

DEPARTMENT OF THE ARMY U.S. ARMY CORPS OF ENGINEERS, ST. LOUIS DISTRICT 1222 SPRUCE STREET ST. LOUIS, MISSOURI 63103-2833

09 September 2024

Reply to: U.S. Army Corps of Engineers St. Louis District Environmental Compliance Section (PD-C) 1222 Spruce Street St. Louis, MO 63103-2833

Dear Sir or Madam:

The St. Louis District, U.S. Army Corps of Engineers, has prepared a draft Environmental Assessment (EA) with unsigned Finding of No Significant Impact (FONSI) to evaluate the proposed Dam Safety Modification action at the Wappapello Lake main dam embankment in Wayne County, Missouri, USA.

Under the National Environmental Policy Act of 1969, as amended, the St. Louis District is distributing this letter to notify concerned agencies, tribes, interest groups, and individuals of the proposed project and to solicit comments from those persons or organizations who may be interested in or affected by the project. The FONSI is unsigned and would only be signed after comments received as a result of this public review have been given full consideration. The electronic version of draft EA and unsigned FONSI are available online at:

https://www.mvs.usace.army.mil/Portals/54/docs/pm/Reports/EA/Wappapello_DSMS_Draft_EA.pdf

The USACE St. Louis District is proposing installation of 14 relief wells combined with an approximate 2.25 acre earthen berm (e.g., filter berm) on the downstream portion of the main dam with a collection system to relieve subsurface water pressures and filter water seepage and reduce erosion of foundation soils. Implementation duration is estimated at 4 years.

Please provide any comments you may have regarding this project to Teri Allen of the USACE St. Louis District Environmental Compliance Section, by **e-mail** at <u>Teri.C.Allen@usace.army.mil</u>, using subject line *Wappapello DSMS Draft EA Comment*; or by **mail** to the address above, ATTN: Environmental and Planning Branch (PD-C, Allen). *Make sure to include the NEPA Unique ID: EAXX-202-00-MVS-1725012636*. In order for comments to be considered prior to a final decision being made, they must be received by this office by close of business on 10 October 2024.

Sincerely,

Teri C. Allen, Ph.D. Senior Technical Specialist Aquatic Ecologist

DRAFT ENVIRONMENTAL ASSESSMENT

Wappapello Dam Safety Modification Study Wayne County, Missouri

NEPA Unique ID: EAXX-202-00-MVS-1725012636



August 2024



U.S. Army Corps of Engineers, St. Louis District Regional Planning and Environmental Division North Environmental Compliance Section CEMVP-PD-C 1222 Spruce Street St. Louis, Missouri 63103-2833

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1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, St. Louis District has prepared this draft Environmental Assessment (EA) to evaluate the potential environmental, cultural, and socioeconomic impacts of alternatives based on the Wappapello Dam Safety Modification Study (DSMS). The purpose of the DSMS is to identify and recommend a Risk Management Plan (RMP) that reduces unacceptable dam safety risks. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, and the Council of Environmental Quality's Regulations (CEQ) (40 CFR 1500-1508), as reflected in the USACE Engineering Regulation, ER 200-2-2. This EA provides sufficient information about the potential adverse and beneficial environmental effects to allow the USACE St. Louis District Commander to make an informed decision on the appropriateness of an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI). This EA also includes a Biological Assessment (BA) for purposes of Endangered Species Act (ESA) coordination and compliance.

1.1 Project Location

Wappapello Dam is located on the St. Francis River (Mile 309) in Sections 2 and 3, Township 26 north, Range 7 east, in the Ozark Uplands of Wayne County, Missouri. Although most of the lake is in Wayne County, a small southern portion extends into Butler County, Missouri. The main dam is 16 miles northeast of Poplar Bluff, Missouri, and 1-mile southwest of Wappapello, Missouri (Figure EA-1).

1.2 Project Description

Project components include the main dam which consists of a compacted earthen embankment section, which serves as the main water barrier; an uncontrolled broad-crested weir spillway, which is a segment of the structure used to provide additional release of water from the dam during major flood events; the outlet works that allow controlled water flow out of the dam; and three small saddle dikes (SD) (Figure EA-2). The earthen dam is 2,700 feet long, 109 feet high, and top of the dam is 30 feet wide. The elevation of the top of the embankment is 419.7 feet. The foundation is made up of rock and soil. The uncontrolled spillway is located in a natural saddle approximately 1,200 feet south of the south end of the dam and is 740 feet wide with a crest elevation of 394.74 feet. The spillway can pass up to 1,631,000 gallons per second (218,000 cubic feet per second). The outlet control structure is approximately 400 feet south of the south end of the dam in the right abutment. Outflows are controlled by three tractor-type gates that are ten feet wide and 20 feet high. Construction of the Wappapello Dam was performed under contract with Hallet Construction Company of Crosby, Minnesota. The contract was awarded 2 August 1938 and all work under the contract was completed in July 1941.



Figure EA - 1. Location of Wappapello Lake, Wayne and Butler counties, Missouri.

1.3 Dam Safety Risk Management Program

The USACE Dam Safety Program uses risk to inform how it manages the approximately 740 dams it operates and maintains, with life safety as the highest priority. This approach is a best practice adopted to evaluate, prioritize and justify dam safety decisions. Using risk information allows USACE to repair its dams in the most effective manner.

Risk comprises the following three elements: the likelihood that natural events will take place, the performance of the infrastructure during these events, and the consequences of poor performance or failure. Risk allows USACE to look at the project in terms of its purposes; ecosystems; constrained budgets; the uncertainty of future events and current knowledge; past design decisions; and combinations of these factors.

A risk assessment is a systematic approach to quantify and describe the hazard, likelihood of something going wrong, and consequences if something goes wrong. It is used to define safety issues, evaluate remediation options, and measure effectiveness of repairs. It enhances decision-making for setting short and long-term priorities for studies, investigations, and repairs. Risk assessments are performed on a continuous basis because risk can change over time.

An Issue Evaluation Study (IES) for Wappapello Dam was completed in December 2021. Ten potential failure modes (PFM) were developed during the IES, but only one was identified as the primary risk driver:

• PFM 4-E: Backward Erosion Piping through Foundation Soils (YPB)

Backward erosion piping through the embankment foundation is the primary risk driving failure mode and is above the individual and societal tolerable risk guidelines.



Figure EA - 2. Location of Wappapello dam and associated structures, Wayne and Butler counties, Missouri.

1.4 Purpose and Need for Federal Action

USACE has developed a Dam Safety Action Classification (DSAC) system to provide consistent and systematic guidelines to address dam safety issues and deficiencies at USACE projects. DSAC ratings, which reflect the degree of urgency in taking action, are informed by the probability of failure and incremental risk associated with the project. The incremental risk is the risk associated with the presence of a dam or project that can be attributed to its breach prior or subsequent to overtopping, or due to component malfunction or misoperation. By definition, incremental risk excludes non-breach risk, which is the risk to the affected areas that remains even if the dam or levee functions as intended. The classification scale ranges from 1 to 5, with 1 being the most urgent. Wappapello Dam is a DSAC 3 (Moderate Urgency) rating. Dams with this rating are considered conditionally unsafe, with a moderate to high incremental risk. USACE considers this level of life risk to be unacceptable, except in unusual circumstances.

The purpose of this project is to reduce risk associated with Wappapello Dam. The area of concern is in the embankment foundation near the old St Francis River channel, where the embankment is underlain by up to 120 ft of St. Francis River alluvium. That alluvium contains a 40-foot-thick Young Point Bar (YPB) deposit with coarse-grained sediments that fine upward in a sequence of progressively finer sands, grading to silts in the upper 10 to 30 feet. This area is subject to pin boils, seepage, and former boreholes that have become active in high-water events. Three boreholes that began flowing remained open through the deeper layers and were plugged after some erosion of surrounding soil from the upper YPB deposit (Figure EA-3). The risk reduction modifications are necessary as the main embankment was determined to be a DSAC 3 (moderate risk) based on a detailed soils data synthesis, updated stratigraphic characterization, seepage modeling, performance observations, and a detailed review of all project data. Backward erosion piping through the embankment foundation is the primary risk driving failure mode and plots above the individual and societal tolerable risk guidelines.

The primary consequence centers downstream of the main dam are Wappapello, MO (1 mile downstream) with a population of risk (PAR) of about 780 in the 0-to-3-mile range, Asherville, MO with about 1600 PAR in the 3-to-7-mile range, Poplar Bluff, MO with about 1100 PAR in the 7 to 15 mile range (although some of this area is in adjacent basin), and Kennett, MO with a PAR of 320 in the 15 to 60 mile range (Figure EA-4). For Top of Active Storage (TAS) in the first three miles flow depths would be between 2 and 16 feet. Between three and seven miles the average water depth is 2 to 12 feet, and after seven miles the average water depth is less than 7 feet maximum. Median estimated life loss for a TAS breach scenario is 16 (day) and 19 (night). The downstream area is primarily agricultural. Impacted structures are primarily single-family residential structures with some commercial/industrial structures intermixed. Additionally, critical infrastructure requiring extra coordination and assistance during evacuation include a

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Figure EA-3. Areal extent of the Young Point Bar Deposit.



Figure EA-4. Estimated inundation levels for a TAS breach event at Wappapello Lake. (https://nid.sec.usace.army.mil/viewer).

county jail and two schools in the town of Greenville, Missouri, and three additional schools in Fisk, Holcomb, and Popular Bluff, Missouri.

1.5 Authorizations

The St. Francis Basin Project, which includes Wappapello Dam and Lake, was authorized for flood control by the Flood Control Act, approved 15 June 1936 (Overton Act), and amended by subsequent Flood Control Acts. Development and use of flood-control reservoir areas for recreational and related purposes was authorized by Section 4 of the Flood Control Act, approved 22 December 1944, and amended by the Flood Control Act approved 24 July 1946 and Section 209 of the Flood Control Act of 1954, approved 3 December 1954. While the project was originally constructed to provide only flood control, its authorized purposes have been modified to include recreation, water quality control, and conservation of fish and wildlife.

1.6 National Environmental Policy Act Scoping

The regulations for implementing NEPA require USACE to perform scoping as an early and open process to identify concerns from the public, organizations, and agencies. Scoping letters were mailed to federally recognized Indian Tribes on 31 August 2023 to initiate consultation on the proposed project. A public NEPA scoping letter requesting comments or concerns was sent to interested parties, agencies, and nearby property owners on 08 February 2024. Three responses were received from agencies regarding input on the project. No comments were received from the general public. All Tribes and agencies consultation information, as well as public input, is located in Appendix EA-1 - Coordination.

2 ALTERNATIVES

CEQ Regulation Section 1502.14 requires the Environmental Analysis to evaluate reasonable alternatives to the proposed action, and, for alternatives that were eliminated from detailed study, briefly discuss the reasons for their elimination. Reasonable alternatives include those that are technically and economically feasible, and meet the purpose and need for the proposed action, rather than simply desirable from the standpoint of the applicant. No specific number of alternatives is required or prescribed to be carried forward for detailed analysis in the EA. (36 CFR 220.7(b)(2)).

2.1 Alternative Development

Risk management measures (RMM) are methods of addressing risk that can either stand alone or be combined to form an array of RMPs. For this study, risk management measures were focused on the Potential Failure Mode (PFM) – Backward Erosion Piping through Foundation Soils. The initial array of risk management measures includes the mandatory measures identified in the USACE Safety of Dams – Policy and Procedures (ER 1110-2-1156). Measures can be divided into two general categories – structural measures and nonstructural/operational measures. Structural measures are ways to address risk by structurally modifying the dam, and nonstructural/operational measures are ways to address risk without structurally modifying the dam.

2.1.1 Initial Array of Risk Management Measures

This section describes the initial array of potential risk management measures that were considered to address backward erosion piping through foundation soils and the rationale for the initial screening decision. Specific screening criteria included cost/efficiency, effectiveness, environmental impacts, O&M considerations, construction duration, resiliency, redundancy, robustness, completeness and acceptable as prescribed by ER 1105-2-100.

An initial array of 13 potential risk management measures was established to address backward erosion piping through foundation soils (Table EA-1).

Risk Management Measure	Description	Screening
1	No Action (required)	Retained - required
2	Filter Berms	Retained for evaluation
3	Relief Wells	Retained for evaluation
4	Center Line Cutoff Wall	Screened due to the likelihood of low benefit:cost ratio
5	Shallow Toe Drain	Screened due to lack of effectiveness
6	Open Excavation – Deep Filter Trench	Screened due to constructability and effectiveness concerns
7	Deep Filter Trench	Screened due to constructability and effectiveness concerns
8	Weighted Berm	Screened due to lack of effectiveness
9	Upstream Blanket	Screened due to lack of effectiveness
10	Upstream Heel Cutoff Wall	Screened due to the likelihood of low benefit:cost ratio
11	Finger Drains	Screened due to lack of effectiveness
12	Remove Dam (required)	Retained - required
13	Replace Dam (required)	Retained - required

Table EA-1. Initial Array of Risk Management Measures and Screening Decision.

2.1.2 Development of Risk Management Plans

The retained measures were assessed to see which would likely meet the study objectives as a stand-alone RMP and which would need to be combined with another measure to make a complete RMP. In order to address the primary risk driver at the dam, the initial array of RMPs each included an embankment toe measure. Finally, this initial array of RMPs was further developed with additional analyses and design, and project costs were updated based on this work. Further screening occurred as described below, and the resultant intermediate array of RMPs is shown in Table EA-2 (note re-numbering). These were carried forward for additional consideration.

Risk Management Measure	Description	Screening
1	No Action (required)	Retained – required by NEPA
2	Filter Berms	Screened due to cost and effectiveness compared to 4B
3	Relief Wells	Retained for evaluation
4B	Expanded Filter Berms + Relief Wells	Retained for evaluation
12	Remove Dam (required)	Screened due to significant impacts
13	Replace Dam (required)	Screened due to significant impacts

 Table EA-2.
 Intermediate array of risk management plan alternatives.

2.2 Final Array of Risk Management Plan Alternatives

Risk management plans were further examined and developed into the final array shown in Table EA-3. These RMPs were carried forward for NEPA evaluation.

Table EA-3. Final array of risk management plan alternatives.

Risk Management Measure	Description	Screening
1	No Action (required)	Retained - required
3	Relief Wells	Retained for evaluation
4B	Extended Filter Berm + Relief Wells	Retained for evaluation

2.2.1 RMP #1 – No Action Alternative

The National Environmental Policy Act (NEPA), ER 1110-2-1156, and ER 1105-2-100, require that the No Action plan be included in a final array of Alternatives. Under NEPA, the No Action Alternative is used as a baseline against which all other Alternatives are evaluated for environmental impacts. Additionally, the no Action Alternative is the risk condition to which all RMPs must be compared. Under the No Action Alternative, the intolerable life safety risks associated with backward erosion piping through foundation soils of the main dam embankment due to geology and soil conditions, and the anticipated frequency of spillway operation would continue.

The following predictions were made by the Project Delivery Team (PDT) regarding future trends associated with the project over the next 50 years absent a federal action:

Basic Assumptions

- The Wappapello Dam would continue to be operated in accordance with the Water Control Manual and O&M Manual;
- Seepage pathways may progress with cyclic loading from high pools, but no significant changes are anticipated to the failure mode System Response Probability (SRPs) over time;

Population Changes

• No major changes in downstream population/development through the end of the period of analysis (50 years);

Climate Change

• No consequential impacts to project purposes or operations;

Downstream Warning Preparedness

- No substantial improvements in warning system technology;
- Implementation of a Risk Communication Plan would continue

However, without eventual intervention, failure of the dam may ultimately occur causing adverse impacts to public safety and increasing the probability of loss of life.

2.2.2 RMP #3 – Relief Well Alternative

The Relief Well Alternative (RMP #3) would include construction of 14 D-type relief wells. Nine of the wells would be screened in the middle aquifer, along the downstream toe of the dam between approximately dam centerline station 13+50 and 19+00. The wells would be 80 feet

deep with roughly 100 foot spacing. Three of the wells would be 40 feet deep and located in the footprint of the original St. Francis River channel. Two of the wells would be located at the flowing boreholes. The target elevation of the relief wells is 345.3 ft. (Figure EA-5)

The relief wells intercept underseepage, reduce groundwater pressure in the foundation, and provide a controlled outlet for the water. The D-type relief wells would discharge the flow to the landside surface that would then drain into a series of collection ditches. The design would also include an upgrade to the existing culvert that extends under the road and utility relocations (Figure EA-6).

This alternative is calculated to reduce the annual probability of failure from backward erosion piping through Young Point Bar Foundation sands by 0.93 orders of magnitude from the Future Without Action Condition (FWAC). Implementation duration is estimated at 3.5 years.

2.2.3 RMP #4B – Extended Filter Berm and Relief Well Alternative

This Alternative would include construction of a seven-foot-thick filter berm extending from the toe of the dam to the access road approximately 140 feet downstream of the embankment, at approximately dam centerline station 13+50 to 19+00. The filter berm would then extend past the road from station 13+50 to 16+00 for approximately 100 feet. The filter berm would not increase pore pressures and would contain a filtered drainage layer. It would then be capped with an approximate 4-foot thick layer of general fill. The overall filter berm would cover approximately 2.25 acres of ground (Figure EA-7).

A system of 12 T-type relief wells would be added near the toe of the dam with the collection system discharging at the end of the filter berm. Nine of these wells would be screened in the middle aquifer, along the downstream toe of the dam between approximately dam centerline station 13+50 and 19+00. These wells would be 80 feet deep with roughly 100 foot spacing. Three of these wells would be 40 feet deep and located in the footprint of the original St. Francis River channel. A system of 2 T-type relief wells would be added at the flowing boreholes.

The relief wells would intercept underseepage and provide reduce groundwater pressure in the foundation and a controlled outlet for the water. Nine of the T-type relief wells would discharge into a buried collector system that is sloped to a drain and discharges at an elevation 345.3 ft at the culvert crossing the road.

This measure would include replacement of the road after construction. The asphalt road is approximately 400 feet long and 20 feet wide. An upgrade to the culvert under the road would also be required, as well as utility relocations. After construction, the road would retain the original alignment, but would be on top of the berm near the terminus. Implementation duration is estimated at 4 years.



Figure EA-5. Preliminary plan for Alternative 3 – relief wells with discharge.



Figure EA-6. Preliminary plan for relocation of utilities around the relief wells and filter berm.



Figure EA-7. Preliminary plan for Alternative 4B – extended filter berms with relief wells .

This alternative is calculated to reduce the annual probability of failure from backward erosion piping through Young Point Bar Foundation sands by 1.84 orders of magnitude from the Future Without Action Condition.

The Tentatively Selected Plan is RMP #4B – Extended Filter Berm and Relief Well Alternative.

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

This section describes the relevant existing biological, physical, economic, and social conditions in the Proposed Action Area, which are referred to under the NEPA process as the Affected Environment. The resources described in this section are those recognized as significant by laws, executive orders, regulations, and other standards of national, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public.

Numerous site visits were conducted between 2023 and 2024 in order to examine environmental resources and determine potential impacts that may result from the Proposed Action. The Proposed Action Area is shown in Figure EA-8.



Figure EA-8. Proposed Action Area (construction footprint) outlined in black near the main dam.

Qualitative impact descriptions are explained by accompanying text. Qualitative definitions/descriptions of impacts as used in this section of the report include:

- Intensity
 - Negligible No noticeable effects to the resource in the project area
 - Minor Noticeable impacts to the resource in the project area, but the resource is still mostly functional
 - Moderate The resource is impaired, so that it cannot function normally
 - Major The resource is severely impaired so that it is no longer functional in the project area
- Duration
 - Short term Temporary effects caused by the construction and/or implementation of a selected alternative
 - Long term Lasting effects caused by an alternative after the action has been completed and/or after the action is in full and complete operation

3.1 Resources Not Evaluated in Detail

The PDT considered relevant environmental resources that would potentially be impacted by the proposed alternatives and eliminated resources from further evaluation that were either not in the area of potential effect or would not be impacted by any of the alternatives. These resources include:

- Climate (Unchanged by alternatives)
- Hydrological Conditions (Unchanged by alternatives)
- Land Use Land Cover (Unchanged by alternatives)
- Mineral and Energy Resources (Unchanged by alternatives)
- Prime Farmlands (No prime or unique soils in the study area)
- Wild and Scenic Rivers (No designated wild and scenic rivers in or near the study area)

The PDT focused on information gathered from the study area and the area of potential effect.

3.2 Physical Resources

3.2.1 Geology, Topography, and Soils

Geology

Wappapello Lake lies within the southeastern limits of the Salem Plateau section of the Ozark Plateau Physiographic Province (Missouri Department of Natural Resources 2021). This province is frequently referred to as the Ozark Dome. The Ozark Dome refers to the eroded remnants of an ancient mountain range now known as the St. Francois Mountains which form the geological core of the highland dome. The Salem Plateau section contains most of the higher summits of the province. The underlying geology of the province include lower Paleozoic sedimentary rocks formations of Ordovician calcium and magnesium carbonates. Karst features like caves, springs and sinkholes are common in the province due to the fact that the carbonate rocks are soluble in groundwater. Surrounding the lake are moderately dissected outcrops of bedrock formations consisting of Ordovician cherty dolomite, interbedded finely grained dolomite of the Gasconade Formation, and sandstone and cherty and finely grained dolomite of the Roubidoux Formation.

Wayne County is geologically diverse with four distinct physiographic regions (Figure EA-9):

- 1. The St. Francois Mountains, which extend into the northwestern part of Wayne County and include several areas over 1,200 feet above sea level. Clark Mountain is the highest at over 1,400 feet above sea level,
- 2. The Patterson Basin, which is old valley fill material covered by a thin loess mantle,
- 3. The Salem Plateau, consisting of Ordovician age rocks, which covers most of Wayne County. It is an extensive land region surrounding the St. Francois Mountains,
- 4. The Mississippi River alluvial delta area, which is in the southeastern part of Wayne County, is primarily lowland produced by the Mississippi River during a previous era. It is level and made up of terraces and intra-terrace flatland. Swamps are predominant on the intra-terrace flatlands, unless they are drained.

Wappapello Dam is located to the eastern edge of the Salem Plateau sub province. The St. Francis River crosses the Salem Plateau to Wappapello Dam, where it flows out on the Mississippi River Alluvial Plain for the remainder of its length. In the Salem Plateau, the drainage pattern is dendritic with steep slopes between the valleys and mesa-like flat areas on top of some of the hills. The relief is generally not over 300 feet except along the larger rivers.



Figure EA-9. Physiographic regions of Missouri.

Topography

The topography of the lake is characterized by steeply sloping hills with dense forest cover. Smaller tributaries to the St. Francis River drain into the lake, cutting steep, narrow valleys into the bedrock. The level areas around the lake are typically cleared agricultural fields or other developed areas. The undeveloped level areas have grown into grassland or oldfields. The lake lies adjacent to the Southeastern Lowlands province, an area of flat, poorly drained land that occupies extreme southeastern Missouri. To the immediate north of the lake lies the edge of the true Ozark Uplands, typified by the St. Francois Mountains which begin in Sam A. Baker State Park.

The dam was constructed in line with a ridge cut by the river in prehistoric times. The topography at the abutments is steep with rock cliffs exposed along the left abutment. The shoreline of the remainder of the lake has a gentle slope. The hills and ridge tops in the immediate vicinity of the dam rise to elevations between 450 and 550 feet NGVD29. Maximum elevations in the hills lie between 750 and 800 feet NGVD29. The topography of the dam site is the result of continuing erosional process cutting into the Paleozoic strata of a once relatively flat portion of the Ozark uplift block. The block has a slight southwesterly tilt and is generally rugged with sharply to broadly rounded ridges and hilltops and v-shaped to rounded valleys. The maximum relief in the vicinity of the dam is about 250 feet. The drainage is generally dendritic but where major streams

have cut deeper there is a trend for drainage to flow northeast and northwest, following the underlying joint structure.

Soils

The USDA's WebSoil survey was used to describe the soil types found around Wappapello Lake. The most abundant soil association at Wappapello Lake is that of the Clarksville-Fullerton-Lebanon series found on the cherty-stony uplands. They are developed from cherty limestones and occasionally interbedded sandstone and some shallow loess. The Clarksville is a cherty silt loam. It possesses a grayish brown cherty silt loam surface over a yellowish-brown cherty silt loam mid-layer with a light silty clay loam subsoil. The soil is excessively to moderately welldrained.

Soils of the Baxter-Dewleyville-Hagerston series are found on some gently to steeply sloping areas. These are red cherty soils developed from cherty limestone. The soils are similar to the above, being suited for forests, grassland, and orchards. Huntington silt loam occupies the first terraces of the bottomland. This is a deep, well-drained, silty alluvial soils. Enis soils may be found on the extreme bottomlands. These are similar to the above.

Young Point Bar Deposits

The YPB deposit is the youngest foundation deposit containing predominantly coarse-grained sediments in a fining-upward sequence of progressively finer sands grading to silts. The fining-upward sequence indicates point-bar deposition by the modern St Francis River prior to inundation by the reservoir. This deposit can be categorized as a less than 500-year-old sediment and as such is typically loose and susceptible to liquefaction. The areal extent of the YPB deposit was determined from study of preconstruction topographic maps and photographs, boring data and downstream resistivity surveys. The lower part of the YPB deposit consists of channel-lag gravel and coarse sand and grades upward to fine sand and silt. The upper part of the deposit consists of overbank silts and clays. Boring data indicates that swales may be filled with silts and clays. The sandy soils within the YPB deposit become coarser and denser with depth but are spatially variable vertically and horizontally. Poorly graded sands and poorly graded sands with silt are prevalent in the lower 10 to 30 feet of the YPB. The upper 20 to 40 feet of the YPB contains higher fines content and is classified primarily as Silty Sand, Silty Clay, with some clay and silt, and a few lenses of poorly graded sand.

Alternative 1 – No Action (Future without Action Condition)

Under the No Action Alternative, no risk reduction actions would be taken on the Wappapello dam structures. The geological formations beneath Butler and Wayne counties would not be altered from their present state due to the No Action Alternative. Soil types and soil composition at Wappapello Lake would not be altered. The overall topography of the area is unlikely to change from existing slope/relief of the land. Topography, Geology, and Soils would not be affected by the No Action alternative.

Alternative 3 – Relief Wells

Similar to the No Action Alternative, the relief well alternative would not permanently alter the topography, geology, or soils of the Wappapello dam structures or surrounding area. The local relief and slope of the Proposed Action Area would remain very similar to existing conditions. The underlying geology of Butler and Wayne counties would not be altered from existing conditions. The relief wells would not alter the soil types or composition. Local soil compaction could result from the use of vehicles and equipment during installation. Existing access would be used when available to avoid unnecessary soil disturbance. Geology and topography would not be affected by the relief well alternative. Impacts to soils would be negligible and short term due to disturbance caused by equipment use during relief well installation and O&M.

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

The Relief Well With Extended Seepage Berm Alternative would not significantly alter the topography, geology or soils of the Wappapello dam structures or surrounding area. The local topography of the Proposed Action Area would be very similar to existing conditions, with a slight increase in elevation due to the berm. Because the berm is being constructed primarily in a swale, the overall height would appear similar to surrounding areas. The underlying geology of Butler and Wayne Counties would not be altered from existing conditions. The relief wells would not alter the soil types or composition. Local soil compaction could result from the use of vehicles and equipment during installation. Existing access would be used when available to avoid unnecessary soil disturbance. Soil composition may change minimally as a result of material placed for the berm. However since it is highly likely that the material would come from a nearby sources, it is anticipated to be similar to soils in the Proposed Action Area. Geology would not be affected by the relief well and filter berm alternatives. Impacts to topography would be minor and long term due to placement of berm material. Impacts to soils would be negligible and long term due to placement of berm material and O&M.

3.2.2 Noise

Inadequately controlled noise presents a risk for adverse impact to human and animals. Sound is measured in decibels (dB). A whisper is about 30 dB, normal conversation is about 60 dB, and a motorcycle engine running is about 95 dB. Noise levels above 70 dB over a prolonged period may start to damage human hearing. Noise levels above 120 dB can cause immediate harm to human ears. The U.S. Environmental Protection Agency (EPA) and the World Health Organization (WHO) recommend maintaining environmental noises below 70 dBA over 24-hours (75 dBA over 8-hours) to prevent noise-induced hearing loss. Furthermore, The National Institute for Occupational Safety and Health (NIOSH) has recommended that all worker exposures to noise should be controlled below a level equivalent to 85 dBA for eight hours to minimize occupational noise induced hearing loss (Occupational Safety and Health Administration 2022).

Sensitive noise receptors are areas where occupants are more susceptible to the adverse effects of noise pollution. These include, but are not limited to, residential dwellings, hospitals, schools, day care facilities, care homes, places of worship, and public playgrounds or recreation fields.

Ambient noise levels along a quiet lakeshore are in the range of 30-65 dBA (Berger 2015). Noise levels at the Wappapello Lake project would be characteristic of rural lakeshore with additional contributions by recreational activities on and around the lake. Boating and vehicle traffic/use increase noise levels when at a close range, and large congregations of people can also contribute to higher noise levels (Figure EA-10). Additionally, vegetation management activities may periodically contribute to higher noise levels. Compared to the surrounding rural area, the noise levels at the Wappapello Lake project would be expected to be somewhat greater than ambient levels during peak days of recreational use (May to September). According to Berger et al., 2015, motorboats range from 65-114 dBA, and roadway traffic is about 69 dBA.

No Action (Future without Action Condition)

Under the No Action Alternative, noise levels at the Wappapello Lake project would remain similar to existing conditions, with vehicular traffic along the top of the embankment on Highway T and boating use along the riverside of the dam. No additional noise producing activities are anticipated, and typical sources of noise would remain unchanged.

Alternative 3 – Relief Wells and

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Noise levels at the main dam embankment would increase due to construction equipment use during implementation of Alternative 3 or 4B. Due to the length of time necessary to construct the filter berm, Alternative 4B may result in elevated noise levels in adjacent areas for a longer duration than the relief well alternative. Most construction activities are classified as point source noise, which is usually associated with a source that remains in one place for extended periods of time (WSDOT 2020). Construction point source noise is commonly measured by maximum decibel level (Lmax), or the highest value of a sound pressure over a stated time interval. Heavy equipment such as excavators, backhoes, and front loaders, graders, pavers, rollers, and dump trucks range from about 73 to 101 dBA average maximum noise levels (Lmax) at 50 feet (WSDOT 2020). However, noises would attenuate outside of the immediate construction zone. Attenuation of 95 dBA at 400' is estimated to reduce the noise to 77 dBA (WSDOT 2020). Attenuation to 800' is approximately 71 dBA; while the noise level at 1600' is reduced to approximately 65 dBA (WSDOT 2020). Neither the relief wells nor the filter berm would contribute to noise levels during operation. Sensitive noise receptors in the area include residences (nearest is approximately 1200') and a four-lane archery range. Additionally, fishing occurs along both sides of the dam outlet structure. The access road to both the archery range and this fishing site would be closed for safety purposes. A Bald Eagle nest is located approximately 432' from the nearest area of construction. However, the USFWS does not

anticipate adverse impacts to the nest or eagles. Thus, impacts to noise levels due to relief well construction and O&M would be minor-moderate and short term.





3.2.3 Water Quality

Wappapello Lake is a medium depth reservoir located in the Ozark Hills with woodlands as the primary land use in the watershed entering the lake. The clear lake tends to become stratified in the summer, resulting in low dissolved oxygen levels in the shallows and elevated levels of soluble iron and manganese. Water Quality Standards (WQS) are the foundation of the Clean Water Act. Water pollution control programs are designed to protect the beneficial uses of the water resources of the state. Each state has the responsibility to set water quality standards that protect these beneficial uses, also called "designated uses." Missouri waters are designated for various uses including aquatic life, wildlife, agricultural use, primary contact (e.g., swimming, water skiing), secondary contact (e.g., boating, fishing), industrial use, public and food-processing water supply, and aesthetic quality. These water quality standards provide the basis for assessing whether the beneficial uses of the state's waters are being attained.

The Missouri Department of Natural Resources is responsible for setting water quality standards to protect designated uses (U.S. Environmental Protection Agency 2024). According to the 2020 Missouri 303(d) List, Wappapello Lake is impaired for the protection of aquatic life due to Chlorophyll-a pollution from nonpoint sources. Chlorophyll-a is a good indicator of algal concentrations and of nutrient over enrichment. Excessive phytoplankton concentrations, as indicated by high chlorophyll-a levels, can cause adverse dissolved oxygen (DO) impacts such as wide diurnal variation in surface DO due to daytime photosynthesis and nighttime respiration,

and depletion of bottom DO through the decomposition of dead algae. Artificially elevated nutrient levels can cause excess algae to grow, causing ecological and aesthetic problems in lakes and streams. The lake was first listed for this pollutant in 2020. Lake Wappapello is considered unimpaired for the following beneficial uses: irrigation for use on crops for human or livestock consumption, livestock and wildlife watering, secondary contact recreation (e.g., swimming, boating, wading), whole body contact recreation that supports swimming uses and has public access, and human health protection as it relates to the consumption of fish.

No Action (Future without Action Condition)

Under the No Action Alternative, water quality at the Wappapello Lake project would remain similar to existing conditions. No additional water quality impacts are anticipated, and sources of impairment would remain unchanged.

Alternative 3 – Relief Wells

Under the Relief Well Alternative, water quality would remain unchanged due to the installation of the 14 relief wells. Relief wells allow groundwater to flow continuously up to the surface by releasing confined pressure stored within the aquifer at depth. Depending on ambient conditions, this water may be cooler or warmer than surface water. However, the amount of water discharge by the relief wells is not anticipated to result in adverse impacts to water quality or temperature. Thus, impacts to water quality due to relief well construction and O&M would be negligible and short term.

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Under the Relief Well With Extended Seepage Berm Alternative, water quality would remain relatively unchanged due to the installation of the 14 relief wells and a filter berm. The relief wells and berm would not adversely contribute to water quality impacts. Thus, impacts to water quality impacts due to construction and O&M would be negligible and short term.

3.2.4 Air Quality

The Clean Air Act of 1963 requires the U.S. Environmental Protection Agency (EPA) to designate National Ambient Air Quality Standards (NAAQS). The USEPA has identified standards for six criteria pollutants: ozone, particulate matter (PM_{10} = less than 10 microns; and $PM_{2.5}$ = less than 2.5 microns in diameter), sulfur dioxide, lead, carbon monoxide, and nitrogen dioxide (Table EA-4). The EPA Greenbook provides a list of which counties in Missouri are in nonattainment for these pollutant criteria. The project lies in Butler and Wayne Counties; both counties are in attainment for all pollutant criteria (U.S. Environmental Protection Agency 2024). https://www3.epa.gov/airquality/greenbook/ancl.html#MO

Pollutant	Averaging time	Criteria	Form
Carbon monoxide	8 hours (primary)	9 ppm	Not to be exceeded more than once per year
Carbon monoxide	1 hour (primary)	35 ppm	Not to be exceeded more than once per year
Lead	Rolling 3 month Average (primary and secondary)	0.15 μg/m ³	Not to be exceeded
Nitrogen dioxide	1 hour (primary)	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
Nitrogen dioxide	1 year (primary and secondary)	53 ppb	Annual Mean
Ozone	8 hours (primary and secondary)	0.070 ppm	Annual fourth-highest daily maximum 8- hour concentration, averaged over 3 years
Particle Pollution (PM _{2.5})	1 year (primary)	12.0 μg/m ³	Annual mean, averaged over 3 years
Particle Pollution (PM _{2.5})	1 year (secondary)	15.0 μg/m³	Annual mean, averaged over 3 years
Particle Pollution (PM _{2.5})	24 hours (primary and secondary)	35 μg/m³	98th percentile, averaged over 3 years
Particle Pollution (PM ₁₀)	24 hours (primary and secondary)	150 μg/m³	Not to be exceeded more than once per year on average over 3 years
Sulfur dioxide	1 hour (primary)	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
Sulfur dioxide	3 hours (secondary)	0.5 ppm	Not to be exceeded more than once per year

Table EA-4. List of six principal pollutants and their corresponding measurement form and criteria as published by the U.S. EPA.

No Action (Future without Action Condition)

Under the No Action Alternative, air quality at the Wappapello Lake project would remain similar to existing conditions. No additional air quality impacts are anticipated, and sources of impairment would remain unchanged.

Alternative 3 – Relief Wells

Construction activities associated with installation of 14 relief wells would increase particulate matter in the general construction area. Increases in dust levels from construction would be reduced by watering the construction site and/or other Best Management Practices (BMPs). Vehicle and equipment emissions would be expected from the construction equipment. Effects to air quality from construction would be localized, minor, and short term, limited to the hours

and site of construction and not expected to have long term impacts. No impacts to regional air quality would occur as a result of the O&M of the relief wells.

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Construction activities associated with installation of 14 relief wells and the filter berm would also increase particulate matter in the general construction area, over a longer time frame than Alternative 3. Increases in dust levels from construction would be reduced by watering the construction site and/or other BMPs. Vehicle and equipment emissions would be expected from the construction equipment, however National Ambient Air Quality Standards are not expected to be exceeded. Effects to air quality from construction would be localized, minor, and short term, limited to the hours and site of construction, and not expected to have long term impacts. No impacts to air quality would occur as a result of the O&M of the relief wells and filter berm.

3.2.5 Greenhouse Gas Emissions

A major factor in climate change is believed to be the increasing concentrations of greenhouse gases (GHGs) in the atmosphere. This increase results from human activity since the 19th century, such as fossil fuel combustion, deforestation, and other activities. Increases in the concentrations of GHGs in the atmosphere during the last 100 years such as methane (CH₄) and nitrous oxide (N_2O) have trapped additional solar radiation, which intensifies the natural greenhouse effect and results in an increase in global average temperatures.

Carbon dioxide (CO₂), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are the principal GHGs emitted which contribute to global warming. Emissions of CO₂ are largely byproducts of fossil fuel combustion, while methane results from off-gassing, natural gas leaks from pipelines and industrial processes, and incomplete combustion associated with agricultural practices, landfills, energy providers, and other industrial facilities. Other human generated GHGs include fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, which have much higher potential for heat absorption than CO₂ and are byproducts of certain industrial processes. Conversely, CO₂ sinks include vegetation and the ocean, which absorb CO₂ through sequestration and dissolution, and are two of the largest reservoirs of CO₂ sequestration.

In 2022, U.S. greenhouse gas emissions totaled 6,343 million metric tons of carbon dioxide equivalents, and 5,489 million metric tons of carbon dioxide equivalents after accounting for sequestration from the land sector. Emissions increased in 2022 by 1 percent (after accounting for sequestration from the land sector) compared to the previous year. The increase in total greenhouse gas emissions was driven largely by an increase in CO₂ emissions from fossil fuel combustion. In 2022, CO₂ emissions from fossil fuel consumption increased by 1 percent relative to the previous year. This increase in fossil fuel consumption emissions was from increased energy use, due in part to the continued rebound in economic activity after the height of the

COVID-19 pandemic. Emissions decreased by 2.3% from 1990 to 2021, though there have been noteworthy fluctuations in recent years. Greenhouse gas emissions in 2022 (after accounting for sequestration from the land sector) were 17 percent below 2005 levels. Of the major sectors nationwide, transportation accounts for the highest volume of GHG emissions at approximately 28% of the total, followed by electricity (25%), industry (23%), commercial and residential (13%), and agriculture (10%) (USEPA 2024a).

In 2021, the most recent data available, the State of Missouri emitted approximately 154.5 million metric tons of CO_2 equivalent, which is primarily driven by electric power, at 51.5% of the total, followed by transportation (24.6%), agriculture (15.0%), industry (10.9%), commercial (5.1%), and residential (4.6%) (USEPA 2024b).

No Action (Future without Action Condition)

The No Action Alternative would not create any GHG emissions from construction in the project area, as no construction would occur under this alternative. Greenhouse gas emissions are expected to remain consistent with the existing conditions.

Alternative 3 – Relief Wells

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

The construction of either of the action alternatives would result in the release of some greenhouse gases, as the construction equipment that would be required (dozers, tractors, excavators, etc.) burn fossil fuels. However, these minor, short-term adverse effects on GHG emissions during the construction phase would be offset by the long-term beneficial effect of aquatic ecosystem restoration.

Emissions associated with construction activities were estimated at the highest possible levels to evaluate the worst-case scenarios. As worst-case scenarios, emissions were calculated based upon gases produced during diesel fuel combustion and emissions reducing technology was not incorporated, but some level of emissions control is anticipated on all equipment used for the project. Nitrous Oxide (N₂O), Carbon Dioxide (CO₂), Methane (CH₄), and Oxides of Sulfur (SOx) were all calculated based upon anticipated equipment types and fuel usage estimates derived during cost estimation (Appendix EA-2). The total social cost of gases produced during construction is estimated to be \$46,089, calculated using the Net Emissions Analysis Tool (NEAT) (USACE 2023).

Fossil fuel emissions may pose environmental and human health risks and should be minimized. Applicable protective measures as outlined in USEPA's Construction Emissions Control Checklist would be followed.

3.2.6 Hazardous, Toxic, and Radioactive Waste (HTRW)

The U.S. Army Corps of Engineers (USACE) regulations (ER-1165-2-132, ER 200-2-3) and District policy requires procedures be established to facilitate early identification and appropriate consideration of potential HTRW in feasibility, preconstruction engineering and design, land acquisition, construction, operations and maintenance, repairs, replacement, and rehabilitation phases of water resources studies or projects by conducting Phase I Environmental Site Assessment (ESA). USACE specifies that these assessments follow the process/standard practices for conducting Phase I ESA's published by the American Society for Testing and Materials (ASTM). The purpose of a Phase I ESA is to identify, to the extent feasible in the absence of sampling and analysis, the range of contaminants (i.e. RECs) within the scope of the U.S. Environmental Protection Agency's (EPA) Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and petroleum products. Current policy is to avoid known HTRW sites. However, the Environmental Quality Section shall be contacted immediately if HTRW material is encountered at any point during construction activities.

No Action (Future without Action Condition)

The HTRW Phase I ESA revealed no concerns with existing site conditions. The status of HTRW would not be expected to change as a result of taking no action.

Alternative 3 – Relief Wells

Given that the HTRW Phase I ESA revealed no concerns, the construction activities associated with the installation of 14 relief wells are not expected to encounter any HTRW. No adverse effects would be expected as a result of the Relief Well Alternative. If any HTRW matter is encountered during construction of this project, USACE would be contacted to coordinate the handling and disposal of the material.

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

The HTRW Phase I ESA revealed no concerns. Thus, the construction activities associated with the installation of relief wells and filter berm are not expected to encounter any HTRW. No adverse effects would be expected as a result of the Relief Well With Extended Seepage Berm Alternative. If any HTRW matter is encountered during construction of this project, USACE would be contacted to coordinate the handling and disposal of the material.

3.2.7 Floodplain Management

Executive Order 11988 requires federal agencies "...avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative." The EO is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances.

The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative. Additionally, Federal Emergency Management Agency (FEMA) regulations require a "no-rise condition"; that is, construction, operation, and maintenance activities do not create an increase in floodway surcharge. This requirement is regulated by Missouri State Emergency Management Agency (SEMA). The proposed work is partially located in the 100-year mapped FEMA flood boundary for the St. Francis River (Figure 11). Floodplains are the adjacent, generally flat surfaces that are periodically inundated by floodwaters.



Figure 11. Extent of floodplain near the Wappapello Dam in Wayne County, Missouri.

No Action (Future without Action Condition)

Under the No Action Alternative, there would not be construction related activities or earthen material placement. No changes would occur to the floodplain.

Alternative 3 – Relief Wells

Under the Relief Well Alternative, avoidance of the floodplain is not possible. However, installing installation of the relief wells would not have an impact on floodplain elevations. Following construction, disturbed areas would be restored to pre-construction grades and contours as practicable to ensure that floodplain elevations are restored.

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Activities associated with construction of the 14 relief wells and a filter berm would result in a minimal amount of earthen material placement in the floodplain. No adverse impacts to floodplain elevations are anticipated. Although the proposed work occurs partially in the 100-year floodplain, the project would not result in more than a negligible change in the floodplain

elevation. All applicable local floodplain permits would be received prior to commencing this project.

3.3 Social and Economic Resources

3.3.1 Aesthetics and Recreation

An authorized purpose of Wappapello Lake is recreation. The primary mission of recreation is to provide a sustainable level of high-quality outdoor recreation opportunities within a safe and healthful environment that meets the needs of present and future generations. Aesthetics at the Wappapello Lake project are important, given that Wappapello Lake is used by thousands of recreational visitors each day. It is for this reason that it is practical to consider both aesthetics and recreation together. Major activities include sightseeing, fishing, boating, waterskiing, camping, picnicking, swimming, hiking, and hunting. Park and recreation areas, which provide both extended-use and day-use opportunities, have been developed. Recreation areas in the vicinity of the man dam include Eagle Point Recreation Area, Spillway Recreation Area, and Redman Creek Recreation Area (Figure EA-12). The primary activities in these areas involve fishing, hiking, volleyball, horseshoe, and playgrounds. According to the 2021 Recreation Report for the lake, Wappapello Lake facilities drew over a million visitors in 2021 (United States Army Corps of Engineers, 2019).



Figure EA-12. Recreation areas near the main dam at Wappapello Lake. Impacted recreation site is circled in orange.

No Action (Future without Action Condition)

Under the No Action Alternative, there would not be construction related activities or increased vehicle traffic that would result in negative impacts to aesthetics or recreation.

Alternative 3 – Relief Wells

Activities associated with construction of the 14 relief wells would decrease the aesthetic appeal of area in the vicinity of the main dam during construction. Minor short term increases in noise levels, dust, vehicle and construction emissions would occur. Access to some portion of the recreation areas may be restricted or closed during construction for public safety. These include the four-lane archery range and fishing access along the left descending bank of the dam outlet channel. Fishing is available at many other locations around the lake, including along the right descending bank of the outlet channel. While no other archery ranges are present at Wappapello Lake, there are several located in nearby towns. Additionally due to the rural area, many archers use facilities on private property. No recreational mitigation is required. The temporal duration is anticipated to be approximately 6 months. Dust levels from construction would be reduced by watering the construction site and/or other BMPs. Noise impacts would be limited to the hours and local vicinity of the construction. No impacts to aesthetics or recreation are minor and short term.

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Activities associated with construction of the 14 relief wells and a filter berm would decrease the aesthetic appeal of area in the vicinity of the main dam during construction. Minor short term increases in noise levels, dust, vehicle and construction emissions would occur. Construction traffic would occur in the vicinity. Access to some portion of the recreation areas may be restricted or closed during construction for public safety. Impacts to recreation are as described for Alternative 3, although the temporal duration would be approximately 3 months longer. Dust levels from construction would be reduced by watering the construction site and/or other Best Management Practices (BMPs). Noise impacts would be limited to the hours and local vicinity of the construction. Impacts due to Alternatives 4B are anticipated to be of longer duration than the impacts of Alternative 3. Minor aesthetic impacts due to the filter berm may be noted by some people, however these are anticipated to be very minimal as the berm is would have a relatively low profile (7') when compared to the main dam. No impacts to aesthetics and recreation are minor and short term.

3.3.2 Traffic and Roadways

Access to Wappapello Lake is facilitated by network of Interstate roadways, U.S. Highways, State Highways and county roads located in Wayne and Butler counties, Missouri (Figure EA-13). The roads leading from major highways to recreation areas at Wappapello Lake are maintained by county authorities. The Proposed Action Area is bounded by Highways D, T, KK, and W. Local roads lead to various recreation areas within the Wappapello Lake boundaries (Figure EA-14).
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Figure EA-13. Major roadways leading to the Proposed Action Area at Wappapello Lake.



Figure EA-14. Roads in the vicinity of the main dam.

No Action (Future without Action Condition)

Under the No Action Alternative, there would not be construction related activities or increased vehicle traffic that would cause negative impacts in the vicinity of Wappapello Lake.

Alternative 3 – Relief Wells and

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Under each action alternative, traffic would increase in the proposed project vicinity due to construction activity. Generally, the more extensive the project features, the longer the construction duration, which would result in more construction traffic, and would increase impacts to roads and residents. Traffic may be rerouted during construction. Roads in the area of the construction activity may be closed to visitors for safety. It is anticipated that the road below the main dam would be impacted due to construction and would be replaced at the completion of the construction. Overall impacts to Traffic and Roadways is minor and temporary.

3.3.3 Socio-Economic and Demographics

Demographic information for Wayne was obtained from the United States Census (V2022). The total population of Wayne County is 10,973, with 4490 households, and a median household income of \$42,758 (U.S. Census Bureau, 2022). The employment rate is 43.6%, and 11.1% of residents have a bachelor's degree or higher (U.S. Census Bureau, 2022). The poverty level is 25.4%. Race is identified as 93.4% White, 1.0% Black, 0.7% American Indian or Alaska Native, 04% Asian, 2.5% Two or More Races, and 2.1% Hispanic or Latino.

Wappapello Lake is important to the local economy in Wayne County. The money spent by visitors on trip expenses to USACE lakes adds to the local and national economies by supporting jobs and generating income. Visitor spending represents a sizable component of the economy in many communities around USACE lakes. According to the 2021 Recreation Report, visitation to Wappapello Lake accounted for over 45 million dollars in visitor spending, including over 24 million in sales of goods and services which involved 360 jobs within 30 miles of the lake (U.S. Army Corps of Engineers 2024). These benefits included over 7 million in labor income and over 14 million in value added (e.g. wages, salaries, payroll benefits, profits, rents, and indirect business taxes) within 30 miles of the lake.

No Action (Future without Action Condition)

The No Action Alternative is not anticipated to have an impact on socioeconomic or demographic profiles in the vicinity of Wappapello Lake. As described above, the recreational opportunities at Wappapello Lake contribute substantially to the local economy in Butler and Wayne counties. Any damage to the recreational experience at Wappapello Lake could translate into declining visitorship. Declining visitorship would cause adverse impacts to the local economy in Wayne County. It is not anticipated that the No Action Alternative would contribute to declining visitorship over the project life.

Alternative 3 – Relief Wells

Activities associated with construction of the 14 relief wells would result a reduced risk of dam failure over time. Construction activities may result in benefits to the local economy through jobs, sales, and accommodations. Thus, the local economy may benefit from the relief well alternative. The relief well alternative is not anticipated to have an adverse impact on socioeconomic or demographic trends in the vicinity of Wappapello Lake.

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Activities associated with Alternative 4B would result in a reduced risk of dam failure over time. Additionally, construction activities of a longer duration may benefit the local economy through a greater number of jobs, sales, and accommodations. The local economy is anticipated to benefit from the relief well and filter berm alternative. Alternative 4B is not anticipated to have an adverse impact on socioeconomic or demographic trends in the vicinity of Wappapello Lake.

3.3.4 Cultural Resources

There are more than 400 known cultural properties at Wappapello Lake. Most of the sites at the Lake were identified during pre-impoundment surveys, but more recent cultural resource management activities continue to identify additional sites. As many as one-fifth of the site count total are comprised of historic sites, some dating back to the founding and settlement of Wayne County. The remainder are prehistoric sites that may date to 10,000 B.C. or even earlier. However, the majority of the prehistoric sites in the area are probably more recent and represent Lake Archaic (ca. 1,000 B.C.), Woodland (ca. 500 B.C. to A.D. 900), and Mississippian sites (ca. A.D. 900 to A.D. 1,500). As these properties are in federal ownership, all historic properties are currently, and will remain, subject to the National Historic Preservation Act of 1966, as amended (NHPA).

In November 2023, the U.S. Army Corps of Engineers, St. Louis District (District) conducted a Phase I archaeological survey of 13.04 acres within the boundaries of Lake Wappapello Dam. The purpose of the survey was to determine if unknown archaeological resources were located within the proposed project area and to meet the inventory requirements as outlined in Section 106 of the National Historic Preservation Act of 1966, as amended prior to ground disturbing activities. The principal investigator for this project meets the Secretary of Interior's Professional Qualifications Standards.

No previously recorded sites are located within the current limits of the project area. Two previous archaeology surveys (WE-8 and WE-174) are located within the current limits of the project area. No archaeological sites were recorded during this survey, and no further work is recommended. The earthen dam was assessed to see if it is eligible for inclusion on the National Register of Historic Place (NRHP). Although the Wappapello Dam was one of the approximately

375 dams, levees, floodwalls and other projects authorized by the Flood Control Act of 1936, it is not of unique construction. The dam has had multiple minor modifications over its lifespan to combat slumping, erosion, and other issues, and to accommodate structures (sheds and trails). The spillway has experienced damages and repairs caused by flood events, most recently in 2017. A topcoat of modern cement has been applied to the upper portion of the spillway. It was determined that the dam and spillway are not eligible for the NRHP.

On 6 March 2024, USACE initiated coordination with the Missouri Department of Natural Resources (MDNR) State Historic Preservation Officer (SHPO) regarding the Wappapello DSMS project. The District's opinion was that the project would have no effect on historic properties. If human remains or unrecorded sites are found during construction activities, all work will be stopped and MO SHPO will be notified prior to any further ground disturbance activities.

On 5 April 2024, the MDNR SHPO responded that based on the survey provided by USACE and its negative findings, the SHPO concurs with the USACE determination of No Historic Properties Affected.

No Action (Future without Action Condition)

Under the No Action Alternative, the main dam safety modification features would not be constructed and the life loss risk would not be lowered. No cultural resource issues are anticipated within the Proposed Action Area.

Alternative 3 – Relief Wells and

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan) The survey conducted by USACE found no archaeological sites within the proposed action area, and the MDNR SHPO concurred with the USACE determination of No Historic Properties Affected.

The earthen dam would not be eligible for the NRHP. No cultural resource issues are anticipated within the Proposed Action Area.

3.3.5 Tribal Resources

In a letter dated 6 March 2024, USACE initiated consultation with federally recognized Indian Tribes for the proposed undertaking under Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations 36 CFR 800. The USACE St. Louis District consults with 21 Tribal Nations that have ties to, or an interest in, this portion of the District's area of responsibility.

Correspondence indicating no objection to the proposed project at this time were received from the Forest County Potawatomi Community, Wisconsin (6 March 2024), Quapaw Nation (7 March 2024), Nottawaseppi Huron Band of the Potawatomi, Michigan (13 March 2024), and Shawnee

Tribe (28 March 2024) (Appendix EA-1). These nations request to be notified if any archaeological or human remains are identified during construction.

No Action (Future without Action Condition)

Under the No Action Alternative, the main dam safety modification features would not be constructed and the life loss risk would not be lowered. No tribal resource issues are anticipated within the proposed action area.

Alternative 3 – Relief Wells and

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

The survey conducted by USACE found no archaeological sites within the proposed action area. The earthen dam would not be eligible for the NRHP. No tribal resource issues are anticipated within the Proposed Action Area.

3.3.6 Environmental Justice

"Environmental Justice" means the just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability, in agency decision-making and other Federal activities that affect human health and the environment so that people:

- are fully protected from disproportionate and adverse human health and environmental effects (including risks) and hazards, including those related to climate change, the cumulative impacts of environmental and other burdens, and the legacy of racism or other structural or systemic barriers; and
- have equitable access to a healthy, sustainable, and resilient environment in which to live, play, work, learn, grow, worship, and engage in cultural and subsistence practices (USACE 2024).

Environmental Justice analysis was developed following the requirements of Executive Order 14008 - Tackling the Climate Crisis at Home and Abroad, January 27, 2021. According to the Climate and Economic Justice Screening Tool (CEJST), the census tracts surrounding and making up Wappapello Lake are considered disadvantaged communities because they meet at least one burden threshold AND the associated socioeconomic threshold. Burden thresholds in the area include the following: climate change, energy costs, health (heart disease), transportation barriers, workforce development (unemployment), and low income (Figure EA-15).



Figure EA-15. Results of the CEJST Report for Wayne County, Missouri.

Additionally, existing Environmental Justice conditions were obtained using the Environmental Justice Screening and Mapping Tool (EJSCREEN) report obtained on 16 February 2024 (Figure EA-16). The selected area for the report included a 5-mile radius around the approximate center point of the Wappapello Lake main dam. The report indicated that there were approximately 2,573 residents in this radius. Socioeconomic indicators for this radius are as follows: People of Color population of 11%, less than the state average of 23%. The low-income population is 36%, slightly greater than the state average of 33%. The percent of residents without a high school education is 14%, greater than the state average of 10%. Environmental indicators like particulate matter, ozone, and lead paint are similar to the state average in some cases, and much less than the state average in the rest.

EJScreen Environmental and Socioeconomic Indicators Data

SELECTED VARIABLES	VALUE	STATE AVERAGE	PERCENTILE IN STATE	USA AVERAGE	PERCENTILE IN USA	
POLLUTION AND SOURCES						
Particulate Matter (µg/m ³)	7.75	8.05	38	8.08	38	
Ozone (ppb)	55.9	59.9	17	61.6	12	
Diesel Particulate Matter (µg/m³)	0.104	0.268	15	0.261	17	
Air Toxics Cancer Risk* (lifetime risk per million)	24	25	0	25	5	
Air Toxics Respiratory HI*	0.3	0.31	14	0.31	31	
Toxic Releases to Air	55	4,500	21	4,600	18	
Traffic Proximity (daily traffic count/distance to road)	1	110	7	210	4	
Lead Paint (% Pre-1960 Housing)	0.085	0.31	27	0.3	32	
Superfund Proximity (site count/km distance)	0.021	0.097	23	0.13	19	
RMP Facility Proximity (facility count/km distance)	0.028	0.45	6	0.43	3	
Hazardous Waste Proximity (facility count/km distance)	0.044	1.3	13	1.9	8	
Underground Storage Tanks (count/km ²)	0.028	2	25	3.9	23	
Wastewater Discharge (toxicity-weighted concentration/m distance)		0.49	52	22	61	
SOCIOECONOMIC INDICATORS						
Demographic Index	23%	28%	50	35%	39	
Supplemental Demographic Index	20%	14%	81	14%	11	
People of Color	11%	23%	45	39%	24	
Low Income	36%	33%	58	31%	64	
Unemployment Rate	21%	5%	96	6%	96	
Limited English Speaking Households	2%	1%	83	5%	61	
Less Than High School Education	14%	10%	75	12%	70	
Under Age 5	2%	6%	20	6%	23	
Over Age 64	20%	18%	67	17%	68	
Low Life Expectancy	25%	21%	86	20%	91	

*Diese particulate matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at https://www.ega.gov/hayas/air-toxic-data-update.

Figure EA-16. Results of EJSCREEN Report for Wayne County, Missouri.

No Action (Future without Action Condition)

Under the No Action Alternative, no disproportionately high and adverse human health, or adverse environmental effects on disadvantaged communities would occur.

Alternative 3 – Relief Wells and

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

The action alternatives would not result in disproportionately high and adverse human health or environmental effects to disadvantaged communities, or cause other Environmental Justice concerns. Communities in the vicinity of the dam would benefit from a reduced dam safety risk.

3.4 Biological Resources

3.4.1 Terrestrial and Wildlife Resources

There are many terrestrial habitats in the areas surrounding Wappapello Lake, including grassland, abandoned fields, croplands, bottomland hardwood forest, and upland hardwood forest. Wappapello lands also include leased agricultural fields planted in rotational crops. However, forested habitat is the primary terrestrial habitat type. Tree species in the bottomland hardwood forest are a mixture of White Oak (*Quercus alba*), Black Oak (*Quercus velutina*), Shagbark Hickory (*Carya ovata*), and Mockernut Hickory (*Carya tomentosa*). Upland forest along the ridge tops have Pignut Hickory (*Carya glabra*) and Post Oak (*Quercus stellata*), which thrive in the soils with low moisture content. Where the soils are mainly sandstone-based, the forest is a mix of oaks and pines, including Shortleaf Pines (*Pinus echinata*). Where soils are limestone-based, large stands of Eastern Red Cedar (*Juniperus virginiana*) are common.

Terrestrial wildlife species at Wappapello Lake are consistent with those of mixed forest habitats of the Ozarks. The area was heavily hunted in the 19th century, which reduced populations of big game species like White-tailed Deer (*Odocoileus virginianus*), Elk (*Cervus canadensis*), Black Bear (*Ursus americana*), Mountain Lion (*Puma concolor*), Bobcat (*Lynx rufus*), Gray Wolf (*Canis lupus*), and Eastern Wild Turkey (*Meleagris gallopavo*). The wildlife management and environmental stewardship activities conducted on the Wappapello Lake Project lands have created an exceptional, well diversified ecological setting that has benefitted and attracted a wide variety of wildlife species.

Currently Deer and Turkey populations are thriving within the Wappapello Lake project area. Furbearers are found along riverbanks, streams and shoreline including River Otter (*Lontra canadensis*), American Mink (*Neovison vison*), Muskrat (*Ondatra zibethicus*), American Beaver (*Castor canadensis*), Striped Skunk (*Mephitis mephitis*), Opossum (*Didelphis virginiana*), and Raccoon (*Procyon lotor*). Small game such as the Eastern Cottontail (*Sylvilagus floridus*), Fox Squirrel (*Sciurus niger*), and Gray Squirrel (*Sciurus carolinensis*), are plentiful in and along the woodland edge habitat. Coyote (*Canis latrans*), Red Fox (*Vulpes vulpes*), and Grey Fox (*Urocyon cineroargenteus*) range between the forested and open field habitats. In addition to the hundreds of thousands of migratory waterfowl that use the lake, dozens of species of migratory birds use the forests and grasslands in the project area.

The reptiles, amphibians, and frogs mentioned in the Aquatic Habitat section can also be expected to use the terrestrial habitats, where appropriate. Eastern Box Turtle (*Terrapene carolina*), Rat Snake (*Pantherophis obsoletus*), Eastern Racer (*Coluber constrictor*), and Northern Water Snake (*Nerodia sipedon*) are common at Wappapello Lake.

No Action (Future without Action Condition)

Without the risk reduction improvements to the main dam at Wappapello Lake, the quality of the terrestrial habitat is not anticipated to be adversely impacted. The current operation and management program would continue under the No Action Alternative.

Alternative 3 – Relief Wells and Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

There is limited wildlife habitat near the main dam embankment where the proposed measures would be constructed. The area is primarily a cleared field, surrounded by recreational, agricultural, and forested lands, as well as office buildings. Minimal tree clearing within the open area is anticipated, and no tree clearing in the forested habitat is proposed. Mobile wildlife would likely relocate during construction activities. Due to the abundance of similar forest habitat in the vicinity, and the fact that a large portion of the proposed action area has been routinely mowed for approximately 50 years, impacts to terrestrial resources and wildlife are anticipated to be minimal.

3.4.2 Aquatic Resources

Wappapello Lake is located within the St. Francis River watershed, which drains approximately 1,839 square miles in Missouri. The St. Francis River flows through Wappapello Lake, which is situated near the center of Missouri's portion of the basin. Major tributaries to the St. Francis River are the Little St. Francis River and Big Creek above the Wappapello Dam, and Mingo Ditch and Dudley Main Ditch below the Wappapello Dam. Wappapello Lake contains approximately 8,400 acres of lake habitat. When Wappapello Lake was created, the rugged terrain and many small tributaries along the St. Francis River created an irregular shoreline. As a result, a variety of coves can be found around the lake, providing many micro-habitats. The reservoir lake drains 1,310 square miles. St. Francis River tributaries that enter Wappapello Lake include the East Fork Lost Creek, West Fork Lost Creek, Mink Creek, Asher Creek, Big Lake Creek, Clark Creek, Hubble Creek, Logan Creek, Perkins Branch and Hickory Flat Creek. At normal recreation pool, the lake is approximately 28 miles long, with an average width of 1.3 miles and average depth of 6.5 feet, although some areas are up to 45 feet deep.

Wappapello Lake supports diverse forms of phytoplankton, zooplankton, aquatic insects, crustaceans, amphibians, reptiles, fish, and mollusks. The U.S. Army Corps of Engineers and Missouri Department of Conservation (MDC) work in a collaborative effort to manage the lake for water quality and ecosystem sustainability. Aquatic habitat degradation is a normal process as lakes age. To refurbish some of the structural habitat that decomposes over time, the agencies have partnered to add brush piles to the lake and investigate new ways to re-establish aquatic vegetation. Additionally, the partners are investigating new ways to better manage water levels in the lake to provide and promote healthy and productive fish populations.

The St. Francis River and Wappapello Lake are home to over 50 fish species that are very popular with recreational anglers. Common sport fish species in the reservoir include White Crappie (*Pomoxis annularis*), Black Crappie (*Pomoxis nigromaculatus*), White Bass (*Morone chrysops*), Largemouth Bass (*Micropterus salmoides*), Spotted Bass (*Micropterus punctulatus*), Bluegill (*Lepomis macrochirus*), Redear sunfish (*Lepomis microlophus*), Channel Catfish (*Ictalurus punctatus*) and Flathead Catfish (*Pylodictis olivaris*).

A variety of aquatic reptiles, amphibians, snakes, turtles, salamanders, frogs, and toads can all be expected to occur in the aquatic habitats in and around the lake. Common Snapping Turtles (*Chelydra serpentina*), River Cooter (*Pseudemys concinna*) Red-eared Slider (*Trachemys scripta*) are common in many palustrine waterbodies, including large reservoirs like Wappapello Lake and in the smaller sloughs, farm ponds, and wetlands surrounding the reservoir. These aquatic habitats are also used by American Toad (*Anaxyrus americanus*), Spring Peeper (*Pseudacris crucifer*), Green Frog (*Lithobates clamitans*), Bullfrog (*Lithobates catesbeianus*), and Northern Leopard Frog (*Lithobates pipiens*). The Alligator Snapping Turtle (*Macrochelys temminckii*) may also be found in the vicinity.

No Action (Future without Action Condition)

The No Action Alternative would not cause an adverse impact to aquatic habitats, and they are expected to remain similar to existing conditions. Unfiltered seepage would continue to flow into the habitat downstream of the dam. No adverse impacts to aquatic organisms or their habitat are anticipated due to the No Action Alternative.

Alternative 3 – Relief Wells

Under the action alternatives, underseepage water would discharge from the relief wells and flow into a concrete and/or riprap lined channel collection system. The water would be discharged into the slough downstream of Wappapello Dam, similar to existing conditions. This would require minimal vegetation removal at the upper end of the slough. A small cofferdam may also be required in this area for installation of the drainage system to prevent the water in the slough from flooding the excavation and dewatering system. Water pumped out of the dewatered area would be discharged into the outlet channel of the dam during construction to reduce impacts to a beaver dam at the slough outlet. An estimated 6-12 inches of water would be maintained in the slough to provide a wetted habitat for small aquatic organisms during construction. In order to reduce the likelihood of impacts to aquatic organisms, the slough would not be dewatered when organisms may be overwintering if at all possible. The area would be allowed to revert back to a natural state after construction. This alternative is anticipated to result in moderate short term impacts to aquatic organisms in the slough, and negligible short term impacts elsewhere.

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Under Alternative 4B, the 14 relief wells would be installed and the filter berm would overlay areas of high seepage probability at the main embankment as well. Instead of a concrete and/or riprap lined channel collection system, a buried reinforced concrete box collection system would be installed. The water would be discharged into the slough downstream of Wappapello Dam, similar to existing conditions. This would require minimal vegetation removal at the upper end of the slough. A small cofferdam may also be required in this area for installation of the drainage system to prevent the water in the slough from flooding the excavation and dewatering system. Water pumped out of the dewatered area would be discharged into the outlet channel of the dam during construction to reduce impacts to a beaver dam at the slough outlet. An estimated 6-12 inches of water would be maintained in the slough to provide a wetted habitat for small aquatic organisms during construction. In order to reduce the likelihood of impacts to aquatic organisms, the slough would not be dewatered when organisms may be overwintering if at all possible. The area would be allowed to revert back to a natural state after construction. This alternative is anticipated to result in moderate short term impacts to aquatic organisms in the slough, and negligible short term impacts elsewhere.

3.4.3 Wetlands

In addition to the lake habitat, there are several freshwater wetlands near the Wappapello Lake main embankment. A review of the USFWS National Wetland Inventory found that the wetland habitats near the lake include riverine, lake, freshwater emergent, and freshwater forested/shrub, (Figure EA-17). The only wetland in the proposed action area is the emergent freshwater wetland resulting from the underseepage drainage into the slough

No Action (Future without Action Condition)

The No Action Alternative would not cause an adverse impact to aquatic habitats, and they are expected to remain similar to existing conditions. Unfiltered seepage would continue to flow into the habitat downstream of the dam. No adverse impacts to aquatic organisms or their habitat are anticipated due to the No Action Alternative.

Alternative 3 – Relief Wells and

Alternative 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Under the action alternatives, a temporary cofferdam would be constructed at the very upper end of the emergent freshwater wetland slough in order to install the drainage collection system where it empties into the slough (Figure EA-18). This water collection system largely follows the existing flow path of water from the dam into the slough. Water quality is not anticipated to be adversely impacted. The cofferdam would be removed after construction is complete and the surrounding area would be allowed to revegetate Draft Environmental Assessment - Wappapello Dam Safety Modification Study Wayne County, Missouri – UNCLASSIFIED NEPA Unique ID: EAXX-202-00-MVS-1725012636

Figure EA-17. National Wetlands Inventory map of the main portion of Wappapello Lake dam.

Figure EA-18. Approximate location of cofferdam (teal) and dewatering hose (yellow) along the slough.

Installation of the cofferdam would meet the requirements of Nationwide Permit (NWP) No. 33 - Temporary Construction, Access, and Dewatering. Missouri 401 water quality certification (WQC) is covered by a programmatic WQC in accordance with General and Specific Conditions for NWP No. 33. *The use of NWP NO. 33 shall be limited to impacts of six months or less in duration*. This will ensure compliance with the Missouri Water Quality Standards antidegradation requirements for maintenance and protection of designated uses. Due to the temporary nature of the proposed activity, as well as the minimal wetland impacts, no compensatory mitigation is required.

3.4.4 Invasive Species

An invasive species is one that is not native to an ecosystem and which causes, or is likely to cause, economic or environmental harm or harm to human health (U.S. Fish and Wildlife Service 2012). Invasive species management efforts at Wappapello Lake are in accordance with the National Invasive Species Act of 1996 (PL 104-332), the USACE Invasive Species Policy, and the Wappapello Lake Master Plan. These efforts seek to contain and reduce the spread and populations of established invasive species to minimize their harmful impacts. Invasive species control is a year-round effort at Wappapello Lake. There are several invasive woody shrubs and vine species that occur at Wappapello Lake, including: Autumn Olive (Elaeagnus umbellata) and multiflora rose (Rosa multiflora). Johnsongrass (Sorghum halepense) and Sericea Lespedeza (Lespedeza cuneata) which are widely distributed along the edges of roads and in open areas. In some forest stands, invasive shrubs dominate the understory, inhibiting the growth of more desirable trees, flowers, and forbs. In aquatic habitats, the primary concern are isolated patches of Purple Loosestrife (Lythrum salicaria), and the Woodland Crayfish (Faxonius hylas). The invasive insect pest, the Emerald Ash Borer (Agrilus planipennis), is widely distributed in the areas around the lake. Invasive bird species includes the European Starling (Sturnus vulgaris). Acceptable invasive species control techniques include chemical, mechanical, biological, fire, cultural, and flooding. All of these alternatives should be evaluated prior to the implementation of a control technique.

No Action (Future without Action Condition)

Without the risk management reduction action, no impacts to or from invasive species is anticipated. Invasive species removal currently being conducted on Wappapello Lake property would continue under the No Action Alternative.

Alternative 3 – Relief Wells and

Alternatives 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Invasive species control would continue to be carried out under the Action Alternatives. This primarily involves invasive species concerns within forests. However, invasive fish, bivalves, insect, and other animal invasives are generally not targeted by Wappapello Lake. Neither the

installation of 14 relief wells or the construction of the filter berm are anticipated to eliminate or introduce invasive species. Thus, impacts to invasive species would be negligible and short term.

3.4.5 Bald Eagle

Although the Bald Eagle (*Haliaeetus leucocephalus*) was removed from the federal list of threatened and endangered species in 2007, it continues to be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA prohibits unregulated take of Bald Eagles, including disturbance (U.S. Fish and Wildlife Service 2007a). Bald Eagles occur regularly in Missouri as both migrants and breeders, with some populations of yearround residents along major rivers and reservoirs in the state. A Bald Eagle nest is located approximately 442 ft from the nearest proposed action area (Figure EA-19). As of 18 May 2022, the nest is actively being used. Coordination with USFWS regarding the need to apply for an incidental take permit under the Bald and Golden Eagle Protection Act was initiated on 25 March 2024. In an e-mail dated 26 Mar 2024, the USFWS responded that no incidental take permit would be required for the dam safety modification.

Figure EA-19. Location of the Bald Eagle nest in within 660' of the proposed action area.

No Action (Future without Action Condition)

The No Action Alternative would not result in any changes to the existing conditions or cause an adverse impact to Bald Eagles or their nests.

Alternative 3 – Relief Wells and

Alternatives 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Due to the frequent O&M in the area (mowing, etc.) and use of the area for recreation, the Bald Eagles using the nest seem habituated to human activity. It is not anticipated that humans or vehicles would have a reason to approach the nest during the action alternative. No staging would occur in the immediate vicinity of the nest. However, the operation of loud equipment and increased construction traffic at the main embankment (> 660' from the nest) may cause a temporary minor adverse impact. It is not anticipated that the installation of relief wells or the construction of the filter berm would result in take. In an email dated 26 March 2024, the U.S. Fish and Wildlife Service recommended that we do not apply for a permit, and stated that eagles typically respond well to disturbances more than 330' from the nest and there is good visual screening from much of the work being done.

3.4.6 Migratory Birds

The Migratory Bird Treaty Act (MBTA) of 1918 provides protection for bird species native to North America. The Wappapello Lake project is an important nesting and feeding area within the Mississippi Flyway for many migratory birds and waterfowl species. A variety of migratory birds might occur in the project areas, some as migrants and some as breeders. Waterfowl, wading birds, shorebirds, passerines, and raptors use the St. Francis River watershed for resting, feeding, nesting, and for other life-history needs.

The Missouri Birding Society has recorded 438 migratory birds species in the state (The Missouri Birding Society 2022). In addition, the Upper St. Francis Watershed is one of The Audubon Society's Important Bird Areas (The Audubon Society 2022). While exact data for species observed on Wappapello Lake's project areas is lacking, a review of eBird checklists found that birders have seen or heard over 150 species at the Wappapello Lake project. Migratory waterfowl use the lake during the winter months alongside the county's year-round residents, like Canada Goose and Double-crested Cormorants. Terns, grebes, and gulls also use the reservoir lake in good numbers. In late spring and early fall, shorebirds return to the open mudflats along the shore. In the summer months, a variety of warblers, vireos, flycatchers, and other perching birds use the forests in the project area during the summer breeding season. Several species of woodpeckers use the forests year-round. Birds-of-prey, like eagles, hawks, and owls, can be found throughout the year.

Birds of many varieties use the lake and the wetlands, sloughs, creeks, and other aquatic habitats surrounding the lake. Shoreline areas and exposed mudflats would be used by shorebirds when those habitats are available. Areas with emergent vegetation like Cattails (*Typha spp.*), River Bulrush (*Bolboschoenus fluviatilis*), or Smartweeds (*Persecaria spp., Polygonum spp.*) would attract herons, rails, egrets, blackbirds, and other marsh birds. Bird using the open water would

include cormorants, gulls, terns, ducks, geese, swans, and other waterbirds. Migratory waterfowl can be found in the Wappapello area in the hundreds of thousands during migration.

No Action (Future without Action Condition)

The No Action Alternative would not result in any changes to the existing conditions or cause an adverse impact to migratory birds or their nests.

Alternative 3 – Relief Wells and

Alternatives 4B – Extended Filter Berm + Relief Wells (Tentatively Selected Plan)

Under the action alternatives, the operation of loud equipment and increased construction traffic would cause a temporary minor adverse impact to migratory birds using the areas within the vicinity of the work. Additionally, direct adverse impact would result from trees felled that are currently used by birds. Per the USFWS guidance, incidental take can result from the taking or killing of migratory birds that results from, but is not the purpose of, an activity. Adverse impacts to birds using the wetlands, mudflats, and open water of the lake are unlikely. Removal of several trees between 1 October and 31 March may impact nests and habitat. Based on the timing of tree removal, the number of trees removed, and the amount of forest available in the vicinity, these impacts would be negligible and short term.

3.4.7 State Listed Species

An automated Missouri Department of Conservation (MDC) Heritage Report was generated on 19 December 2023 (Project ID 13796, Appendix EA-1 - Coordination). A detailed Natural Heritage Review Report, which lists sensitive resources which may be located in the vicinity of by the proposed project, was provided by MDC on 26 February 2024 (NHR ERT ID: 13796). This report divides the resources into Level 3 (Records of federal-listed also state-listed species or critical habitats near the project site:) and Level 2 (Records of state-listed endangered species and/or state-ranked species and natural communities of conservation concern). MDC tracks these species and natural communities due to population declines and/or apparent vulnerability.

The Level 3 species included in this report included Indiana Bat, Northern Long-eared Bat, Alligator Snapping Turtle, and Bald Eagle. The Bald Eagle was discussed in Section 3.2.19. The bats, Alligator Snapping Turtle, and several mussel species are discussed in Section 3.2.22 – Federally Listed Species.

The Level 2 species included Western Chicken Turtle (*Deirochelys reticularia miaria*), Harlequin Darter (*Etheostoma histrio*), and American Bitterns (*Botaurus lentiginosus*). Impacts to migratory birds, like American Bitterns, were discussed in Section 3.4.6 - Migratory Birds. Impacts to aquatic species were discussed in Section 3.4.2 - Aquatic Habitat.

In Missouri, Western Chicken Turtles are a bottomland, hardwood forest species that inhabit cypress-bordered shallow ponds, rivers sloughs, temporarily water-filled ditches and drainage ditches in spring and early summer. However, they spend considerable time on the forested lands, especially near wetlands. They are active on the forest floor from mid-March to late October and overwinter in the leaf litter soil of lowland forests. During spring and early summer, females lay 5-15 eggs in loose soil about 4 inches or so underground. Young turtles typically hatch in the late summer or early fall and may remain in the nest until the following spring Western Chicken Turtles eat a variety of aquatic invertebrates. Natural Heritage records identified Western Chicken Turtle 1.45 miles from the project area.

The following best management practices (BMPs) recommended to reduce impacts to the Western Chicken Turtle as well as the anticipated impact of the proposed action are listed below:

- Avoid removing or destroying unique habitat features, such as downed trees, that provide habitat for the Western Chicken Turtle.
 - Removal or destruction of unique habitat features, such as downed trees is not anticipated.
- Draining or destroying known wetland habitat should be avoided.
 - A small emergent wetland would be temporarily dewatered at the upper end. No permanent impacts are anticipated.
- Erosion and sediment controls should be implemented, maintained and monitored for the duration of the project.
 - Erosion and sediment controls would be implemented, maintained and monitored for the duration of the project.
- Disposal of wastes and garbage should be done in designated areas far from wetlands.
 - Waste and garbage would be properly disposed of.
- Avoid altering water levels in wetlands where Western Chicken Turtles are present.
 - Western Chicken Turtles are not recorded in the waterbody to be manipulated.
- Compaction and alteration of soil (vehicle and ATV use, disking, etc.) surrounding wetlands and swamps that support Western Chicken Turtles should be avoided.
 - Care would be taken to avoid compaction and alteration of soil surrounding the slough.

By incorporating these BMPs, adverse impacts to Western Chicken Turtles are not anticipated.

3.4.8 Federally Listed Species

In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, an updated official list of species and critical habitats potentially occurring in the vicinity of the proposed action areas was acquired from the USFWS Information for Planning and Conservation (IPaC) website at (<u>https://ecos.fws.gov/ipac/</u>) on 31 July 2024 (Project Code: 2024-0028287; Table EA-5).

Table EA-5. List of federally threatened and endangered species and habitat potentially occurringin the vicinity of the proposed project.

Common Name (Scientific Name)	Classification	Habitat		
Gray Bat (Myotis grisescens)	Endangered	Caves and mines; rivers and reservoirs adjacent to forests.		
Indiana Bat (<i>Myotis sodalis)</i>	Endangered	Caves, mines (hibernacula); small stream corridors with well-developed riparian woods; upland forests (foraging).		
Northern Long-eared Bat (Myotis septentrionalis)	Endangered	Caves and mines; rivers and reservoirs adjacent to forests.		
Tricolored Bat (Perimyotis subflavus)	Proposed Endangered	Caves, mines, storm sewers, box culverts, surge tunnels at quarries, and rock faces (hibernacula over water bodies such as rivers or lakes, where insect populations are highest (foraging); more often associated with uplands than bottomland forest in clusters of dead leaves in trees, live leaf foliage, lichens, patches of pine needles caught in tree limbs, buildings, caves, and rock crevices (active-period).		
Alligator Snapping Turtle (Macrochelys temminckii)	Proposed Threatened	Deeper water (usually large rivers, major tributaries, bayous, canals, swamps, lakes, ponds, and oxbows); shallower water in early summer and deeper depths in late summer and mid- winter. Prefer structure (e.g., tree root masses, stumps, submerged trees, etc.).		
Rabbitsfoot (Quadrula cylindrica)	Threatened	Creeks and medium to large rivers with mixed sand and gravel substrates.		
Snuffbox Mussel (Epioblasma triquetra)	Endangered	Typically occurs in small to medium sized streams with a swift current.		

Common Name (Scientific Name)	Classification	Habitat
Western Fanshell (Cyprogenia aberti)	Threatened	Lower St. Francis River.
Monarch Butterfly (Danaus plexippus)	Candidate	Uses milkweed plants as a reproductive host. Could occur anywhere in Missouri with host milkweed present.

3.4.8.1 Conservation Measures

- Tree removal would be restricted to the 1 November 31 March bat non-active period (unless deemed an imminent safety hazard).
- Dewatering of the slough would occur when water temperatures are above 55°F if practicable.
- Vegetation removal would be minimized to avoid impacts to terrestrial and aquatic organisms.

3.4.8.2 Gray Bats

Legal Status

The Gray Bat (*Myotis grisescens*) is federally listed as Endangered and additional information regarding its legal status can be found on the <u>ECOS species profile</u>.

Recovery Plans

Available recovery plans for the Gray Bat can be found on the ECOS species profile.

Life History Information and Identified Resource Needs

Gray Bats typically live in caves year-round. In winter, Gray Bats hibernate in caves that often have multiple entrances and good air flow (U.S. Fish and Wildlife Service 2009). In the summer, Gray Bats roost in karst features, often along rivers. Gray Bats may also occasionally roost at man-made sites that simulate summer caves, such as storm drains and bridges (Hays 1964); (Elder 1978); (Timmerman 1992); (Keeley 1999); (Sasse 2019).

Breeding begins in the fall (early August to mid-November) when the male Gray Bats arrive at hibernacula. The adult females and their newborns roost in maternity caves. The adult males and yearlings of both sexes roost in bachelor caves. By August, all the juveniles are flying and general mixing and dispersal of the colony occurs over the summer range. Newly volant Gray Bats travel up to 4 miles between roost caves and foraging areas.

After the summer maternity period, Gray Bats migrate to their winter hibernacula. Bats spend time at transient (stop-over) caves between summer and winter grounds. Transient roosts are likely utilized by bats migrating long distances, while bats migrating short distances might make direct movements to hibernacula. The duration spent at transient locations by individual Gray Bats is unknown. However, in Missouri, recordings from bat detectors placed at transient caves during the migratory period show that transient caves are used over several weeks each spring and fall (USFWS unpublished data 2021).

Gray Bats generally return to the same summering and wintering sites; however, males and yearling females seem less restricted to specific cave and roost locations (USFWS 1982, 2009). According to 2021 Missouri Department of Natural Resources data, only a single cave is known to occur in the Wappapello quadrant (Missouri Department of Natural Resources 2021), however Wayne County has known karst geologic features (e.g. caves, springs, and sinkholes, all characterized by subterranean water movement). Additionally, a literature review identified a number of caves which could potentially be used by Gray Bats in nearby counties.

Gray Bats emerge at night to forage in forested areas along banks of streams and lakes and may travel over 20 miles in a given night to feed. Whenever possible, Gray Bats of all ages fly in the protection of forest canopy between caves and feeding areas. Such behavior provides increased protection from predators. This species is highly dependent on aquatic and terrestrial insects, especially mayflies, caddisflies, stoneflies beetles, and moths (U.S. Fish and Wildlife Service 2009).

As a consequence of their combined thermoregulatory and other habitat requirements, Gray Bats congregate in larger numbers and in fewer hibernating caves than any other North American bat (Tuttle 1979). Natural factors such as flooding, cave-ins, freezing, and disease occasionally impact Gray Bats; however population decline has been attributed primarily to human disturbance of bats and alteration of their habitat (Barbour 1969); (Mohr 1972); (Harvey 1975); (Tuttle 1979); (U.S. Fish and Wildlife Service 1982). Hibernacula and maternity caves are especially vulnerable to disturbances. Human entry into a hibernaculum causes bats within range of sound or light to arouse at least partially from hibernation and use energy reserves that cannot be replenished before spring emergence (Tuttle 1976). Disturbance at maternity caves is most harmful from late May through mid-July when non-volant young are in the roost (U.S. Fish and Wildlife Service 1982). Human intrusion may also cause the bats to abandon a summer cave (Barbour 1969). Additionally, temperate North American bats are threatened by white-nose syndrome, cause by the fungus *Pseudogymnoascus destructans*. The fungus grows best in cold, humid conditions that are typical of many bat hibernacula.

Species Presence and Use

The proposed Wappapello Lake project is located in Missouri bat zone 2. According to 2022 data, the nearest zone 3 site is located approximately 7.4 miles away. Gray Bats were observed roosting near a Wappapello Dam conduit expansion joint on 15 March 2007, during Periodic Inspection #9 when the dewatered inspection was performed (Lemons, pers. comm.). The bats are accessing the conduit from the downstream opening, adjacent to the stilling basin and outlet channel. This structure is cave-like with no visibility without an artificial light source.

Wappapello staff observed the conduit opening for bat activity in spring and fall 2022. The results of the emergence surveys indicate that bats are still using the conduit structure. Additionally, Gray Bats utilize culverts in the vicinity of Wappapello Lake.

Potential Impacts to Gray Bats

Depending on the time of year, bats may be utilizing the conduit structure as shelter. Construction activities at the main dam embankment may cause noise and vibration disturbances. No human entrance into the conduit would occur. However, disturbance which results in arousal from torpor requires an increase in total energy expenditure at a time when food and water resources are likely scarce or unavailable, and increases the probability of mortality in bats with limited fat stores.

If bats are present within the dam conduit, the number present is expected to be low. Bats which flee the conduit or relocate either within or outside the conduit may use energy reserves that cannot be adequately replenished. Over time, this may result in reduced reproductive fitness.

Construction and maintenance related activities may temporarily discourage bats from foraging in the immediate vicinity of the proposed action areas. Minimal tree clearing is anticipated, and those identified for removal do not exhibit bat roost tree characteristics. In the event that trees \geq 3" dbh need to be removed from the proposed action area, removal would be restricted to the 1 November – 15 March bat non-active period (unless deemed an imminent safety hazard).

Determination of Effects

Due to the small number of bats suspected to sporadically use the structures, as well as the conservation measures discussed in Section 3.4.8.1, no cumulative effects to the Gray Bat population are anticipated. Based on the site specific information which includes a small potential for indirect adverse effects to individual Gray Bats, the USACE St. Louis District has determined that the Wappapello Dam Safety Modification "may affect, but not likely to adversely affect" the Gray Bat.

3.4.8.3 Indiana Bats

Legal Status

The Indiana Bat is federally listed as 'Endangered' and additional information regarding its legal status can be found on the <u>ECOS species profile</u>.

Recovery Plans

Available recovery plans for the Indiana Bat can be found on the ECOS species profile.

Life History Information and Identified Resource Needs

Indiana Bats range from the northeast United States to the Midwest, reaching its western range limit in Iowa, Missouri, and Oklahoma, and are considered to potentially occur in any area with forested habitat (U.S. Fish and Wildlife Service 2007b). Indiana Bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines.

In spring, Indiana Bats emerge from hibernation. Females form nursery colonies under the loose bark of trees (dead or alive) and/or in cavities, where each female gives birth to a single young in mid-June and early July and then nursing continues until weaning, which is shortly after young become volant (able to fly) in mid- to late-July. Males appear to roost singly or in small groups, except during brief summer visits to hibernacula. Males have been observed roosting in trees as small as 3 inches dbh, but the average roost diameter for male Indiana Bats is 13 inches (U.S. Fish and Wildlife Service 2007b).

During the summer, Indiana Bats frequent the corridors of small streams with well-developed riparian woods, as well as mature bottomland and upland forests (U.S. Fish and Wildlife Service 2007b). They forage for insects along stream corridors, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fence rows, and over farm ponds and in pastures (U.S. Fish and Wildlife Service 2007b). It has been shown that the foraging range for the bats varies by season, age and sex and ranges up to 81 acres (U.S. Fish and Wildlife Service 2007b). Migration back to the hibernaculum may begin in August, peak in September, and continue into October.

The most significant threat facing Indiana Bat populations today is white-nose syndrome. Other major range wide threats to the Indiana Bat include habitat loss and degradation, forest fragmentation, winter disturbance, environmental contaminants, non-native invasive species, climate change, and wind turbines (U.S. Fish and Wildlife Service 2019a). Disturbance of hibernating Indiana Bats seldom results in immediate mortality of bats within the hibernacula, except in cases of vandalism when bats are purposely killed (U.S. Fish and Wildlife Service 2019a).

Species Presence and Use

Site specific information includes suitable summer roosting and foraging habitat within the forested and lake/river areas within the Wappapello Lake boundaries, recorded Indiana Bat captures and a maternity roost within five miles of the Wappapello Dam outlet works in 2012, no impacts to caves or mines, minimal tree clearing, removal of trees > 3" dbh restricted to 1 Nov – 15 March, and no surveys indicating which bat species (other than Gray Bats) use the conduit structure. However, there are a few documented instances of Indiana Bats using human-made non-mine or cave hibernacula.

Potential Impacts to Indiana Bats

Although the potential for Indiana Bats to utilize the conduit are presumed to be less than that for Gray Bats, the potential impacts to Indiana Bats are consistent with those described for the Gray Bat.

Effects Determination – Indiana Bats

Due to the small number of Indiana Bats which may sporadically use the structures, as well as the conservation measures discussed in Section 3.4.8.1, no cumulative effects to the Indiana Bat population are anticipated. Based on the site specific information which includes a small potential for indirect adverse effects to individual Indiana Bats, the USACE St. Louis District has determined that the Wappapello Dam Safety Modification "may affect, but not likely to adversely affect" the Indiana Bat.

3.4.8.4 Northern Long-Eared Bats

Legal Status

The Northern Long-eared Bat is federally listed as 'Endangered' and additional information regarding its legal status can be found on the <u>ECOS species profile</u>.

Recovery Plans

Available recovery plans for the Northern Long-eared Bat can be found on the <u>ECOS species</u> profile.

Life History Information and Identified Resource Needs

The Northern Long-eared Bat (NLEB) is found across much of the eastern and north central United States, and all Canadian provinces from the Atlantic Ocean west to the southern Yukon Territory and eastern British Columbia (U.S. Fish and Wildlife Service 2022a). NLEBs are thought to predominantly overwinter in hibernacula that include caves and abandoned mines that have relatively constant, cooler temperatures, high humidity, and no strong currents. NLEBs have also

been observed overwintering in other types of habitat that have similar conditions to cave or mine hibernacula (U.S. Fish and Wildlife Service 2022a).

Typical of most bat species in the eastern United States, northern long-eared bats migrate between winter hibernacula and summer roosting habitat. When female northern long-eared bats emerge from hibernation, they migrate to maternity colonies. NLEBs typically roost singly or in maternity colonies underneath bark or more often in cavities or crevices of both live trees and snags. NLEBs are flexible in tree species selection in that tree species that form suitable cavities or retain bark will be used by the bats opportunistically. Males' and non-reproductive females' summer roost sites may also include cooler locations, including caves and mines. To a lesser extent, NLEBs have also been observed roosting in colonies in human-made structures, such as in buildings, in barns, on utility poles, behind window shutters, in bridges, and in bat houses (U.S. Fish and Wildlife Service 2022a).

NLEBs are nocturnal foragers and feed on moths, flies, leafhoppers, caddisflies, arachnids, and beetles, with diet composition differing geographically and seasonally. Foraging occurs primarily 3-10 ft above the ground, above the understory but under the canopy on forested hillsides and ridges, rather than along riparian areas. Foraging also takes place over small forest clearings and water, and along roads (U.S. Fish and Wildlife Service 2022a).

There are countless stressors affecting NLEB, however the primary factor influencing the viability of the NLEB is white-nose syndrome. Other primary factors that influence NLEB's viability include wind energy mortality, effects from climate change, and habitat loss. Habitat loss may include loss of suitable roosting or foraging habitat, resulting in longer flights between suitable roosting and foraging habitats due to habitat fragmentation, fragmentation of maternity colony networks, and direct injury or mortality. Loss of or modification of winter roosts (i.e., making hibernaculum no longer suitable) can result in impacts to individuals or at the population level.

Species Presence and Use

Surveys recorded NLEB capture within five miles of the Wappapello Dam outlet works in 2012, 2014, and 2015. While no NLEBs have been observed using the main dam structures, studies reveal that NLEBs have been observed overwintering in habitats with conditions similar to cave or mine hibernacula.

Potential Impacts to Northern long-eared Bats

Northern Long-eared Bats have the potential to utilize the dam conduit, as it may provide marginal roosting habitat. The potential impacts to northern long-eared bats are consistent with those described for the Gray Bat.

Effects Determination - Northern Long-eared Bats

Due to the small number of Northern Long-eared Bats which may sporadically use the structures, as well as the conservation measures discussed in Section 3.4.8.1, no cumulative effects to the Northern Long-eared Bat population are anticipated. Based on the site specific information which includes a small potential for indirect adverse effects to individual Northern Long-eared Bats, the USACE St. Louis District has determined that the Wappapello Dam Safety Modification *"may affect, but not likely to adversely affect"* the Northern Long-eared Bat.

3.4.8.5 Tricolored Bats

Legal Status

The Tricolored Bat is federally listed as "Proposed Endangered' and additional information regarding its legal status can be found on the <u>ECOS species profile</u>.

Recovery Plans

Available recovery plans for the Tricolored Bat can be found on the ECOS species profile.

Life History Information and Identified Resource Needs

Tricolored Bats are hibernate in caves and abandoned mines, although in the southern United States, where caves are sparse, Tricolored Bats are often found roosting in road-associated culverts where they exhibit shorter torpor bouts and forage during warm nights. They prefer caves that are humid and warm. During the spring, summer, and fall, Tricolored Bats are found in forested habitats where they roost in trees, primarily among leaves of live or recently dead deciduous hardwood trees, but may also be found in Spanish moss, pine trees, and occasionally human structures (U.S. Fish and Wildlife Service 2021a). They also sometimes roost in caves during summer. They forage for insects high in the air along forest edge and the boundary of streams or open bodies of water. Tricolored Bats mate during spring, fall, and sometimes in the winter. Maternity colonies begin forming in mid-April and females bear 1 to 2 pups by late May to mid-July. Tricolored Bats face extinction due primarily to the rangewide impacts of white-nose syndrome.

Species Presence and Use

Surveys through 2021 did not record Tricolored Bat capture within five miles of the Wappapello Dam outlet works. While no Tricolored Bats have been observed using the main dam structures, studies reveal that Tricolored Bats have been observed overwintering in habitats with conditions similar to cave or mine hibernacula.

Potential Impacts to Tricolored Bats

Tricolored Bats have the potential to utilize the dam conduit, as it may provide marginal roosting habitat. The potential impacts to Tricolored Bats are consistent with those described for the Gray Bat.

Effects Determination - Tricolored Bats

Due to the small number of Tricolored Bats which may sporadically use the structures, as well as the conservation measures discussed in Section 3.4.8.1, no cumulative effects to Tricolored Bat populations are anticipated. Based on the site specific information which includes a small potential for indirect adverse effects to individual Tricolored Bats, the USACE St. Louis District has determined that the Wappapello Dam Safety Modification "may affect, but not likely to adversely affect" Tricolored Bats.

3.4.8.6 Alligator Snapping Turtle

Legal Status

The Alligator Snapping Turtle is federally listed as ' Proposed Threatened ' and additional information regarding its legal status can be found on the <u>ECOS species profile</u>.

Recovery Plans

Available recovery plans for the Alligator Snapping Turtle can be found on the <u>ECOS species</u> profile.

Life History Information and Identified Resource Needs

Alligator Snapping Turtles are large aquatic reptiles that inhabit large rivers, loughs and oxbow lakes in southern and southeastern Missouri (U.S. Fish and Wildlife Service 2021b). They are also known to occur in reservoirs and upland Ozark streams. This species is completely aquatic and only rarely exits the water to bask in the sun. They spend most of their time submerged in deep water near structure like roots or sunken logs. According to the Missouri Department of Conservation, overharvesting, water pollution, bycatch from fishing gear, and extensive habitat alteration are the main reasons for the decline of this species in the state. This species is expanding its range, as evidenced by increased reports within reservoirs and upland Ozark streams in the southern part of the state.

Species Presence and Use

The use of the habitat in the vicinity of the proposed action area by Alligator Snapping Turtles is unknown. This may be due to the rarity of the species in the vicinity, or the sparsity of survey data due to the recent federal listing of the species. However, moderately suitable habitat may exist for juveniles in the slough, and for juveniles and adults in the nearby Lower St. Francis River.

Potential Impacts to Alligator Snapping Turtles

Alligator Snapping Turtles using the slough as habitat may be disturbed by the lowering of the water level during construction. Dewatering of the slough would occur when water temperatures are above 55°F if practicable. Since Alligator Snapping Turtles rarely exit the water, it is unlikely that terrestrial construction activity would cause direct effects. Some construction activities may cause soil compaction or result in minor temporary indirect adverse impacts, such as a very slight increase in turbidity.

Effects Determination

No cumulative effects to Alligator Snapping Turtle populations are anticipated. Based on the site specific information which includes a small potential for indirect adverse effects to individual Alligator Snapping Turtles, the USACE St. Louis District has determined that the Wappapello Dam Safety Modification "*may affect, but not likely to adversely affect*" Alligator Snapping Turtles.

3.4.8.7 Rabbitsfoot

Legal Status

The Rabbitsfoot mussel (*Quadrula cylindrica*) is federally listed as "Threatened" and additional information regarding its legal status can be found on the <u>ECOS species profile</u>.

Recovery Plans

Available recovery plans for the Rabbitsfoot can be found on the ECOS species profile.

Life History Information and Identified Resource Needs

Rabbitsfoot is primarily an inhabitant of small to medium sized streams and some larger rivers. In Missouri, the Rabbitsfoot mussel has been reported from the Spring (Upper Arkansas system), Black and St. Francis Rivers (Oesch 1984). The St. Francis River is a major tributary of the lower Mississippi with its headwaters in southeastern Missouri and flowing south into northeastern Arkansas. The Rabbitsfoot mussel usually occurs in shallow water areas along the bank and adjacent runs and shoals with reduced water velocity. Specimens also may occupy deep water runs, having been reported in 9 to 12 feet of water. Bottom substrates generally include gravel and sand (Parmalee 1998).

Similar to other freshwater mussels, the Rabbitsfoot has a complex reproductive cycle that includes an obligate ectoparasitic stage that requires a fish host for successful reproduction (U.S. Fish and Wildlife Service 2019b). Suitable fish hosts for Rabbitsfoot populations west of the Mississippi River include blacktail shiner (*Cyprinella venusta*) and cardinal shiner (*Luxilus cardinalis*), red shiner (*C. lutrensis*), spotfin shiner (*C. spiloptera*), and bluntface shiner (*C.*

camura) (Fobian 2007). In addition, rosyface shiner (*Notropis rubellus*), striped shiner (*L. chrysocephalus*), and emerald shiner (*N. atherinoides*) sometime serve as hosts for rabbitsfoot (Fobian 2007).

Threats to Rabbitsfoot populations include impoundments, which result in alteration of river flow within impounded areas, increased sediment deposition, altered water quality, changes in hydrology and channel geomorphology, decrease habitat heterogeneity, altered flood patterns, and blockage of upstream and downstream movement of mussels and their fish hosts. Additional threats include chemical contaminants, gravel and metal mining, temperature changes, and introduction of non-native clams and mussels (U.S. Fish and Wildlife Service 2019b).

Species Presence and Use

Within the St. Francis River, the Rabbitsfoot is primarily known from the upper St. Francis mainstem in Wayne and Butler counties, Missouri, above Wappapello Lake, and a single tributary, Big Creek, also in Wayne County. Site specific information includes no known populations in the vicinity of or below the Wappapello dam (U.S. Fish and Wildlife Service 2019b) (V. Kuczynska, USFWS, pers. comm.).

In 2002, (Hutson 2004) surveyed 32 sites along the St. Francis River mainstem and reported 16 live specimens from 3 sites located in the upper river between RMs 218.0 and 172.1 in Wayne County, Missouri. At the time of listing, biologists determined the status of this population as declining with most records of occurrence limited to a <20-mile reach of the main stem in Wayne County (U.S. Fish and Wildlife Service 2019b). Data collected since listing suggest this portion of the population in Wayne County, Missouri, is stable. In 2014 and 2016, biologists reported 20 and an unknown number of live specimens, respectively, with evidence of recruitment both years from sites along this same reach of the upper St. Francis River (U.S. Fish and Wildlife Service 2019b). The survey conducted by Hutson and Barnhart (2004) between 2001-2003 is the latest information available for the stretch of the St. Francis below Wappapello Dam (S. McMurray, MDC malacologist, pers. comm.; V. Kuczynska, USFWS, pers. comm.). A spot survey conducted by MDC for the Missouri Department of Transportation at the Wayne County Road 517 bridge crossing downstream of the Dam about 10 years ago did not result in finding much at all (S. McMurray, MDC malacologist, pers. comm.).

Potential Impacts to Rabbitsfoot Mussel

No potential adverse impacts to known Rabbitsfoot mussel populations above Wappapello Dam have been identified.

Effects Determination

Site specific information includes no Rabbitsfoot mussels identified below Wappapello Dam based on data collected between 2001-2003 (Hutson 2004), communication from FWS stating

that "the Rabbitsfoot populations we know of are all located in the St. Francis River a ways upstream of the reservoir". Thus the USACE St. Louis District has determined that the Wappapello Dam Safety Modification would have "*no effect*" on the Rabbitsfoot mussel.

3.4.8.8 Snuffbox Mussel

Legal Status

The Snuffbox Mussel is federally listed as "Endangered" and additional information regarding its legal status can be found on the <u>ECOS species profile</u>.

Recovery Plans

Available recovery plans for the Snuffbox Mussel can be found on the ECOS species profile.

Life History Information and Identified Resource Needs

The Snuffbox is found in small- to medium-sized creeks, to larger rivers, and in lakes (U.S. Fish and Wildlife Service 2022b). The species occurs in swift currents of riffles and shoals and wavewashed shores of lakes over gravel and sand with occasional cobble and boulders. Individuals generally burrow deep into the substrate, except when spawning or attempting to attract a host. The general biology of the snuffbox is similar to other bivalved mollusks belonging to the family Unionidae. Adults are suspension-feeders, spending their entire lives partially or completely buried within the substrate. Adults feed on algae, bacteria, detritus, microscopic animals, and dissolved organic material (U.S. Fish and Wildlife Service 2022b). Similar to other freshwater mussels, the Snuffbox has a complex reproductive cycle that includes an obligate ectoparasitic stage that requires a fish host for successful reproduction. Juvenile Snuffbox have successfully transformed on logperch (*Percina caprodes*), blackside darter (*Percina maculata*), rainbow darter (*Etheostoma caeruleum*), Iowa darter (*Etheostoma exile*), blackspotted topminnow (*Fundulus olivaceous*), mottled sculpin (*Cottus bairdii*), banded sculpin (*Cottus carolinae*), Ozark sculpin (*Cottus hypselurus*), largemouth bass (*Micropterus salmoides*), and brook stickleback (*Culaea inconstans*) in laboratory tests (USFWS 2022 and citations therein).

Species Presence and Use

Snuffbox records exist for Butler, Wayne, and Stoddard Counties, Missouri, where it was considered "locally abundant" (U.S. Fish and Wildlife Service 2022b). The species is known from above Wappapello Reservoir, but was absent from Missouri surveys conducted below Wappapello Dam in 1983, 1986, and 2002 (U.S. Fish and Wildlife Service 2022b). The snuffbox has been collected more recently from the St. Francis River upstream of Wappapello Reservoir. Twelve live snuffbox were sampled at sites in 2002. Live individuals were found during collections at river mile 172.1 in 2005 and 2006 (U.S. Fish and Wildlife Service 2022b). The Snuffbox is restricted to a 10-mile reach between river miles 172.1–182.0 on the northeastern edge of the Ozark Plateaus in the vicinity of Sam A. Baker State Park, Wayne County, Missouri (U.S. Fish and

Wildlife Service 2022b). The most recent collections within this reach include three live individuals found in 2014 and live or fresh dead record(s) from 2016 (U.S. Fish and Wildlife Service 2022b).

Potential Impacts to Rabbitsfoot Mussel

No potential adverse impacts to known Snuffbox mussel populations above Wappapello Dam have been identified.

Effects Determination

Site specific information includes no Snuffbox mussels identified below Wappapello Dam . Thus the USACE St. Louis District has determined that the Wappapello Dam Safety Modification would have "*no effect*" on the Snuffbox mussel.

3.4.8.9 Western Fanshell

Legal Status

The Western Fanshell is federally listed as "Threatened" and additional information regarding its legal status can be found on the <u>ECOS species profile</u>.

Recovery Plans

Available recovery plans for the Western Fanshell can be found on the ECOS species profile.

Life History Information and Identified Resource Needs

In Missouri, the Western Fanshell has been recorded from the Black, Little Black, Cane Creek, Current and Spring Rivers (Black/White river system), the St. Francis River, Castor River, and from the North Fork Spring River and Spring River (upper Arkansas system) (Hutson 2004). Fanshell mussels are typically found in large creeks and rivers with good water quality, moderate to swift current and gravel-sand substrates. Like most freshwater mussels, fanshells, occur in aggregations (mussel beds) that vary in size and are often separated by stream reaches where mussels are absent or rare. Specific information on microhabitat requirements is lacking. Habitat utilized by fanshell mussels is not static over time, and suitable habitat patches may disappear and re-emerge in different locations. The lifespan for fanshell mussels is unknown, but is estimated to range from 6 to 26 years, with a mean age at death of 12-13 years (U.S. Fish and Wildlife Service 2020a).

As with most freshwater mussels, the fanshell mussels have a unique life cycle that relies on fish hosts for successful reproduction. Freshwater mussels are generally immobile. They disperse primarily through the behavior of host fish and their tendencies to travel upstream and against the current in rivers and streams. Fanshell mussels are long-term brooders, typically spawning

from August – October and release conglutinates in early spring (U.S. Fish and Wildlife Service 2020a).

Mussels are omnivores that primarily filter feed on a wide variety of microscopic particulate matter suspended in the water column, including phytoplankton, zooplankton, bacteria, detritus, and dissolved organic matter. Juveniles likely pedal feed in the sediment, whereas adults filter feed from the water column (U.S. Fish and Wildlife Service 2020a).

Resource needs include stable river channels and banks, a hydrologic flow regime which maintains benthic habitats, lateral and longitudinal habitat connectivity, suitable water quality, presence and abundance of fish hosts, no or low numbers of competitive or predaceous nonnative species. Mussels are adapted to periodic high and low flows; however, excessively high flows may lead to scouring of suitable substrate, and prolonged exposure to non-watered environments is not tolerable.

Historically, Western Fanshell occurred from directly below Wappapello Dam in Missouri, to the Interstate 40 crossing approximately 2.3 river miles (RM) (3.7 rkm) upstream of Madison, Arkansas (approximately 238.5 RM or 383.9 rkm). The Lower St. Francis River is approximately 283 RM (456 rkm), but Western Fanshell only occurs at one site 0.5 RM (0.8 rkm) below Wappapello Dam, and only five live individuals were collected (Hutson 2004). Hutson and Barnhart (2004) stated that although they found numerous mussels immediately downstream of Wappapello Dam, the lower St. Francis mainstem did not provide suitable mussel habitat and mussels were only sporadically collected. Species collected from the mussel bed located approximately 0.5 RM below Wappapello Dam by Hutson and Barnhart (2004) include: Bankclimber (live), Bluefer (live), Creeper (live), Deertoe (live), Fawnsfoot (weathered dead), Mapleleaf (live), Mucket (weathered dead), Pimpleback (live), Pink Papershell (live), Pistolgrip (live), Plain Pocketbook (live), Rock Pocketbook (weathered dead), Round Pigtoe (weathered dead), Threehorn Wartyback (live), Threeridge (live), Wabash Pigtoe (weathered dead), Western Fanshell (live), White Heelsplitter (live), and Yellow Sandshell (fresh dead). The survey conducted by Hutson and Barnhart (2004) between 2001-2003 is the latest information available for the stretch of the St. Francis below Wappapello Dam (S. McMurray, MDC malacologist, pers. comm.). A spot survey conducted by MDC for the Missouri Department of Transportation at the Wayne County Road 517 bridge crossing downstream of the Dam about 10 years ago did not result in finding much at all (S. McMurray, MDC malacologist, pers. comm.).

USFWS (2020a) states that the current condition evaluation for this Western Fanshell population found that population size, extent, and reproduction/recruitment were in low condition despite all habitat factors being in medium condition (U.S. Fish and Wildlife Service 2020a). They suggest that metrics other than those evaluated in the assessment are influencing population resiliency. The population was assigned an overall low current condition based on all population factors being low and PE of one site.

The primary threats affecting the Western Fanshell include water quality degradation, altered flow, landscape changes, and habitat fragmentation, all of which are exacerbated by the effects of climate change (U.S. Fish and Wildlife Service 2020a).

Species Presence and Use

Mussel beds may be constrained by threshold limits at both flow extremes. Under low flow conditions, mussels may require a minimum flow to transport nutrients, oxygen, and waste products. Under high flow conditions, areas with relatively low flow may provide a refuge for mussels (U.S. Fish and Wildlife Service 2020a). Fanshell mussels undoubtedly evolved in the presence of extreme hydrological conditions to some degree, including severe droughts leading to dewatering, and heavy rains leading to damaging scour events and movement of mussels and substrate, although the frequency, duration, and intensity of these events may be different from today. On 3 May 2011 and 2 May 2017, flood waters overtopped the auxiliary spillway at Wappapello Lake and scoured out Missouri Highway T. The 2011 post-flood changes were extensive. Scour removed 25 vertical feet of material along the entire face of the spillway. The area downstream of the spillway was eroded to bedrock in numerous locations, while other locations revealed 8+ feet high remnants of material. The scoured area reached 500+ ft downstream of the dam, removing as much as 40+ vertical feet of material in the main drainage path. Cobble to boulder-size material was carried a distance of up to 2000 ft from the spillway. The confluence of the outlet channel and spillway channel itself was covered in fine material. The left descending bank of the outlet channel showed extensive tree damage from erosive velocities exiting the spillway channel. Lake staff indicated that additional material had washed down the St. Francis River until settling out in a bend. In 2017, flow reached nearly 22,000 cubic feet per second at the height of the overflow.

Based on these events, it is unknown whether this habitat patch utilized by fanshell mussels is suitable and present at this location. USACE sought to conduct a mussel survey downstream of Wappapello Dam in coordination with MDC. A preliminary reconnaissance conducted by Dave Knuth (MDC) and Eric Lemons (USACE) indicated that the downstream shallow area was mainly unconsolidated sand and fine gravel, and the area likely would not be suitable for mussels (D. Knuth, MDC Biologist, pers. comm.).

Potential Impacts to Western Fanshell

No impacts to water quality or quantity; substrate disturbance; or impacts to fish hosts downstream of Wappapello dam are anticipated.

Effects Determination

Based on site specific information including an overall low population condition based on data collected between 2001-2003, two subsequent flood and high scour events (2011 and 2017), the

adaptability of mussels to periodic high and low flows, and no anticipated impacts to the lower St. Francis river, the USACE St. Louis District has determined that the Wappapello Dam Safety Modification "*may affect, but not likely to adversely affect*" the Western Fanshell mussel.

3.4.8.10 Monarch Butterfly

Legal Status

The Monarch Butterfly is federally listed as "Candidate" and additional information regarding its legal status can be found on the <u>ECOS species profile</u>. As a candidate species, consultation with U.S. Fish and Wildlife Service under section 7 of the Endangered Species Act is not required for the monarch butterfly. USACE is choosing to include the species in the evaluation of the periodic maintenance and inspection of the Wappapello Dam project, and to take advantage of any opportunity to conserve the species.

Recovery Plans

Available recovery plans for the Monarch Butterfly can be found on the ECOS species profile.

Life History Information and Identified Resource Needs

Monarch populations of eastern North America have declined 90%. Much of the monarch butterfly's life is spent migrating between Canada, Mexico, and the U.S. Monarchs do not overwinter in Missouri (U.S. Fish and Wildlife Service 2020b). The Monarch occurs in a variety of habitats where it searches for its host plant, milkweed. Of the over 100 species of milkweed that exist in North America, only about one fourth of them are known to be important host plants for monarch butterflies. The main monarch host plant is Common Milkweed (*Asclepias syriaca*) (Kaul 2019). Other common hosts include Swamp Milkweed (*Asclepias incarnata*), Butterflyweed (*Asclepias tuberosa*), Whorled Milkweed (*Asclepias verticillata*), and Poke Milkweed (*Asclepias exaltata*). Three factors appear most important to explain the decline of Monarchs: loss of milkweed breeding habitat, logging at overwintering sites, and climate change and extreme weather. In addition, natural enemies such as diseases, predators, and parasites, as well as insecticides used in agricultural areas may also contribute to the decline.

Potential Impacts to Monarch Butterfly

Potential impacts to larvae and adults could involve the removal of host milkweed plants, construction noise, and other disturbances. Some milkweed has been established near the Project Office; however, it is not currently located in the proposed action areas. Marginal habitat may be present the proposed action areas. If present, milkweed may be disturbed or destroyed during construction activities and within the required vegetation free zones necessary for dam safety during routine mowing. Wappapello Lake is not an over-wintering site for the Monarch Butterfly.

Effects Determination – Monarch Butterfly

Based on the site specific conditions, the USACE St. Louis District has determined that the Wappapello Dam Safety Modification *"is not likely to jeopardize the continued existence"* of the Monarch Butterfly.

Coordination with the USFWS regarding the Endangered Species Act, Fish and Wildlife Coordination Act, Migratory Bird Treaty Act is ongoing and will be completed prior to signing a NEPA decision document (FONSI or ROD).

3.5 CUMULATIVE IMPACTS

Cumulative effects as described by the Council on Environmental Quality (CEQ) for implementing the National Environmental Policy Act (NEPA) are "the impact on the environment which results from the incremental impact of the actions when added to other past, present, and reasonably foreseeable future action regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" [40 CFR § 1508].

3.5.1 Geographic (Spatial) and Temporal Boundaries

The geographic boundary for the action area was defined as all lands and waters within the watershed. The temporal boundary for the cumulative effects analysis is the past 50 years, the present, and the next 50 years. Proposed activities would be implemented within the next five years (funding dependent) and effects of these actions would be most evident during implementation and immediately upon completion.

3.5.2 Cumulative Effects By Resource

The remainder of this chapter describes the results of the cumulative effects analysis for each resource considered from Chapter 3. Table EA-6 provides the cumulative effects analysis which includes the past, present and reasonably foreseeable actions that might impact each resource category identified to have an incremental cumulative effect. If a resource was not identified to have a cumulative effect, then this resource was not discussed in detail. The cumulative effects analysis identifies future conditions of the No Action (without project) and with the project (discussed in whole, as an alternative, unless otherwise noted). Table EA-7 is a checklist identifying potential incremental cumulative effects on the resources affected by the action alternatives.

Resource	Past Actions	Present Actions	Future Actions	No Action Alternative	Considered Action Alternatives
Geology, Topography, and Soils & Floodplain	Conversion of St. Francis River to reservoir at Wappapello Lake; conversion of forest and prairies to agriculture and recreational facilities	Maintenance of lake facilities and farmlands	Maintenance of lake facilities and farmlands	Continued unfiltered underseepage from dam	Small amount of fill material placed for filter berm
Noise	Conversion of St. Francis River to reservoir at Wappapello Lake; conversion of forest and prairies to agriculture and recreational facilities	Recreation and agriculture	Recreation and agriculture	Recreation and agriculture	Short-term construction
Water & Air Quality & Greenhouse Gasses	Conversion of St. Francis River to reservoir at Wappapello Lake; conversion of forest and prairies to agriculture and recreational facilities. Increasing human populations and industrialization result in increased water quality problems. Establishment of Clean Water Act, Clean Air Act, NEPA, USEPA, state environmental agencies and associated regulations greatly improve conditions	Recreation and agriculture	Recreation and agriculture	Recreation and agriculture	Control seepage under dam

 Table EA-6.
 Cumulative Effects Analysis for Identified Resources.

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Resource	Past Actions	Present Actions	Future Actions	No Action Alternative	Considered Action Alternatives
Aesthetics and Recreation	Conversion of St. Francis River to reservoir at Wappapello Lake; conversion of forest and prairies to agriculture and recreational facilities	Recreation	Recreation	Recreation	Short-term construction; closed archery range
Traffic and Roadways	Conversion of St. Francis River to reservoir at Wappapello Lake	Operation and maintenance	Operation and maintenance	Operation and maintenance	Short-term construction; additional construction traffic on local roads
Socio- Economic, Demographics, & Environmental Justice	Conversion of St. Francis River to reservoir at Wappapello Lake; agriculture and recreational facilities.	Recreation; Operation and maintenance	Recreation; Operation and maintenance	No increase in dam safety	Increase safety of dam
Cultural & Tribal Resources	Recognition and protection of historic, cultural, and tribal resources through the passage of several Federal Laws	Recreation and agriculture	Recreation and agriculture	Recreation and agriculture	Features are designed to reduce dam underseepage no impact to cultural and tribal resources
Resource	Past Actions	Present Actions	Future Actions	No Action Alternative	Considered Action Alternatives
---	---	---	---	---	---
Terrestrial & Wildlife; Aquatic Organisms, & Wetlands	Conversion of St. Francis River to reservoir at Wappapello Lake; conversion of forest and prairies to agriculture and recreational facilities; habitat fragmentation and conversion	Monitoring of fish and wildlife species and habitat by Federal and state agencies; implementatio n of small- scale habitat improvement measures	Monitoring of fish and wildlife species and habitat by Federal and state agencies; implementatio n of small- scale habitat improvement measures	Continued unfiltered underseepage from dam	Temporary, minor, local impacts due to construction, but not likely to adversely affect organisms or habitat. Conservation measures and best management practices would be implemented to avoid and minimize impacts to T&E species would also benefit other species
Invasive Species	Conversion of St. Francis River to reservoir at Wappapello Lake; conversion of forest and prairies to agriculture and recreational facilities; habitat fragmentation and conversion; Establishment of federal and state environmental regulations improve conditions. Invasive species removal	Federal and state regulations regarding BMP to reduce invasive species; invasive species removal	Federal and state regulations regarding BMP to reduce invasive species; invasive species removal	Federal and state regulations regarding BMP to reduce invasive species; invasive species removal	Best management practices would be implemented to avoid and minimize introduction and/or spread of invasive species

Draft Environmental Assessment - Wappapello Dam Safety Modification Study Wayne County, Missouri – UNCLASSIFIED NEPA Unique ID: EAXX-202-00-MVS-1725012636

Resource	Past Actions	Present Actions	Future Actions	No Action Alternative	Considered Action Alternatives
Bald Eagles and Migratory Birds	Listing and delisting of species under ESA; passage of Bald and Golden Eagle Protection Act; passage of Migratory Bird Treaty Act; habitat loss and alteration	Operation and maintenance activities; recreational activities; local traffic	Operation and maintenance activities; recreational activities; local traffic	Continue present actions	Best management practices and conservations measures avoids trees with bald eagle nests. Measures implemented to minimize impacts to T&E species would also benefit migratory birds
Threatened & Endangered species	Recognition of T&E species through the Endangered Species Act (ESA); listing of multiple T&E species within the vicinity	Monitoring of fish and wildlife species, including T&E species, by Federal and state agencies	Monitoring of fish and wildlife species, including T&E species, by Federal and state agencies; implementatio n of small- scale habitat improvement measures	Continue present actions	Conservation measures and best management practices would be implemented to avoid impacts to T&E species

3.5.3 Cumulative Effects Determination

Adverse cumulative effects are not anticipated due to the implementation of this Dam Safety Modification. The USACE determined no adverse cumulative effects due to implementation of this project because the proposed actions would result in minimal adverse impacts to Wappapello Lake properties, habitat, and surrounding areas, and would reduce unacceptable dam safety risks to the local residents and downstream populations. Impacts are summarized in Tables EA-6 and EA-7.

No Action Alternative Future Effects Compared to Existing Conditions (Effects of Nature)		Symbols: X = Long-Term Effect T = Temporary Effect C = Cumulative Impact	Proposed Alternative Effects of Action Alternatives to No Action Effects (Effects of Project)											
BEI	BENEFICIAL ADVERSE			BENEFICIAL ADVERS			SE							
SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT	Affected Resource	SIGNIFICANT SUBSTANTIAL MINOR			NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
							A. Physical Effects							
			Х				Topography, Geology, & Soils				Х			
			Х				Land Use/Land Cover				Х			
			Х				Prime Farmland				Х			
			Х				Noise					Х		
			Х				Water Quality				Х			
			Х				Air Quality					Х		
			Х				Climate				Х			
			Х				Hazardous Waste				Х			
							B. Biological Effects							
			Х				Aquatic Habitat					Χ		
			Х				Terrestrial Habitat				Х			
			Х				Bald Eagle				Х			
			Х				Migratory Birds					Х		
			Х				Invasive Species				Х			
			Х				State-listed Species					Х		
			Х				Federally-listed Species					Х		
							B. Social Effects							
				Х			Economics			С				
			Х				Aesthetics					Х		
			Х				Recreation					Х		
			Х				Cultural Resources, Historic Prop.				Х			
			Χ				Tribal Resources				Χ			
				Х			Environmental Justice			С				

 Table EA-7.
 Checklist for Identifying Potential Cumulative Effects.

4 RELATIONSHIP OF PLAN TO ENVIRONMENTAL REQUIREMENTS

The relationship of the Extended Filter Berm + Relief Wells (Tentatively Selected Plan) to environmental requirements, environmental acts, and /or executive orders is shown in Table EA-8.

Table EA-8. Relationship of the Recommended Plan to environmental requirements, environmental acts, and/or executive orders.

Federal Policy	Compliance Status
National Environmental Policy Act, 42 USC 4321-4347	Partial ¹
Water Resources Development Acts of 1986, 1990, 2000 and 2007	Full
Migratory Bird Treaty Act of 1918, 16 USC 703-712	Partial ²
Comprehensive Environmental Response, Compensation, and Liability Act, 42 USC 9601-9675	Full
Resource Conservation and Recovery Act, 42 USC 6901-6987	Full
Endangered Species Act, 16 USC 1531-1543	Partial ²
National Historic Preservation Act, 16 USC 470 et seq.	Full
Noise Control Act, 42 USC 7591-7642	Full
Clean Air Act, 42 USC 7401-7542	Full
Prevention, Control, and Abatement of Air and Water Pollution at Federal Facilities (EO 11282 as amended by EOs 11288 and 11507)	Full
Protection and Enhancement of the Cultural Environment (EO 11593)	Full
Floodplain Management (Executive Order 11988)	Partial ³
Protection of Wetlands (EO 11990 as amended by EO 12608)	Full
Protection and Enhancement of Environmental Quality (EO 11991)	Full
Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898)	Full
Protection of Migratory Birds (EO 13186)	Partial ²
Bald and Golden Eagle Protection Act, 42 USC 4151-4157	Full
Clean Water Act, 33 USC 1251-1375	Full
Rivers and Harbors Act, 33 USC 401-413	Full
Fish and Wildlife Coordination Act, 16 USC 661-666c	Partial ²

¹ Full compliance after submission for public comments and signing of FONSI

² Required permits, coordination will be sought during document review

³All applicable local floodplain permits would be received prior to commencing this project

5 COORDINATION AND PUBLIC REVIEW

Notification of this Draft Environmental Assessment and unsigned Finding of No Significant Impact was sent to the officials, agencies, organizations, and individuals listed below for review and comment (Table EA-8). Additionally, an electronic copy was available on the U.S. Army Corps of Engineers St. Louis District's website during the public review period at:

http://www.mvs.usace.army.mil/Missions/ProgramsProjectManagement/PlansReports.aspx during the public review period.

Please note that the Finding of No Significant Impact was unsigned during the public review period. These documents are to be signed into effect only after having carefully considered comments received as a result of the public review.

To assure compliance with the National Environmental Policy Act, Endangered Species Act, and other applicable environmental laws and regulations, coordination with these agencies will continue as required throughout the planning and construction phases of the proposed road relocation and EMR habitat restoration.

List of contacts for public notice of availability of draft EA unsigned Finding of No Significant Impact can be found in Appendix EA-1.

6 LIST OF PREPARERS

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8 FINDING OF NO SIGNIFICANT IMPACT

Wappapello Dam Safety Modification Study Wayne County, Missouri

PROJECT DESCRIPTION:

The U.S. Army Corps of Engineers, St. Louis District (Corps) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The Wappapello Dam Safety Modification Report and Environmental Assessment (DSMR/EA) for the Wappapello Dam Safety Modification Study (DSMS) addresses dam safety issues and deficiencies at Wappapello Dam in Wayne County, Missouri.

The EA, incorporated herein by reference, evaluated various alternatives that would address dam safety issues and deficiencies; define, estimate, and communicate risk; address non-breach and incremental risk through permanent flood risk management measures; and reduce incremental dam safety risk to tolerable levels in the study area. The Tentatively Selected Plan (TSP), also known as Risk Management Plan (RMP) 4b, includes construction of a filter berm that extends from the toe of the dam to approximately 140 feet past the access road. A second filter berm would be located near the left abutment. A system of 14 T-type relief wells would be added near the toe of the dam. This measure would include replacement of the road after construction. The asphalt road is approximately 400 feet long and 20 feet wide. An upgrade to the culvert under the road is required. After construction, the road would retain the original alignment but be on top of the berm near the end.

In addition to a "no action" plan, two final alternatives were evaluated. The alternatives included Alternative 3 – Relief Wells, and Alternative 4B – Expanded Filter Berms + Relief Wells.

SUMMARY OF POTENTIAL EFFECTS:

For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table FONSI-1:

Resource	Less than significant effects	Less than significant effects as a result of mitigation*	Resource unaffected by action
Aesthetics	\boxtimes		
Air quality	\boxtimes		
Aquatic resources/wetlands	\boxtimes		
Invasive species	\boxtimes		
Fish and wildlife habitat	\boxtimes		

Table FONSI-1: Summary of Potential Effects of the Recommended Plan

Resource	Less than significant effects	Less than significant effects as a result of mitigation*	Resource unaffected by action
Threatened/Endangered species/critical habitat	\boxtimes		
Historic properties	\boxtimes		
Other cultural resources	\boxtimes		
Floodplains	\boxtimes		
Hazardous, toxic & radioactive waste	\boxtimes		
Hydrology	\boxtimes		
Land use	\boxtimes		
Noise levels	\boxtimes		
Public infrastructure	\boxtimes		
Socio-economics	\boxtimes		
Environmental justice	\boxtimes		
Soils	\boxtimes		
Tribal trust resources	\boxtimes		
Water quality	\boxtimes		
Climate change			\boxtimes

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs) as detailed in the EA would be implemented, if appropriate, to minimize impacts.

No compensatory mitigation is required as part of the recommended plan. Federal actions associated with the structural modification of the Keystone Dam would not result in any net habitat loss.

Public review of the Draft EA was completed prior to finalizing the DSMS. All comments submitted during the public review period are responded to in the Final EA.

Pursuant to section 7 of the Endangered Species Act of 1973, as amended, the U.S. Army Corps of Engineers determined that the TSP *may affect but is not likely to adversely affect* the following federally listed species or their designated critical habitat: Gray Bat (*Myotis grisescens*), Indiana Bat (*Myotis lucifugus*), Northern Long-eared Bat (*Myotis septentrionalis*), Tricolored Bat (*Perimyotis subflavus*), Alligator Snapping Turtle (*Macrochelys temminckii*), and Western Fanshell mussel (*Cyprogenia aberti*). The TSP would have *no effect* on Rabbitsfoot mussel (*Quadrula cylindrica cylindrica*) and Snuffbox mussel (*Epioblasma triquetra*) or their designated critical habitat. Additionally, the TSP is *not likely to jeopardize the continued existence* of the Monarch Butterfly (*Danaus plexippus*). The U.S. Fish and Wildlife Service (FWS) concurred with the Corps' determination on DATE OF CONCURRENCE LETTER.

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that the TSP has no effect on historic properties. The Missouri Department of Natural Resources SHPO concurred with the determination on 5 April 2024.

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with section 404(b)(1) Guidelines (40 CFR 230). The TSP would meet the requirements of Nationwide Permit (NWP) No. 33 - Temporary Construction, Access, and Dewatering. The Missouri 401 water quality certification (WQC) is covered by a programmatic WQC in accordance with General and Specific Conditions for NWP No. 33. Conditions of the water quality certification will be implemented in order to minimize adverse impacts to water quality. This will ensure compliance with the Missouri Water Quality Standards antidegradation requirements for maintenance and protection of designated uses.

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed.

Completeness, effectiveness, efficiency, and acceptability criteria used in the formulation of alternative plans as specified in the <u>Principles and Requirements for Federal Investments in Water Resources</u>, March 2013. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on this report, the reviews by other Federal, State, and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

Date

Andy J. Pannier Colonel, U.S. Army District Commander