or during Inadvertent Discoveries of Human Remains

Procedure Statement:

This policy applies whenever the Osage Nation Historic Preservation Office (ONHPO) Director determines that it is prudent and necessary to consult on any projects or activities involving potential excavation of human remains during authorized intentional excavations approved by the Osage Nation.

Purpose of the Procedure:

The Osage people desire to protect their rights to privacy and to Osage Intellectual Property. Due to the continued abuse, misrepresentation, and exploitation of the right of the Osage people, it is necessary that guidelines be established and strictly followed so as to protect the rights of the past, present, and future generations of the Osage people.

This procedure, as required and promulgated by NAGPRA, applies to Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony as defined in the statute and regulations (see glossary) that are excavated intentionally or discovered inadvertently on Federal or Tribal lands.

Towards this end, the Osage Nation shall be consulted by all entities that propose projects or activities involving Osage cultural resources and that such proposed projects or activities be reviewed and approved by the Traditional Cultural Advisors Committee and the Osage Nation Historic Preservation Office through a permitting process or other contractual agreement.

This protocol should in no way be construed as a substitute for mandated consultation with the Osage Nation, nor is it a justification to excavate any human remains outside the specific and discrete standards of archaeological activity. If the planned activity is also subject to review under Section 106 of the National Historic Preservation Act (16 U.S.C. 470), consultation and any agreement for compliance conducted under that Act should be coordinated with the requirements of the NHPA.

Further, any excavation or removal of Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony discovered inadvertently or excavated intentionally as part of a planned activity must be undertaken in accordance with the requirements of the

Archaeological Resources Protection Act (ARPA) (16 USC 470) and its implementing regulations as well as the requirements of the Native American Graves Protection and Repatriation Act (NAGPRA) (23 USC 3001). Under NAGPRA, a written plan of action is required for both inadvertent discoveries and intentional excavations (43 CFR 10.5(e)).

Scope:

This policy applies to the ONHPO Director, the Traditional Cultural Advisors committee, NAGPRA Coordinator, and all other designated ONHPO staff members and representatives involved in proposed projects or activities including research and multimedia sources of Osage intellectual property.

Definitions:

- “Human Remains” refers to the physical remains of the body of a person of Native American ancestry.
- “Funerary Objects” refers to objects that, as a part of the death rite or ceremony of a culture, are reasonably believed to have been placed with individual human remains either at the time of death or later, including any items exclusively made for burial purposes or to contain human remains.
- “Sacred Objects” refers to ceremonial objects which are needed by traditional Native American religious leaders for the practice of traditional Native American religions by their present day adherents.
- “Objects of Cultural Patrimony” refers to those objects having ongoing historical, traditional, or cultural importance central to the Native American group or culture itself, rather than property owned by an individual Native American, and which, therefore, cannot be alienated, appropriated, or conveyed by any individual regardless of whether or not the individual is a member of the Indian tribe or Native Hawaiian organization and such objects shall have been considered inalienable by such Native American group at the time the object was separated from such group.
- “Intentional Excavation” includes the planned archaeological removal of human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to section 3 (c) of the Native American Graves Protection and Repatriation Act. (43 CFR 10.2 (g)(3))
- “Projects” or “Activity” includes, but is not limited to, any Phase 3 cultural resource surveys, archaeological investigations including excavation via meter-by-meter units, and/or other subsurface excavations undefined here or yet to be defined.
- “Agency” refers to the Federal or state organization that has authority under law to conduct archaeological investigations on Federal or state lands and can enter into government-to-government consultation with the Osage Nation.

Governing Laws and Regulations:

- National Historic Preservation Act of 1966, as amended through 2006 (16 U.S.C. 470)
- Protection of Historic Properties, as amended through 2004, (36 CFR Part 800)

- Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 et seq.)
- Archaeological Resources Protection Act, as amended (16 U.S.C. 470)
- American Indian Religious Freedom Act, as amended (42 U.S.C. 1996)
- National Environmental Policy Act (42 U.S.C. 4321, et seq.)
- Executive Order No. 13007
- Agency-Specific Legislation
- Osage Nation Constitution
- Osage Nation Cultural Preservation Act, as amended (ONCA 07-24)
- Osage Grave Protection Act (ONCA 15-75)

Procedure:

With respect to the treatment of human remains encountered during investigations or inadvertently discovered, the Osage Nation requests that all projects or activities adhere to the following:

- 1) That **No Photographs Be Taken** of the human remains and that hand-drawn illustrations or plan notes be used in documentation and other communication, this requirement will also be stated as an agency responsibility as stipulated in any Memorandum of Agreement for a project. Should unforeseen, unusual circumstances arise, the agency may request that photographs be taken. These photographs will, however, be taken **only after** consultation and concurrence with the Osage Nation and other concerned Tribes consulting on a project; and
- 2) That all excavations, work, and/or activities in a one hundred (100)-meter radius of the human remains be stopped immediately; and
- 3) That the Osage Nation Historic Preservation Office Director be immediately notified by phone, within twenty-four (24) hours of finding human remains; and
- 4) The ONHPO be given the opportunity to visit the location and be provided an on-site orientation of the location where the human remains were discovered prior to any further disturbance or excavation in the location; and
- 5) That agency staff not conduct excavation, handling, or removal of any human remains without the Osage Nation Historic Preservation Office approval; and
- 6) That agency staff conduct themselves in a professional and sensitive manner in the vicinity of, and with respect to, the human remains, including limiting handling the remains only to the extent which is necessary and not using the unfortunate circumstance

as an opportunity to gain experience or knowledge with respect to the recovery and analysis of human remain; and

- 7) That only natural materials be used in the process of collection, transportation, and storage of human remains;
- 8) That each skeletal element be placed in its own container so as to prevent damage to the remains during their collection, transportation, and storage; and
- 9) That all objects associated with the human remains be collected, transported, and stored with the human remains with which they were associated and remain so throughout the process to and including reburial; and
- 10) That all objects that may reasonably be determined to be associated with the human remains be considered associated with those remains; it is understood that the agency staff will err on the side of caution, i.e. be liberal in their determination of association in consultation and concurrence with the Osage Nation; and
- 11) That the agency consult with the Osage Nation Historic Preservation Office for approval to collect, preserve, and process an amount (to be determined in each case) of soil from identified graves; and
- 12) That, if approved by the ONHPO, all soil samples collected from grave locations be kept with those remains and be processed following consultation specific to those samples, and be processed separately from other samples; and
- 13) That agency will provide the Osage Nation with copies of all documentation concerning human remains including documentation concerning the transfer of control of the human remains and the associated objects from agency to any curation/storage entities; and
- 14) That the Osage Nation Historic Preservation Office will be “cc’d” on all correspondence between or among the agency and other entities when the correspondence concerns human remains or associated funerary objects; and
- 15) That the Osage Nation Historic Preservation Office will provide the name(s) and contact information of any preferred Biological Anthropologist/Archaeologist of which it is aware who may conduct analysis of the collected faunal and human remains on behalf of the agency; and
- 16) That agency will contact the Osage Nation Historic Preservation Office sufficiently in advance, or when it is notified, of any pre-construction meetings and construction of the project. The Osage Nation reserves the right to request project monitoring at any time during the project planning or execution.

Attachment F

MIAMI TRIBE OF OKLAHOMA INADVERTANT DISCOVERY POLICY

Created by the Miami Tribe of Oklahoma NAGPRA Committee:

Julie Olds, Cultural Resources Officer, Chair of NAGPRA Committee Scott Willard, NAGPRA Director, Vice-Chair of NAGPRA Committee Robin Lash, Miami Tribe General Counsel

Rebecca Hawkins, Consulting Archeologist, Algonquin Consulting Morgan Lippert, NAGPRA Historian and Archivist

Introduction:

The Miami Tribe of Oklahoma does not condone, support or initiate archeological exploration that knowingly targets ancestral human remains. Unfortunately, the inadvertent discovery of ancestral human remains occurs too frequently due to modern infrastructure construction or improvements as well as archeological exploration that was not intended to find ancestral remains. This document provides a policy roadmap for the inadvertent discovery of ancestral human remains that lie within the original homelands of the Myaamia people.

Implementation:

This policy statement shall be deemed valid for use and implementation by any Federal, state or local-municipal entity that engages in ground disturbing activities for any reason. This policy also applies to universities, museums and any Federally funded non-governmental institution that engages in archeological exploration for academic or non-academic purposes.

This policy is effective for ground disturbing activities in the following locations in the ancestral homelands of the Myaamia people: The entire states of Ohio, Indiana, Michigan, Illinois and Wisconsin and the Ohio river border counties in Kentucky. We also recognize the post 1846 removal territories, Miami and Linn counties in Kansas and Ottawa County in Oklahoma.

Initial Discovery:

Through the process of ground disturbing activities, when the discovery of human remains occur:

- 1) All work in that area must immediately cease. Any remains or funerary objects removed from the excavation as a result of the ground disturbing work must be collected and safeguarded.
- 2) Law enforcement and the county coroner must be notified in order to determine if the remains constitute a crime scene or modern burial.
- 3) All ground disturbing work within a 100 foot radius of the discovery must cease.
- 4) Written documentation of the discovery, the condition of the remains and any detailed information that may benefit the decision making process of the Miami Tribe should be recorded.
- 5) Only LEO/Coroner personnel are authorized to take photos or make drawings of the discovery unless consent is given by the Miami Tribe in writing.
- 6) First notification of the inadvertent discovery should occur within 36 hours of discovery. A more detailed follow-up with LEO-Coroner's initial findings and any important data should be made within 72 hours following discovery.
- 7) Consultation should commence with the Miami and other interested Tribes to mutually determine how ground disturbing activities within the quarantined area will resume. Participation in the consultation may include any or all of the following: representatives from the NAGPRA Department, THPO and Tribal Government. Initial contact should be made to both the NAGPRA Department and the THPO.

Scott Willard, NAGPRA Director Logan York, THPO

swillard@miamination.com lyork@miamination.com

In-Situ reburial and site avoidance:

The preferred outcome for an inadvertent discovery would be the covering of the remains In-Situ (as well as replacing anything removed during the excavation that caused the discovery) and avoidance of the area or deviation around the site of discovery. However, the

Miami Tribe recognizes that this preferred solution may not be obtainable due to the nature and scope of the work being conducted. Every reasonable option should be explored before the decision is made to remediate the ancestor.

Remediation Procedures:

If the consensus determination following consultation is to remove (remediate) the ancestor(s), the following procedures should be implemented.

- 1) All remediation work must be conducted by qualified, state certified archeology personnel from a university or private firm as to be determined through consultation.
- 2) Tribal Monitors may (should) be present during the exhumation process to observe and report progress back to Tribal representatives. Monitors may also provide immediate direction should questions arise during the process.
- 3) All human remains that constitute each single individual shall be kept together, along with all funerary objects collected with that individual.
- 4) The curation facility housing the remains shall be determined through the consultation process and qualify as a secure location with experience in the handling of ancestral human remains as well as the NAGPRA repatriation process.
- 5) A preliminary inventory of remains and funerary objects, as well as standard archeological data collection should be conducted throughout the remediation process and delivered to the Tribe for study and to aid in future decisions resulting from ongoing consultation.
- 6) Photography and artistic renderings of the remediation site (including human remains and funerary objects) can only be approved through prior consultation and with the advice and consent of the Miami Tribe and other consulting Tribes.
- 7) Location identifying information (GPS coordinates) as well as any approved photography and/or artistic renderings and archeological data should be considered sensitive information not for distribution to the public or other unauthorized personnel. All information of this nature shall be quarantined and only used as needed by authorized individuals. Consultation with the Miami Tribe and other interested Tribes will determine the future use or disposition of this information.

Proper Care and Handling of Ancestors / Cultural Advisory:

The Miami Tribe believes that ancestral human remains, even if affiliation cannot be determined, should be treated with the same respect and dignity as any human being should expect to be treated. The following procedures serve to present the current best practices while taking all conditions into consideration.

Cultural Considerations:

The following represent cultural guidelines that may safeguard the physical and spiritual health of the individuals remediating the ancestor. They are only guidelines but strongly recommended for implementation.

- 1) No use or possession of tobacco products within 20 feet of the burial location or the remains themselves, Including associated funerary objects.
- 2) No food or beverages within 20 feet of the burial site or the remains themselves, including the associated funerary objects. This applies to the transport, analysis, storage and repatriation of the remains and the associated funerary objects.

- 3) No pregnant or menstruating women within 20 feet of the burial site or the remains themselves, including the associated funerary objects.
- 4) No photographs or artistic renderings of the human remains or funerary objects without the express consent of the Miami Tribe or consent of interested Tribes engaged in consultation.

Care and Handling of Human Remains and Funerary Objects:

The following represent the procedures to follow throughout the remediation of the ancestor's remains and funerary objects.

- 1) The archeological team conducting the remediation will follow all standard professional processes and procedures throughout and will not deviate from standard practice without approval from all consulting parties.
- 2) The human remains will be removed in articulated sections as much as possible. Each section will be wrapped in bubble wrap and nested in a plastic tub for protection.
- 3) If the remains are too fragile to be removed in a clean state, they will be removed with the stabilizing soil attached.
- 4) To preserve fragile remains, some surrounding dirt should be placed in the plastic tub to help maintain humidity and prevent further degradation.
- 5) Small funerary objects that will fit in the same container as the human remains shall be kept together. Larger items shall be wrapped in bubble wrap and placed in individual containers. The separated objects must have identifiers to link them to the human remains.
- 6) If there is more than one individual, there must be distinct identification labels to ensure associated funerary objects can be reunited later with the correct individual.
- 7) All residual dirt accumulated through the remediation process is considered by the Miami Tribe to be associated with the human remains. All care will be taken to preserve the dirt so it can be reburied with the ancestor at a future date.
- 8) If the remediation is expected to last more than one day, all reasonable and appropriate security actions must be taken to protect the site from looting, vandalism or other criminal activity. Recommendations include but are not limited to:
 - a) Security guard or LEO involvement
 - b) Perimeter fencing of site
 - c) Tarp coverings of excavation
 - d) Surveillance cameras and signage
 - e) Other as determined by site conditions and circumstances at time of remediation.
- 9) Exhumed human remains and funerary objects shall not be left unprotected or unattended at the remediation site. Transfer to a secure facility or the agreed upon curation facility should be ensured daily, if necessary.

Post Exhumation Procedures

This section details steps to follow upon completion of the remediation.

- 1) A full inventory should be completed listing human remains and all funerary objects collected during the remediation.
- 2) The human remains, funerary objects and any unassociated objects removed shall not be subjected to any scientific testing, analysis or experimentation.
- 3) A qualified osteologist should inspect any faunal remains to determine that all human remains are accounted for.
- 4) The Miami, as well as other interested Tribes, should be consulted on culturally acceptable storage of the individual(s) until the NAGPRA process is complete.
- 5) For Federal or State controlling parties: It is the agency's responsibility under the law to conduct NAGPRA consultation for the repatriation of the individual(s). If the agency chooses not to engage in the NAGPRA consultation process, legal control of the individual(s) must be immediately relinquished (in writing) to the curation facility in possession of the individual(s) so that the NAGPRA process can be fulfilled.
- 6) For Universities or Federally funded non-governmental institutions: It is the institution's responsibility under the law to conduct NAGPRA consultation for the repatriation of the individual(s). It is recommended that consultation commence as soon as an inventory is completed.

Attachment G

GUIDANCE FROM THE MISSOURI STATE HISTORIC PRESERVATION OFFICER

MISSOURI GUIDELINES FOR PHASE I ARCHAEOLOGICAL SURVEYS AND REPORTS

INTRODUCTION

Please note that the following “Guidelines for Phase I Archaeological Surveys / Reports in Missouri” are just that, guidelines. They are designed to provide baseline procedures for field methodology and budgeting so that adequate information can be provided to the Missouri Department of Natural Resources, State Historic Preservation Office (SHPO) staff for their review and comment on a project.

We fully expect that “field decisions” will need to be made to allow for individual situations. We will accept reports that vary from the following guidelines so long as an adequate justification is provided as to why the variations in methodology were made. For example, if a project corridor crosses several small drainages with a high likelihood for archaeological sites and then crosses into a large area of uplands with less likelihood for archaeological sites, it would be appropriate to widen out the shovel probe interval in the upland areas. A similar analysis would apply where, slopes, wetlands, or other aspects that would make previous habitation unlikely were not surveyed and are described in the report as such. Use professional judgment when considering methodology variations and expect to provide the justification in the report.

To avoid having requests for clarification or additional information, keep in mind that this is likely the only information on the project the SHPO reviewer has and they were not involved during the fieldwork, analysis and write-up of the project. We recommend that prior to submission, if possible, you pass the report by a cold reader (a person familiar with the following procedure, who was not involved in the fieldwork, analysis and write-up).

In addition, please bear in mind that these are guidelines for *archaeological* surveys. Do not confuse the project footprint and the Area of Potential Effect (APE) for an archaeological project with the footprint and the APE for a project that also includes an architectural component (i.e. cell tower) when reading and dealing with the standing structures and photographs section.

Thank you,

MISSOURI DEPARTMENT OF NATURAL RESOURCES STATE
HISTORIC PRESERVATION OFFICE

Archaeological Review Staff

Survey Procedures

A. Pedestrian survey of previously plowed / disturbed and high surface visibility areas:

Pedestrian survey of project areas is the most archaeologically thorough and cost effective technique presently available. Pedestrian survey can be employed in areas with good surface visibility. Visibility must equal 25 percent or greater of the ground surface area to use pedestrian survey techniques. The appropriate transect interval is 5 meters.

The exception to this is areas that have never been plowed or otherwise disturbed in the past because it is unlikely that artifacts would be found on the surface regardless of surface visibility (see Systematic shovel testing).

B. Systematic shovel testing of low surface visibility and previously undisturbed / unplowed areas:

In areas that have not been previously plowed, or areas with less than 25 percent surface visibility, systematic shovel testing should be employed. The appropriate transect interval is 15 meters. Such shovel testing involves the excavation of holes at least 25cm in diameter down to archaeologically sterile soil (usually the B-horizon) if possible. If it is not possible to get to archaeological sterile soil using the standard method being employed then every third test hole should be augured to a sufficient depth. The excavated material from each shovel probe should be screened through a minimum of ½ inch mesh.

Where cultural materials are encountered the grid interval should close to 5 meters to more accurately delineate the actual site boundaries (i.e. do not “Swiss cheese” the entire site, just locate an accurate boundary).

C. Deep testing:

When dealing with areas that potentially contain deeply buried cultural remains it will be necessary to utilize techniques that can investigate deep strata. Usually such techniques include hand or mechanical systematic deep coring, or deep trenches using heavy equipment (typically a backhoe). Examples of geomorphic features requiring such testing are floodplains, alluvial fans, and occasionally some uplands and terraces where post-Pleistocene loess deposition has occurred.

D. Photographic Requirements for Structures:

Photographs must be provided for all structures located within the project area and the Area of Potential Effect (APE). This includes all structures regardless of the condition. For example, a 40-acre subdivision development project that contains 3 former farmsteads on the property will require photographs of all structures.

Be sure to provide a statement regarding eligibility and effect in the “Recommendations” portion of the report for each structure or district (see example – Section C Recommendations below).

E. Collection Strategy and Curation:

At a minimum, samples of artifacts observed during Phase I survey should be collected and curated. If artifact collection is not feasible due to lack of landowner permission, then field photographs of diagnostic artifacts (scale included) and a sample of non-diagnostic artifacts should be included in the report along with a signed statement from the landowner indicating the desire to retain the artifacts.

Artifacts should be curated either with the consulting firm or with the Museum Support Center at the University of Missouri.

Survey Report

At the completion of the field survey a report of the archaeological findings and recommendations must be sent to the SHPO for evaluation. Please keep in mind, that when submitting reports to the SHPO for review, all project reports submitted will be considered final and therefore should be thorough and complete. Draft reports will be reviewed only if agreed upon during consultation prior to project initiation.

For most projects we recommend that the Section 106 Survey Memo be completed for the report. When determining if the Survey Memo or a full text report is appropriate, bear in mind that other researchers (including yourselves) will be using the report in future and it will need to convey the information regarding the survey and sites located clearly.

If you are submitting a full text report, a Section 106 Survey Memo must be completed and included. Staff uses the Section 106 Survey Memo to compile a bibliographic index of archaeological investigations throughout the state. And in this situation it should be noted that maps and attachments will not be required (as they are already in the report) and many of the fields on the form, such as "Cultural Material Recovered" will be completed as "please see the following report".

To assist in this evaluation and to avoid delays in processing, the full text reports should contain, at a minimum, a discussion of the following topics:

A. Background Information:

1. Full, detailed description of project for which the survey was conducted. This must include the name of the applicable Federal agency.
2. Previous archaeological research within a minimum of one mile from the maximum extent of the archaeological Area of Potential Effects (which includes areas such as construction limits and access roads) for the project area. This must be based on examination of published and unpublished literature at the Cultural Resource Inventory in Jefferson City, Missouri and other regional and local repositories as appropriate.

This must include, but not be limited to the following: the site files, CRM reports, Determinations of Eligibility, historic architectural surveys, etc. A thorough examination of historical documents to ascertain presence and extent of historical occupation/land use of project area should also be included. At a minimum, copies of relevant plat maps and atlases that document historic habitation with a discussion of length of occupation and use must be included. These topics need to be addressed in the report of investigations in addition to the ASM site file check.

3. Delineation of important regional research questions based on cultural history and past investigations. This should include, but not be limited to, referencing The Master Plan for Archaeological Resource Protection in Missouri (1987).
4. Thorough discussion and description of present and past environment and the implications for interpreting the local archaeological record should be included. Such topics as topography, soils, and discussion of relevant periods of prehistory should also be included. Discuss only the periods of prehistory and history that are relevant to the current project based on the background research.

B. Survey Information:

1. Complete description of project area including acreage, ground cover, topography, and any other factors that are important to interpreting the survey results.
2. Relevant portion of the 7.5 minute topographic map delineating the project area.
3. Survey techniques thoroughly described and documentation of consultation for alternative procedures.
4. Sketch maps should be included with each report. While maps do not have to be to scale and can be hand drawn, they must be legible and include the following information:
 - Land use / ground cover (including percentage surface visibility).
 - Survey limitations (a description and justification for any areas that could not be surveyed. For example: 0.2 acres of pasture could not be surveyed because landowner could not be contacted to turn off electric fence and remove livestock.) These areas should be clearly labeled on Figure 2, the sketch map.
 - Survey techniques employed in relation to individual areas of land use / ground cover (i.e. pedestrian survey or shovel probes)
 - Location of testing procedures (i.e. backhoe trenches, test units, etc.) and site limits (if applicable).
5. Any additional photographs, maps, or other relevant materials that would contribute to the understanding of the project.

C. Recommendations:

This section must include the consultant's recommendations determined by consulting the appropriate National Register Bulletin(s) available from the National Park Service. At a minimum, National Register Bulletin 15 - "How to Apply the National Register Criteria for Evaluation" must be employed to make determinations of eligibility and recommendations.

Other bulletins are available for specific topics and should be consulted and used appropriately for topics such as:

cemeteries*
shipwrecks*

historic archaeological
sites historic landscapes

rural historic landscapes
traditional cultural
properties

* Missouri state laws also protect these resources. Refer to <http://www.moga.mo.gov/statutesearch/> for the revised Missouri Statutes concerning protection of these resources.

Recommendations in the report must include one of the following statements with regard to the project as a whole *in addition to determinations of eligibility for the individual sites / structures*:

a) No Historic Properties Located.

For projects that failed to locate historic properties

b) No National Register Eligible Historic Properties Located.

Historic properties were located; however they do not meet the eligibility standards for listing on the National Register of Historic Places

c) National Register Eligible Historic Properties Located.

Historic properties were located which meet the eligibility standards for listing on the National Register of Historic Places.

d) Historic Properties May Meet Requirements For National Register Listing; Phase II Testing Is Recommended

Historic properties were located which may meet the eligibility standards for listing on the National Register of Historic Places. However, not enough information was collected during the Phase I. Phase II Testing is therefore needed to make the eligibility

determination.

For example: Survey located twelve archaeological sites, 23XX001 through 23XX012. Sites 23XX001, 23XX002, and 23XX003 are small, low-density prehistoric scatters that do not appear to meet requirements for National Register Eligibility (see site form for details). Sites 23XX004 – 23XX011 are small historic period scatters which do not appear to meet requirements for National Register eligibility. One site, 23XX012 appears to be eligible. Mid-range dates for the ceramics collected suggest a mid-1800s occupation, but the site terminus post quem and terminus ante quem are 1874 and 1895 respectively, as based on an indicated structure in historic atlases. It therefore appears that the ceramics may have been curated. The site may meet requirements for National Register Eligibility, and avoidance or Phase II testing is recommended for this resource.

In addition, the survey located 4 buildings over 50 years old. Buildings A, B, and C (see photograph log) have had several recent additions and had vinyl siding added and do not appear to be eligible for listing in the National Register of Historic Places. Building D (see photograph log), is a Greek Revival I - house that appears to be eligible under Criterion C for Architecture. As planned, the proposed project will have no adverse effect on this historic property because it will have no direct impact to the physical structure of the building.

“Potentially Eligible” ***This term is not acceptable.*** Resources will be considered eligible until proven otherwise. Recommendations of eligibility should clearly state that the site/structure “is eligible for listing on the National Register of Historic Places” or the site/structure “is not eligible for listing on the National Register of Historic Places”.

D. Site Information (if present):

1. A full description of the site location, material recovered (including curation facility), and a preliminary interpretation of its place in the local culture history must be included.
2. A completed site form with topographic map and sketch map must be submitted to the SHPO for each site. **Site forms should be included only in the SHPO copy of the reports.** These site forms are not to be included in any reports that may be disseminated to the general public. Reports must include the citation *Section 304 of the National Historic Preservation Act of 1966* on the confidentiality of site location information.
3. Recommendations for each site are required. These will consist of either: “the site is not eligible”, “further testing will be required”, or mitigation alternatives for the site. Any suggestions concerning site disposition should be stated in terms of their relationships to relevant regional research questions and The Master Plan for

Archaeological Resource Protection in Missouri (1987).

E. Archaeological Contractor's Vita:

All contract archaeologists working in Missouri must either have a current vita on file with the SHPO or submit one with each report.

F. Project Correspondence:

Project correspondence must be included as an appendix. This should include such letters as the initial SHPO survey request, and any other relevant correspondence. Please do not include budget information.