



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

Reply to:

01 April 2026

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

Dear Sir or Madam:

The U.S. Army Corps of Engineers St. Louis District is proposing to enhance federally managed land at Mark Twain Lake to produce sustainable summer maternity and foraging habitat for the Indiana Bat, as well as other forest dwelling species. Features of the proposed project would include openland/grassland and forest stand management activities. The Indiana Bat (*Myotis sodalis*), as well as other forest dependent bat species, are currently listed as endangered under the Endangered Species Act of 1973, as amended.

The Environmental Compliance Section (PD-C) of the St. Louis District, U.S. Army Corps of Engineers, has prepared a draft Environmental Assessment (EA), entitled, *Mark Twain Lake Indiana Bat Habitat Improvement Project, Monroe and Ralls Counties, Missouri*, dated March 2026. The purpose of this EA is to document existing conditions, evaluate potential impacts associated with each alternative and assist in planning and decision making for the Mark Twain Lake Indiana Bat Habitat Improvement Project. The FONSI summarizes the anticipated effects of the project on the environment, and is unsigned. The FONSI would be signed into effect only after comments received as a result of this public review have been carefully considered. A signed FONSI is required before implementation of the project can occur.

The District is providing a review and comment period regarding the analysis and outcomes for this project to fulfill the National Environmental Policy Act (NEPA) of 1969, as amended (**NEPA Unique ID: EAXX-202-00-B3P-1768392247**). The EA and associated appendices are available online at: [https://www.mvs.usace.army.mil/Portals/54/docs/pm/Reports/EA/MTL BHI EA 17Mar2026.pdf](https://www.mvs.usace.army.mil/Portals/54/docs/pm/Reports/EA/MTL%20BHI%20EA%2017Mar2026.pdf), or you may request a copy of the EA and FONSI be mailed to you.

The draft EA will be available for public review from 01-30 April 2026. Comments may be submitted via email to: Teri.C.Allen@usace.army.mil, or by writing to the address above. Include the project title and NEPA Unique ID number with all comments. All comments must be received by close of business on 30 April 2026 to be taken into consideration.

Sincerely,

ANDERSON.ALISO
N.M.1537554785

Digitally signed by
ANDERSON.ALISON.M.153755478
5
Date: 2026.03.26 11:09:05 -05'00'

Alison Anderson
Chief, Environmental Compliance Section

**DRAFT ENVIRONMENTAL ASSESSMENT WITH
FINDING OF NO SIGNIFICANT IMPACT**

Mark Twain Lake Indiana Bat Habitat Improvement Project

Monroe and Ralls Counties, Missouri

NEPA Unique ID: EAXX-202-00-B3P-1768392247



March 2026

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



Table of Contents

1	INTRODUCTION.....	1
1.1	Project Location	1
1.2	Purpose and Need for the Proposed Actions	1
1.3	Authority.....	3
2	ALTERNATIVES	3
2.1	Alternative Development.....	4
2.1.1	Alternative 1 - No Action	4
2.1.2	Alternative 2 – Openland/Grassland Management.....	4
2.1.3	Alternative 3 - Forest Management	4
2.1.4	Alternative 4 - Indiana Bat Habitat Improvement Plan.....	5
2.2	Evaluation and Comparison of Measures.....	5
2.3	Alternatives Carried Forward for Analysis	5
2.3.1	Alternative 1 - No Action	7
2.3.2	Alternative 4 - Indiana Bat Habitat Improvement (BHI).....	7
2.4	Development of Indiana Bat Habitat Improvement Alternative.....	9
2.4.1	Indiana Bat Habitat Management Goals.....	9
2.4.2	Proposed Action Areas.....	9
2.4.3	Proposed Management Actions and Objectives	10
2.5	Overall Conservation Measures and Best Management Practices.....	17
3	AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS	19
3.1	Resources Not Evaluated in Detail.....	20
3.2	Physical Resources.....	20
3.2.1	Topography, Geology, and Soils.....	20
3.2.2	Land Use and Land Cover	21
3.2.3	Noise	22
3.2.4	Water Quality	24
3.2.5	Air Quality	25
3.2.6	Hazardous, Toxic, and Radioactive Waste (HTRW) Concerns.....	26
3.3	Biological Resources	27
3.3.1	Terrestrial Habitat and Organisms	27
3.3.2	Bald Eagles.....	29

3.3.3	Migratory Birds	31
3.3.4	Aquatic Habitat and Organisms	32
3.3.5	Regulatory Authorizations	33
3.3.6	Invasive Species	34
3.3.7	Threatened and Endangered Species Biological Assessment.....	36
3.3.8	State Listed Species.....	47
3.4	Social and Economic Resources.....	49
3.4.1	Economics	49
3.4.2	Aesthetics And Recreation.....	50
3.4.3	Cultural Resources	51
3.4.4	Tribal Resources.....	52
4	TENTATIVELY SELECTED PLAN	52
5	COMPLIANCE WITH ENVIRONMENTAL POLICY	52
6	COORDINATION AND PUBLIC REVIEW.....	53
7	ENVIRONMENTAL ASSESSMENT PREPARERS	55
8	REFERENCES	56
9	FINDING OF NO SIGNIFICANT IMPACT	59

LIST OF FIGURES

Figure 1.	Location of Mark Twain Lake in Monroe and Ralls counties, Missouri.	1
Figure 2.	Examples of Indiana Bat roost trees.	2
Figure 3.	Example of a timber access layout showing landing area, haul road, and skid trails. ...	8
Figure 4.	General example of a skid road used for extracting forest products.	9
Figure 5.	Location of compartments and proposed Indiana Bat management areas.	11
Figure 6.	(A) Snag Tree development and (B) Prescribed burning of forested area.	16
Figure 7.	Examples of the sound level and decibel (dB) level of various sources.....	23
Figure 8.	General location of Bald Eagle nests within the Mark Twain Lake boundary.	30

LIST OF TABLES

Table 1.	Summary of alternatives considered and results of screening evaluation.	6
Table 2.	Acreages of compartments and bat habitat improvement areas.	10
Table 4.	USEPA NAAQS criteria for six regulated air pollutants	25
Table 5.	Invasive and noxious species in and around the Mark Twain Lake Project Area.....	34

Table 6. Federally listed threatened and endangered species potentially occurring within the Proposed Project Area.....	36
Table 7. Missouri listed and state-ranked species which may occur near the project area	48
Table 8. Relationship of the Tentatively Selected Plan to environmental requirements, environmental acts, and/or executive orders.	52

1 INTRODUCTION

The St. Louis District of the U.S. Army Corps of Engineers (USACE) has prepared this Environmental Assessment (EA) to evaluate the environmental impacts associated with the proposed Indiana Bat Habitat Improvement (BHI) Project involving forest management actions, grassland /openland management, including the construction of access roads, landing areas, and forest resource sales on Mark Twain Lake property.

This EA has been prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA), and the Department of Defense National Environmental Policy Act Implementing Procedures dated 30 June 2025. Impacts on environmental resources are discussed in detail in this Environmental Assessment and summarized in a Finding of No Significant Impact (FONSI).

1.1 PROJECT LOCATION

Clarence Cannon Dam and Mark Twain Lake are located on the Salt River in northeastern Missouri, generally in Monroe and Ralls counties (Figure 1). The main dam site is located in Ralls County at mile 63.0 on the Salt River, approximately 12 miles southeast of Monroe City, Missouri. The Proposed Action Areas are located on land primarily along the north-central portion of the lake property.

1.2 PURPOSE AND NEED FOR THE PROPOSED ACTIONS

The Indiana Bat (*Myotis sodalis*), as well as other forest dependent bat species, are currently listed as endangered under the Endangered Species Act of 1973, as amended. The purpose of this project is to enhance the federally managed habitat at Mark Twain Lake to produce sustainable summer maternity and foraging habitat for the Indiana Bat, as well as other forest dwelling species. In winter, Indiana Bats hibernate in caves and mines. They are highly concentrated during hibernation, with 72% of the population hibernating in just four sites in Missouri, Indiana, and Illinois. The largest known hibernating population of Indiana Bats is in Lime Kiln Mine at the Sodalis Nature Preserve in Hannibal, Missouri, less than 20 miles from Mark Twain Lake. A study by Roby and Birdsall (2021) revealed routes of tracked female Indiana Bats from this critical hibernacula along the northern corridor of Mark Twain Lake in search of suitable summer roosting habitat. In summer, most reproductive females occupy sites in forested areas under the exfoliating bark of dead or dying trees that retain large, thick slabs of peeling bark (Figure 2). Generally, roost quality improves with tree height, diameter, amount of peeling bark, and solar exposure. Maternity roosts (trees used by reproductive female bats and their young) are typically high-quality roosts (i.e., large, tall trees with peeling bark and/or large cracks/crevices that receive a high degree of solar radiation). Many summer Indiana Bat colonies are located in Missouri, and Mark Twain Lake lies directly along the migration pathways between Lime Kiln Mine and many of these summer colonies (Roby & Birdsall, 2021). Loss of summer habitat is listed as one of the major threats to the survival of the species, and the Mark Twain

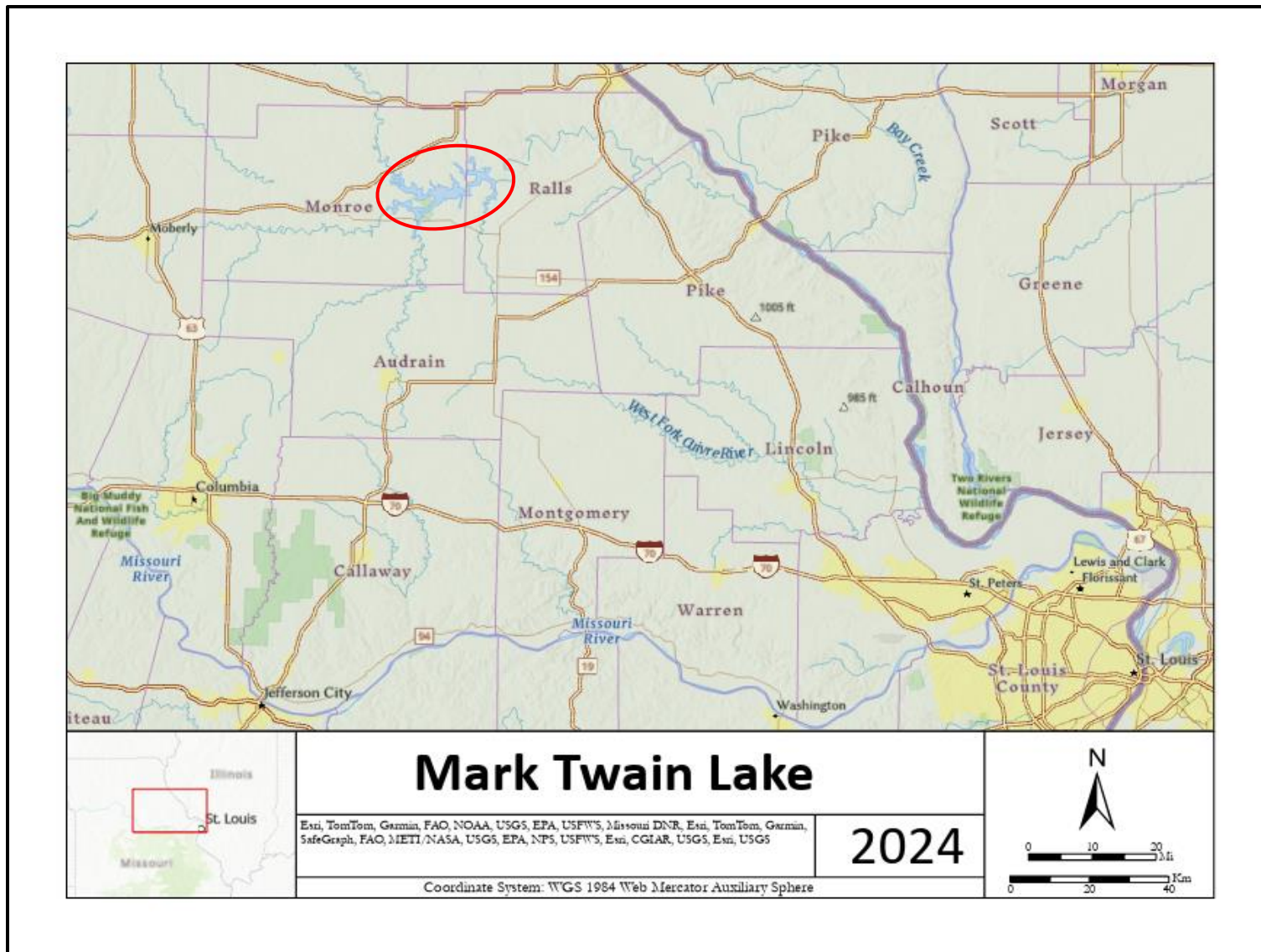


Figure 1. Location of Mark Twain Lake in Monroe and Ralls counties, Missouri.



Figure 2. Examples of Indiana Bat roost trees.

Lake property contains extensive tracts of this vital forest habitat. The proposed actions are needed to ensure that high quality habitat, which is essential to Indiana Bats for summer foraging, roosting, and care of offspring, is available in this critical area, including that which lies within the Mark Twain Lake property boundaries.

1.3 AUTHORITY

Mark Twain Lake was authorized by the Flood Control Act of 1938 and modified by the Flood Control Act of 1962 based on the Chief of Engineer's recommendations presented in House Document No. 507, Eighty-seventh Congress, 2nd Session. The authorized purposes of the lake project include flood control in the lower Salt and Mississippi Rivers, hydroelectric power generation, water supply, fish and wildlife conservation, recreation, and incidental benefits to navigation.

The St. Louis District's Mark Twain Lake Master Plan provides guidelines for the day-to-day management of the lake's operations. This plan is periodically updated to reflect the need for management and land use changes. One of the authorized purposes for Mark Twain Lake includes fish & wildlife conservation. The primary mission of fish & wildlife conservation is to manage and conserve natural resources, consistent with ecosystem management principles, while providing quality public outdoor recreation experiences to serve the needs of present and future generations. Furthermore, the Forest Cover Act of 1960 (Public Law 86-717) is a statutory mandate directing the USACE reservoir areas be managed "to encourage, promote, and assure fully adequate and dependable future resources of readily available timber, through sustained yields programs, reforestation, and areas for conservation, recreation and other beneficial uses".

Additionally, the Endangered Species Act (ESA) of 1973, as amended, emphasizes that it is the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act (ESA Section 2(c)(1)). Section 7(a)(1) of the ESA mandates that "All other Federal agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act". Thus, the purposes of the proposed Bat Habitat Improvement actions are consistent with the authorized purposes of the Mark Twain Lake Project, the Forest Cover Act of 1960, and the Endangered Species Act.

2 ALTERNATIVES

NEPA requires the Environmental Assessment 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.

2.1 ALTERNATIVE DEVELOPMENT

This section describes the initial array of potential management alternatives that were considered to address habitat improvement in order to promote the conservation of endangered and threatened species and their habitat, as well as meeting the requirements of the Forest Cover Act of 1960. Specific screening criteria included effectiveness, environmental impacts, O&M considerations, visitor safety and experience, and cost/efficiency. The initial array of four potential management alternatives are briefly described below.

2.1.1 ALTERNATIVE 1 - NO ACTION

The National Environmental Policy Act requires that the No Action plan be included in a final array of Alternatives, and is used as a baseline against which all other Alternatives are evaluated for environmental impacts. Under Alternative 1 – No Action, no specific actions would be undertaken to improve habitat for the federally endangered Indiana Bat and other forest dwelling bat species; however USACE would continue to manage lands as described in the current master plan.

2.1.2 ALTERNATIVE 2 – OPENLAND/GRASSLAND MANAGEMENT

Openland/grassland management would be implemented in order to provide semi-open areas for bat foraging. Indiana Bats typically forage in semi-open to closed forested habitats with open understory, forest edges, and riparian areas. The Indiana Bat is a nocturnal insectivore. It emerges shortly after sunset and begins feeding on a variety of insects that are captured and consumed while flying. Insects which are preyed upon heavily include beetles, moths, and caddisflies. In order to manage and maintain these sites, mechanical manipulations (e.g., mowing, successional disking, forest mulching, and supplemental food resource development), chemical controls, planting establishments, and prescribed burning would be employed. Differing levels of woody succession would be encouraged in the openlands to provide diversity in habitat for differing species of wildlife. Woody tree and shrub species such as Sumac (*Rhus* spp.), Blackberry (*Rubus* spp.), American Plum (*Prunus americana*), Shingle Oak (*Quercus imbricaria*), and Sassafras (*Sassafras albidum*) would be encouraged to occupy portions of the grasslands to enrich habitat diversity. However, the height of successional woody species within management areas would be limited to maintain clear flight paths. Forbs and pollinator vegetation that support moths, butterflies, and other winged insect prey species would be promoted.

2.1.3 ALTERNATIVE 3 - FOREST MANAGEMENT

Forest management would be implemented to provide suitable summer bat roosting habitat. In summer, most reproductive females occupy sites in forested areas under the exfoliating bark of dead or dying trees that retain large, thick slabs of peeling bark. Primary roosts usually receive direct sunlight for more than half the day. Roost trees are often within canopy gaps in a forest, in a fenceline, or along a wooded edge. Habitats in which maternity roosts occur include riparian zones, bottomland and floodplain habitats, wooded wetlands and upland communities. Forest management would include maintaining a minimum of five snag trees per acre at preferred

locations within identified stands; preserve standing dead trees and increasing solar exposure where practical; preserving adequate stocking of mature Shagbark Hickory (*Carya ovata*); reducing the basal area of overstory and mid-story canopy of fully and overstocked forest stands to improve flight travel corridor and solar exposure; creating clear lanes of travel at forest and field transition areas; creating/maintaining gaps in the forest canopy for interior feeding/flight spaces; applying prescribed burning to remove forest floor debris, to impact fire intolerant species, and to modify understory composition; reducing shade tolerant mid-story tree species in the forest habitat to encourage understory and forest floor vegetative diversity; improve species composition and stem density on understocked forest stands; and managing for woodland/semi-savannah conditions on limestone bluff tops. Basal area density modifications would be restricted to bat non-active periods (15 November through 15 March).

2.1.4 ALTERNATIVE 4 - INDIANA BAT HABITAT IMPROVEMENT PLAN

The Bat Habitat Improvement (BHI) plan would consist of both openland/grassland and forest management activities as described above. It would be implemented to provide suitable summer roosting habitat as well as abundant foraging habitat within the protected environment of the Mark Twain Lake Project.

2.2 EVALUATION AND COMPARISON OF MEASURES

Table 1 summarizes the features and impacts of the alternatives considered. Considerations for Bat Habitat Improvement included:

- Meeting regulatory requirements
- Minimizing the construction footprint, construction cost, and operation and maintenance costs (O&M)
- Avoiding or minimizing any cultural or environmental impacts
- Safety for recreationists
- Improving habitat for multiple life sustaining functions

2.3 ALTERNATIVES CARRIED FORWARD FOR ANALYSIS

Alternatives carried forward for further evaluation in this EA include the No Action Alternative and Alternative 4 - Indiana Bat Habitat Improvement.

Table 1. Summary of alternatives considered and results of screening evaluation.

Alternative	Forest Cover Act Effective	Endangered Species Act Effective	Environmental / Cultural Impacts	Estimated Project and Annual O&M Cost	Impacts Visitor Safety	Improves Visitor Experience	Cost / Efficiency	Screening
1- No Action (required)	No	No	Low	Low/Medium	-	-	Low / Low	Retained - Required
2- Openland/Grassland Management	Yes - Low	No	Low	Low/Medium	+	+	Low / Low	Screened – Does not meet the requirement for adequate roosting habitat
3- Forest Stand Management	Yes - High	Yes - Medium	Low-Medium	Medium/Medium	++	++	Medium / Medium	Screened – Does not meet the requirement for adequate foraging habitat
4- Indiana Bat Habitat Improvement (Combined Openland/Grassland Management + Forest Management)	Yes - High	Yes - High	Low-Medium	Medium/Medium	+++	+++	Medium / High	Retained for evaluation – Adequately meets requirements for roosting and foraging

- Adverse impact; + Beneficial impact

2.3.1 ALTERNATIVE 1 - NO ACTION

Under the No Action Alternative, the forested and openland/grassland areas of Mark Twain Lake would not be managed to purposely improve summer habitat for Indiana Bats and other forest dwelling bat species, which could potentially lead to degraded summer habitat conditions. Under the No Action Alternative, USACE would continue to manage lands as described in the current master plan. Management practices are used to maximize the support value of the Mark Twain Lake Project for fish and wildlife production, while at the same time maximizing recreational opportunities for hunters and fishermen. Such activities may include tree, shrub, and wildlife food plot plantings; succession control; provision of nest boxes, and invasive species management.

2.3.2 ALTERNATIVE 4 - INDIANA BAT HABITAT IMPROVEMENT (BHI)

Under Alternative 4 – the Indiana Bat Habitat Improvement Alternative, openland/grassland and forest management would be implemented to provide semi-open areas for bat foraging as well as suitable summer roosting habitat in the locations specified in this report. Application of prescribed burning would be selectively utilized to improve/maintain grassland composition, density, and quality. Additionally, the height of successional woody species within management areas would be limited to maintain clear flight paths. Forbs and pollinator vegetation that support moths, butterflies, and other winged insect species would be promoted. Forest management would include maintaining a minimum of five snag trees per acre at preferred locations within identified stands; preserve standing dead trees and increasing solar exposure where practical; preserving adequate stocking of mature Shagbark Hickory; reducing the basal area of overstory and mid-story canopy of overstocked forest stands to improve flight travel corridor and solar exposure; creating clear lanes of travel at forest and field transition areas; creating/maintaining gaps in the forest canopy for interior feeding/flight spaces; applying prescribed burning to remove forest floor debris, to impact fire intolerant species, and to modify understory composition; reducing shade tolerant mid-story tree species in the forest habitat to encourage understory and forest floor vegetative diversity; and managing for woodland/semi-savannah conditions on limestone bluff tops. Basal area density modifications would be restricted to bat non-active periods (15 November through 15 March).

While the purpose of the forest management measures is to improve forest health for bat species, some of the felled trees may be sold commercially. In order to access the marketable felled trees, the establishment of skid trails for the transport of forest resources would be necessary. While access roads would consist of ridgetops, openlands, and preexisting roads (agricultural, county, USACE, etc.), skid trails may be established perpendicular to mid-slope if necessary. Skid trails are generally mapped to inform general location, and simple maintenance parameters are provided. Skid trails are not built roads, but lanes established on the native surface of the forest floor by the repetitive traffic of heavy equipment and the abrasive forces of trees being dragged. Additionally, landing areas would be necessary for accumulating timber prior to transport out of the forest. Landing areas may be established on ridge tops and flat areas suitable for access and for minimizing soil disturbance. Landing areas would be established in

locations where removal of potential roost trees is unnecessary, and most landing areas would be sited in naturally open areas, with firm, well-drained soils with a slight slope to allow for drainage. Skid trails and landing areas themselves would also provide suitable foraging and travel corridors for bats. Surface maintenance, such as grading and berms/diversions to manipulate flows of water to reduce soil erosion/movement, may be necessary. Such parameters or limitations would be specified in contracts/agreements under which potential contractors would operate. An example of a timber access layout is shown in Figure 3, and an example of a skid road is shown in Figure 4. The Operations Element of Mark Twain Lake would prepare the determination of availability for forest products to be sold on Mark Twain Lake Project lands. The sale of forest products would be administered by the USACE St. Louis District Real Estate Element, in accordance with ER 405-1-12 (USACE, 1985). Minor sales may be accomplished by the Operations Project Manager on water resources development projects under the general guidance (ER 405-1-12) (USACE, 1985) issued by the Real Estate Element. Timber available for sale would be incidental to the Indiana Bat Habitat Improvement Alternative, and would be utilized to perpetuate bat and wildlife habitat improvement over a longer temporal scale.

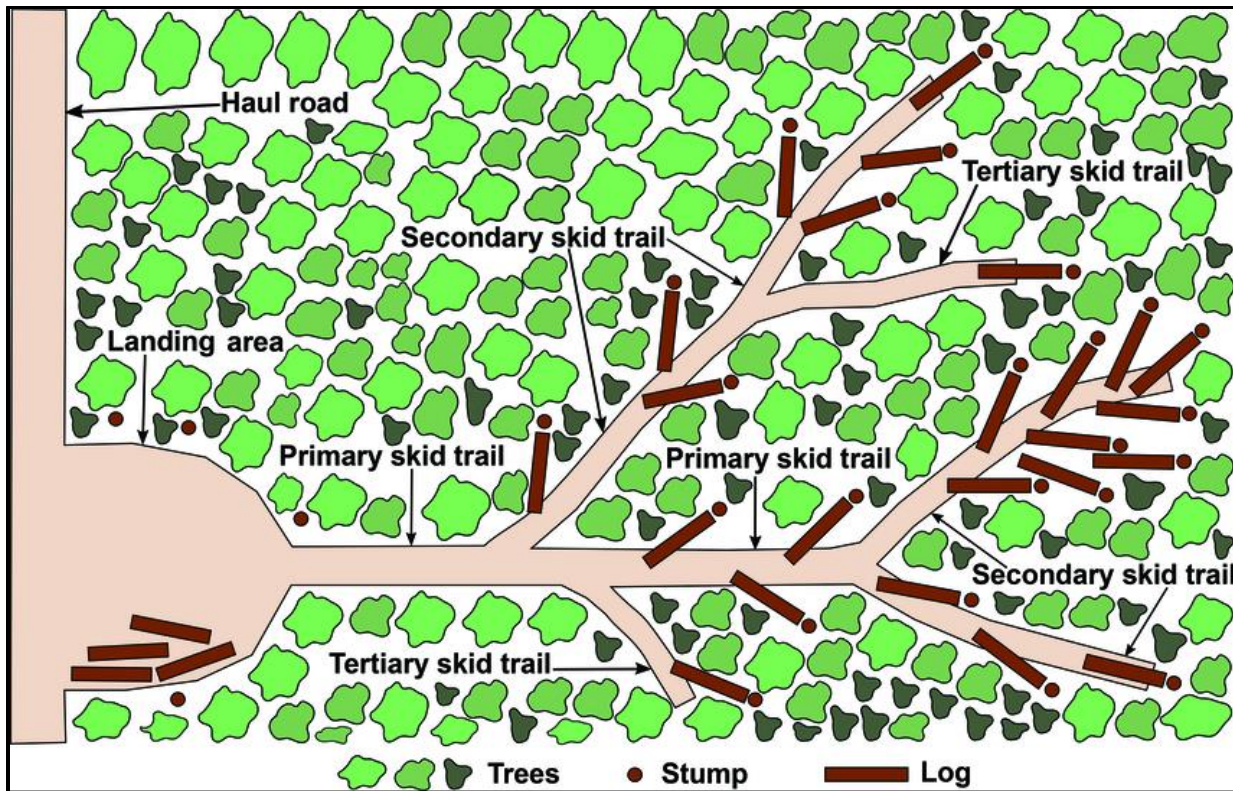


Figure 3. Example of a timber access layout showing landing area, haul road, and skid trails.



Figure 4. General example of a skid road used for extracting forest products.

2.4 DEVELOPMENT OF INDIANA BAT HABITAT IMPROVEMENT ALTERNATIVE

2.4.1 INDIANA BAT HABITAT MANAGEMENT GOALS

The goal of this project is to promote and perpetuate habitat that contributes to the specific requirements of the Indiana Bat, while still integrating requirements of resident and migratory fauna that also inhabit the public lands of the lake. Fortunately, the specific management activities recommended in this alternative have broad capabilities and can support multiple purposes. Openland/grassland and forest resource management goals at Mark Twain Lake are to manage public lands for the provision of vegetative habitat to encourage optimal utilization of a diversity of game and non-game wildlife species, as well as encourage, promote, and assure fully adequate and dependable future resources of readily available timber through sustained yield programs. Forest resources in particular are managed in accordance with Public Law 86-717, the Forest Cover Act. Goals are accomplished to the extent practicable and compatible with other uses of the Mark Twain Lake Project.

2.4.2 PROPOSED ACTION AREAS

Though resource professionals at Mark Twain Lake would like to include all acreage constituting the public lands surrounding the reservoir under this plan, capabilities, funding resources, and the execution of agency mission requirements dictate a more focused approach on application. When examining the forest and openland habitats, the challenge that presented itself was the realization that crucial habitat components existed in all management areas. Ultimately, the plan focus was determined through examination of a 2021 study which tracked female Indiana Bats

from their hibernacula at the Sodalis Nature Preserve in Hannibal, Missouri, to their maternal roosting trees and summer roosting habitat (Roby & Birdsall, 2021). The study revealed routes of tracked female Indiana Bats along the northern corridor of Mark Twain Lake in search of suitable summer roosting habitat. This Indiana Bat Habitat Improvement project focuses on creating enhanced summer habitat along that established corridor, as females typically return to the same maternity colony every year unless loss of bark, tree fall, or other events render their current roost sites unusable (Callahan, Drobney, & Clawson, 1997).

Along the identified female Indiana Bat flight corridor, eight compartments divided into 230 individual stands/units for management purposes make up the Proposed Action Areas (159 forested stands; 71 openland/grassland units). Areas were selected based upon the following features: contiguous tracts of mature forest component; interspersed grassland habitat; accessibility; and lakeshore/water source interface. The eight compartments total 8360 acres, within which 7214 acres would be specifically managed for bat habitat improvement. Of these, 4333 acres are forested and 573 acres are openland/grassland. Specifics for the eight compartments identified for inclusion in Alternative 4 are shown in Table 2 and Figure 5.

Table 2. Acreages of compartments and bat habitat improvement areas.

Compartment #	Number of Stands or Units	Acres in Compartment	Acres Managed for Bat Habitat Improvement
5	17	587	587
6	10	402	371
7	15	1123	1123
9	19	873	606
11	43	2507	2507
48	13	875	656
ES3	13	900	747
ES4	34	1093	617
Totals		8360	7214

2.4.3 PROPOSED MANAGEMENT ACTIONS AND OBJECTIVES

Descriptions of the management actions that would be employed during the execution of Alternative 4 (BHI) and their role in bat habitat improvement are provided below.

Forest Stand Improvement

Forest Stand Improvement (FSI) includes practices that guide or influence a forest stand to meet environmental, recreational, and/or aesthetic objectives. In this study, FSI would be used to improve forest health, modify plant species composition, and influence stand structure to enhance habitat for bat species.

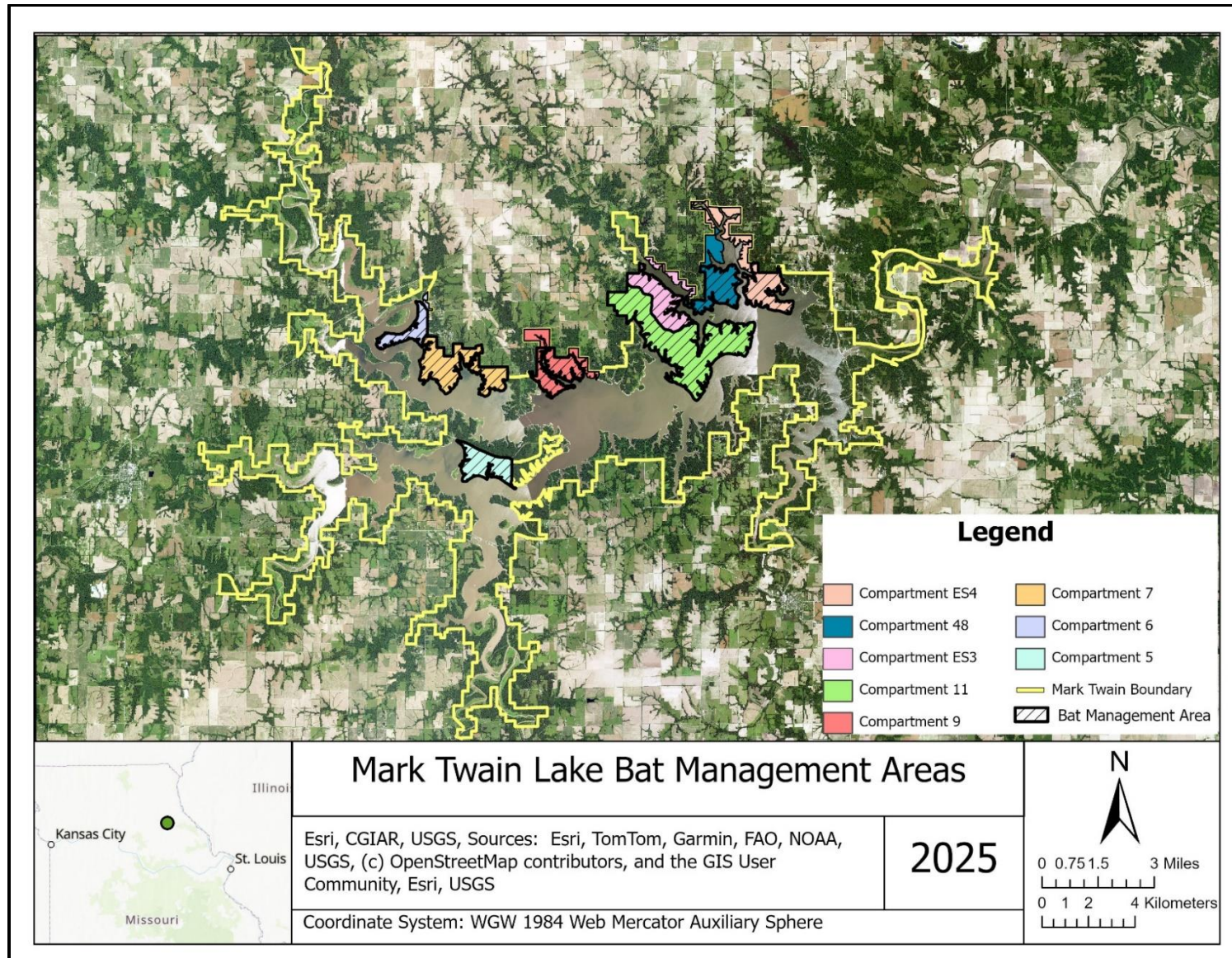


Figure 5. Location of compartments and proposed Indiana Bat management areas.

Basal Area Reduction

An action to reduce the density of a forest stand by removing a specific number of stems or volume from a management area and retaining a specified square footage of coverage per acre. Basal area reduction (BAR) can be accomplished through a forest stand improvement action, or through varied harvest/silvicultural techniques (i.e., intermediate cutting activity, selective resource harvest, shelterwood silviculture).

Reduced basal area of overstory and mid-story canopy of overstocked forest stands improve flight travel corridors and solar exposure. Solar exposure controls the temperature of potential roost trees, which has been known to be an important factor in roost tree selection and the raising of young for the Indiana Bat. Flight travel corridors are important spaces for Indiana Bat foraging; these corridors also improve habitat connectivity.

Invasive Treatment

Invasive treatment is the removal of invasive woody and non-woody species to prevent or control a widespread infestation. Mechanisms for removal and control include chemical, physical, and mechanical actions, and the use of prescribed burns.

Control of non-native species allows for the growth of native species that enhance the habitat value in terms of roosting, foraging, prey production, and travel. Flyways are frequently improved through removal of invasive species that restrict the flight of bats and movement of other wildlife.

Cedar Removal

Cedar removal involves the elimination of dense areas of Cedar trees. Cedar trees are often considered an undesirable tree species in Missouri forests because they can become overly abundant, forming dense monocultures that suppress native plants by blocking sunlight and water.

Monocultures of Cedar trees can reduce biodiversity and alter habitats for wildlife such as the Indiana Bat. Removal of cedars can help restore native plant communities by allowing sunlight to reach the ground and promote the growth of other native plants potentially increasing insects that are preyed on by bats.

Edge Feathering

Edge feathering involves cutting back woody succession that may occur along two habitat transition locations, such as an open field to a forested setting. The practice is usually completed based on a square foot such as 50' long by 30' deep. Within this area, trees are stump cut and felled to create a "soft edge".

Edge feathering creates transitional zones that improve flight access between forested areas where Indiana Bats typically roost and open fields where foraging can occur. The selective gradient removal and thinning of trees and vegetation along habitat edges also creates heterogeneous/mixed habitat that supports diverse vegetation and wildlife, including prey insects. Feathering also improves solar exposure needed for desired tree regeneration and thermal needs for the bats in potential roost trees.

Crop Tree Release

Crop tree release is a FSI practice which focuses on removing unwanted trees around a specific individual tree. The goal of this method is to promote the individual “keep” tree by removing the surrounding competing trees.

The removal of trees around chosen crop trees improves solar exposure to the selected tree for use as a potential roost tree. This method allows for the selection and promotion of trees with genetic characteristics of flaking bark which are strongly selected as roost trees. The seeds of these crop trees will promote the next generation of suitable bat habitat trees.

Single Tree Selection

Single tree selection is a forest management technique for uneven-aged forests that involves periodically harvesting individual trees of various sizes and age classes. This process promotes the regeneration of new age classes and fosters the growth of remaining trees, ultimately maintaining a diverse, multi-aged stand that mimics natural forest processes.

This approach creates openings for solar exposure around selected trees, improving the likelihood that they would provide suitable roost habitat. An increase in open forest structure would also enhance suitable flight foraging areas for various bat species and other wildlife.

Forest Canopy Opening

Forest canopy opening is a thinning technique which allows for removal of all trees within a desired area in a forested ecosystem. The areas would vary in size from 1 to 3 acres. The shape of the openings is generally a square or rectangle which provides edge habitat while still supplying a large central opening. Locations where forest canopy opening is proposed often contain little to no open foraging opportunities for several hundred yards.

These forest openings would serve as early succession open foraging areas for bat species. Additionally, canopy openings would increase light penetration within forests to promote regeneration of species, including white oak and hickories which are important species for tree roosting bats. Increased light also allows potential roost trees to receive enough sunlight to maintain suitable temperatures needed by bats as they raise young during summer roosting. Strategic establishment of 1-3 acres open areas within forest stands also improves the interconnectedness of potential forage and roosting habitats.

Snag Development

Snag development involves purposefully causing death to selected standing trees for eventual use by wildlife. Snag creation can be accomplished through numerous mechanisms including tree topping, mechanical girdling, or through a “hack and squirt” application (Figure 6A). Snag development levels would be dependent upon number and condition of existing snag trees, species composition, and size class. Management activities would target a minimum density of five snags per acre.

Snag trees provide suitable roosting habitat for bats via exfoliating bark, broken limbs, broken tops, cracks, and crevices created as the tree naturally decays. Development of snag trees will support the provision of shelter as well as roost locations for females to raise young, in addition to providing nesting, feeding, and shelter to other wildlife. Primary maternity roost trees are usually within canopy openings in a forest, along a wooded edge, or in a fence line. These habitats provide the tree with greater solar exposure which in turn helps young develop faster.

Forest Inventory

Forest inventory includes the collection and measurement of data regarding the quality and volume of forest resources, the condition of its dynamics, regeneration and products that can be obtained by surface area, in such a way to provide information for the sustainable management of a particular stand or forest community.

Forest inventory data is used to develop plans and guide management efforts. This information is important in determining necessary actions needed to improve habitat conditions for the Indiana Bat and other wildlife needs. Continued review and inventory of forest stands would be conducted to ensure management actions work towards achieving project goals, including increased quality and quantity of high quality Indiana Bat and wildlife habitat.

Succession Control

Succession control involves the removal or control of woody and herbaceous vegetation from openland management units. Differing levels of woody succession are encouraged to occupy portions of openland systems to enrich habitat diversity. Ideally warm season grass fields would have interspersions of woody cover and forb vegetation. Succession control is also used to promote forb and pollinator vegetation which supports Lepidoptera (moths and butterflies) and other winged insect species which bats forage on in openland management units. Additionally, limiting the height of successional woody species would aid in maintaining clear flight paths. Acceptable control techniques include chemical, mechanical (mowing, cutting, mulching), biological, prescribed burning. All mechanisms would be evaluated prior to the implementation of a control technique. The control technique chosen would be based upon potential ecological impact, susceptibility of targeted species, social acceptability, and cost benefit analysis. Pesticide use is evaluated and approved by licensed USACE personnel prior to the large scale use of chemical

pesticides. Treatment of invasive species would occur within the proposed treatment stands as part of FSI or succession control or as needed to ensure tree seedling survival and recruitment.

Methods of succession control include:

Mowing – Mechanical removal of woody and herbaceous vegetation of a field through the use of a heavy-duty rotary mower.

Succession Disking – Mechanical chopping and tillage of woody and herbaceous vegetation of a field for the purposes of control and vegetative change. Generally accomplished with off-set agricultural disk.

Herbicide Application – The application of a selective or non-selective herbicide for the purposes of controlling targeted herbaceous or woody vegetation.

Forest Mulching – The mechanical removal of woody vegetation up to 8" dbh through the use carbide-tipped drum roller mounted on a tracked motor unit. Mechanical action chips all woody materials to ground level and is utilized extensively to reclaim old fields.

Planting – Involves supplemental resource development via plantings to control and maintain desired vegetation composition.

Prescribed Burning

Prescribed burning is the intentional application of fire in a measured manner, and under specified weather conditions to affect change upon a natural habitat or environment (Figure 6B).

Openland/grassland areas proposed for prescribed burning would include warm and cool season grasses, pollinator plots, old field and early successional habitat. In openland/grassland habitat, fire would be utilized to promote forbes, control succession, and suppress warm and cool season grasses. Openland/grassland burns would take place from mid-August to early May. Forested areas proposed for burning would encompass reproduction, pole and mature forest stands. In forested areas, fire removes fallen leaf litter which promotes the growth of herbaceous vegetation. The timing of burns within forested areas would be between 15 Nov and 15 March when the Indiana Bats are in the hibernacula. Various techniques and fire types, such as backfire and flank fires, weather condition (temp, wind, humidity), and moisture content of soil and leaf litter would be used to keep fire intensity low. These techniques minimize the harm to dead, dying or cavity trees in the stand which the Indiana Bat utilizes as maternal colonies in the spring.

Prescribed burning in forest management areas and openland/grassland systems would increase bat feeding opportunities by promoting diverse vegetation for a variety of desirable insects by providing prey food and shelter resources. Prescribed burning within these areas would provide a diversity of vegetation in the continuous forest and openland habitat.



Figure 6. (A) Snag Tree development and (B) Prescribed burning of forested area.

Wildlife Habitat Analysis

Wildlife Habitat Analysis is an evaluation of grassland management units assessing the five factors of wildlife habitat: nesting habitat, brood-rearing habitat, natural food resource, habitat arrangement, and water sources.

Grasslands and open fields offer foraging habitat for the Indiana Bat by supporting insect populations. Analysis of these areas guide management efforts to ensure they continue to provide habitat that support wildlife, including insects on which bats feed. Reviews would be conducted after management efforts to ensure actions undertaken are leading to desired management goals.

By utilizing the above actions, the following objectives targeted towards Indiana Bat requirements would be achieved while still meeting the needs of Mark Twain Lake's vast array of wildlife:

- Application of prescribed burning would be extensively utilized to improve/maintain grassland composition, density, and quality.
- Limit height of successional woody species within management areas to maintain clear flight paths.
- Control non-native and invasive species

- Promote forb and pollinator vegetation that supports Lepidoptera (moths and butterflies) and other winged insect species.
- Maintain a minimum of five snag trees per acre at preferred locations within identified stands.
- Preserve standing dead trees and increase solar exposure where practical.
- Preserve adequate stocking of mature Shagbark Hickory.
- Reduce basal area of overstory and mid-story canopy of overstocked forest stands to improve flight travel corridor and solar exposure.
- Create clear lanes of travel at forest and field transition areas.
- Perform forest stand inventory incorporating snag tree density survey.
- Silviculture practices implemented on the dominant and co-dominant forest strata would incorporate best management practices for Indiana Bat.
- Restrict tree felling to 15 November through 15 March outside the bat active season.
- Apply prescribed burning to remove forest floor debris, to impact fire intolerant species, enhance understory composition, and encourage regeneration of native tree species.
- Create/maintain gaps in the forest canopy for interior feeding/flight spaces.
- Manage for woodland/semi-savannah conditions on limestone bluff tops.
- Reduce shade tolerant mid-story tree species occurring in the forest habitat to encourage prey and forest floor vegetative diversity.

Stand and unit treatment plans were developed by identifying optimal management measures needed in each location to improve the bat habitat. Table 3 provides a detailed description of the proposed treatment plans by treatment action, compartment, stand/unit, acreage, and target year (Appendix A – Table 3).

2.5 OVERALL CONSERVATION MEASURES AND BEST MANAGEMENT PRACTICES

Conservation Measures

Conservation measures are incorporated to avoid or minimize adverse impacts to specific protected natural resources. The conservation measures below are focused on resources connected to the treatment actions. Conservation measures would consist of accepted government and private management activities practices.

- *Stream and Wetland Protection* – Forested buffers with a minimum width of 50 feet would be retained on each side of all perennial and intermittent streams to prevent any soil, bank, and bed disturbance.
- *Soil Protection* - Access roads would consist of ridge tops, openland, interior and existing roads. Landings would be established where necessary on ridge tops and flat areas suitable for access and appropriate to minimize soil disturbance. Tree removal would cease during periods of saturated soil conditions to protect against excessive compaction.

- *Protection of Special Features* – Resources such as wetlands, ecologically sensitive areas, and cultural sites would be excluded from tree removal areas.
- All tree removal of trees $\geq 3''$ dbh would be limited to between 15 November to 15 March.
- Trees that exhibit roost-characteristics would be retained unless they pose a safety threat.
- All trees that are girdled would be left standing for wildlife habitat and allowed to fall down naturally unless they pose a hazard to public safety or property.

Best Management Practices (BMPs)

Soil disturbance from vehicle use and equipment staging may be a concern. The following BMPs would be used to mitigate sediment erosion and runoff:

- Existing road systems and landing areas would be used when possible.
- Traffic would be kept to a minimum during wet and muddy conditions.
- Landing areas would be located on currently disturbed areas, when possible. Otherwise, landing areas would be limited to areas with firm, well-drained soils with a slight slope to allow for drainage.

Pesticides would be utilized for invasive species control. Any operator that uses herbicide as part of these habitat management actions will be licensed by the State of Missouri and abide by the following BMPs:

- Maintain a spill containment and cleanup kit appropriate for the materials used and report all spills.
- Follow all EPA product label instructions on chemical containers.
- Mix and load chemicals in a landing area that is outside streamside management zones or other sensitive areas.
- Apply chemicals only under favorable weather conditions to prevent drift.
- Calibrate spray equipment to apply chemicals uniformly and in the correct quantities.
- Dispose of chemical containers according to label instructions.
- Prevent chemical leaks from equipment. Do preventative maintenance and repair on all equipment for leaking hoses, connections, and nozzles.

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. In addition, environmental impacts for each relevant resource are also evaluated in this section. 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.

Under NEPA, when considering whether the reasonably foreseeable effects of the proposed action are significant, DoD will consider the potentially affected environment and degree of the effects of the action (DOD, 2025).

- (1) In considering the potentially affected environment, DoD may consider, as appropriate to the specific action, the affected area (national, regional, or local) and its resources.
- (2) In considering the degree of the effects, DoD may consider the following, as appropriate to the specific action:
 - (i) Both short- and long-term effects;
 - (ii) Both beneficial and adverse effects;
 - (iii) Effects on public health and safety;
 - (iv) Economic effects; and
 - (v) Effects on the quality of life of the American people.

In this EA, impacts are assessed using the following scale:

- Outcome:
 - Beneficial impacts would result in positive outcomes to the natural or human environment.
 - Adverse impacts would result in unfavorable or undesirable outcomes to the natural or human environment.
- Degree:
 - Negligible – No noticeable effects to the resource in the project area. Negligible impacts would occur at the lowest level of detection.
 - Minor – Impacts would be noticeable but would not affect the function or integrity of the resource.
 - Moderate – Impacts may be readily apparent and would influence the function or integrity of the resource.
 - Major – Impacts would be substantial and would result in severely adverse or exceptionally beneficial changes to the resource.
- 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 Project Delivery Team (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)
- Mineral and Energy Resources (Unchanged by alternatives)
- Prime Farmlands (Unchanged by alternatives)
- Wild and Scenic Rivers (No designated wild and scenic rivers in or near the study area)
- Floodplain Management (Unchanged by alternatives)
- Traffic and Roadways (Unchanged by alternatives)

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

3.2 PHYSICAL RESOURCES

3.2.1 TOPOGRAPHY, GEOLOGY, AND SOILS

Topography – The topography at Mark Twain Lake reaches a maximum elevation of about 780 feet NGVD in the southwestern portion of the project to a minimum of approximately 520 feet NGVD along the main stream of the Salt River. The North Fork, Middle Fork, Elk Fork and South Fork are the main tributaries of the Salt River within the project boundaries and have a maximum elevation of 675 feet NGVD in the western part of the project. The sides of the major valleys are dissected by short tributaries whose gradients extend from the flat uplands to the valley bottoms. The divides between these tributaries form a continuous belt of hills along either side of the major valleys. The land adjoining the project is relatively flat farmland.

Geology – The predominant geologic structure controlling the local dip of rock strata at the project is the Lincoln Fold, a complex plunging asymmetrical anticline located in northeast Missouri. The lake project is located in the Dissected Till Plains Section of the Central Lowlands Physiographic Province. The geologic formations occurring at the surface within the lake project include Paleozoic sedimentary rocks (primarily limestone and shale) Pleistocene glacial drift, and recent alluvium. The area is characterized by low to moderate relief in the uplands with locally high relief (up to 200 feet) occurring in the bluffs along the Salt River and its tributaries. Some karst features are present in the project area, most notably, solution cavities in the limestone bluffs.

The geologic formations' stratigraphy in the area consists essentially of nearly flat-lying sedimentary strata of Mississippian and Pennsylvanian formations on the uplands. These in turn, are overlain by Pleistocene deposits of glacial till, residuum, or on the floodplains, by recent alluvium. Frequently observed formations found in differing regions of the project include the Hannibal Formation, Chouteau Formation, Burlington-Keokuk Formation, Warsaw Formation, Pennsylvanian Age Strata, and Pleistocene and Recent Deposits.

Soils – Soil surveys have been prepared by the United States Department of Agriculture – Natural Resources Conservation Service (NRCS) for the counties encompassing Mark Twain Lake (Ralls and Monroe counties, MO). The predominant soil units within the lake project are the Armstrong-Leonard Association and the Goss-Gorin-Lindley Association. The soils of the area present several problems. They are erosive particularly when the shoreline of the lake is subjected to periods of high water combined with windy conditions; bank erosion and caving can occur. Many of the soil deposits are in an area of glacial origin, and include rocks and boulders of large to moderate size at or immediately beneath the ground surface. These conditions can complicate foundation and utility trench design and placement.

Alternative 1 – No Action (Future Without Project)

Under the No Action Alternative, no specific management actions targeted towards bat habitat improvement would be taken on the openland/grassland and forested areas surrounding Mark Twain Lake. The geological formations beneath Ralls and Monroe counties would not be altered from their present state in the Future Without Project (FWOP) condition. Soil types and soil composition at Mark Twain would not be altered but could be expected to change naturally in the future depending on erosion along the lake edge and on slopes. In addition, development of hydric soils may occur in wetter areas over time. The overall topography of the area is unlikely to change from the existing slope/relief of the land. Future erosion may change local relief to some degree. No impacts to overall topography, geology, and soils are anticipated as a result of not implementing the bat habitat improvement project.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

Similar to the No Action Alternative, the BHI alternative would not alter the topography or geology of the openland/grassland or forest stands surrounding Mark Twain Lake. The local relief and slope of the areas would remain consistent with existing conditions. The underlying geology of Ralls and Monroe counties would not be altered from existing conditions. While the BHI actions would not alter the soil types or composition in any way, some soil compaction may occur in areas where heavier equipment is required to implement the plan. Overall impacts to topography, geology, and soils would be minorly adverse and short term.

3.2.2 LAND USE AND LAND COVER

The Mark Twain Lake Master Plan is the strategic land use management document that guides the comprehensive management and development of all recreational, natural, and cultural resources located on fee and easement lands and waters at the Mark Twain Lake project. The

land use at the Mark Twain Lake project is primarily for outdoor recreation. Mark Twain Lake has approximately 59 outdoor recreation areas, over 485 campsites, over 50 picnic sites, 27 boat ramps, 536 marina slips, and nearly 50 miles of multi-use trails (USACE, 2025). In addition to the recreation areas, there are 26,121 acres of forest habitat, 6,620 acres of open fields/grasslands, 2,300 acres of shoreline transition, and 1,100 acres comprising Mark Twain State Park.

The land cover at Mark Twain Lake is largely surface water in the form of the Mark Twain Lake reservoir (18,600 acres). The waters of the lake are divided into open recreation, restricted waters, no-wake zones, and fish and wildlife sanctuary. Surrounding the lake are the terrestrial areas including high density recreation areas (10,234 acres), low-density recreation areas (5,656 acres), project operations areas (2,082 acres), wildlife management areas (14,536 acres), and environmentally sensitive areas (3,633 acres).

Alternative 1 – No Action (Future Without Project)

Under the No Action Alternative, land use in the Mark Twain Lake Project as a whole would not change based on the absence of BHI in openland/grassland and forested areas. Project land use would remain zoned for development and resource management consistent with authorized project purposes. It is likely that existing forest land would remain forested, unless developed for recreation or operational purposes. However, in areas where land cover is not actively managed, land cover composition would change as invasive species grow and spread, and shade dominant trees begin to occupy the dominant canopy. Additionally, understory areas may become overgrown with shrub cover and reduce or prevent regeneration of target tree species. The openland/grassland may become overgrown with undesirable species, including shrubs and trees, and eventually fill in and become forested. Overall impacts to land use and land cover would be moderately adverse and long term.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

The BHI actions would not alter overall existing land uses. The land cover would change in a beneficial manner with the BHI alternative. The BHI actions would remove invasive shrubs and trees over a large area, which would ultimately benefit land cover through the creation of more diverse and healthy forest community types. Additionally, it would create beneficial conditions that promote the regeneration of Shagbark Hickory and other desirable tree species, preserve and foster standing dead trees, and create and maintain gaps in the forest canopy for foraging in order to provide appropriate summer bat habitat. Overall impacts to land use and land cover would be moderately beneficial and long term.

3.2.3 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, Neitzel, & Kladden, 2015). Noise levels at the Mark Twain 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 7). Additionally, vegetation management activities may periodically contribute to higher noise levels. Compared to the surrounding rural area, the noise levels at the Mark Twain 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. The loudest sounds are likely to be related to be gunshots related to hunting, or fireworks during certain celebrations (140 dB).

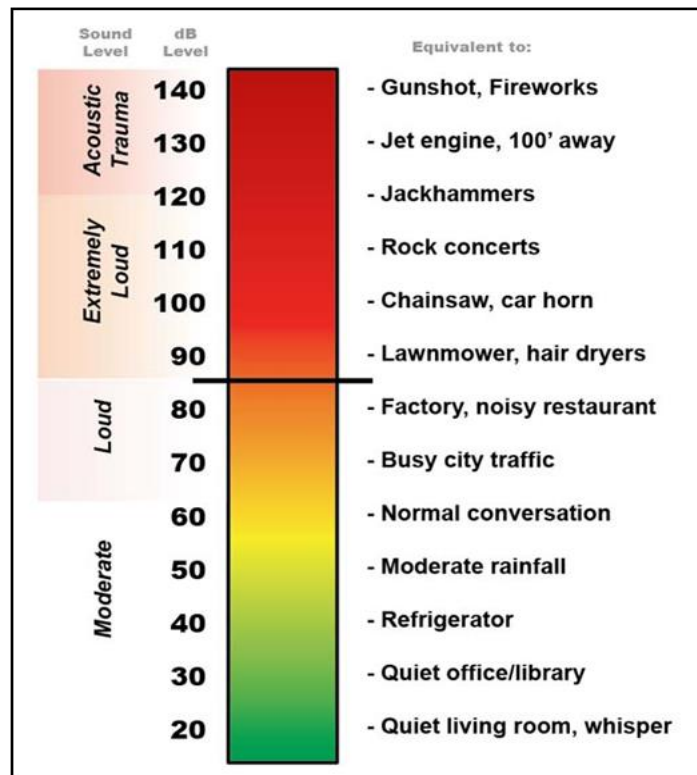


Figure 7. Examples of the sound level and decibel (dB) level of various sources.

Alternative 1 – No Action (Future Without Project)

Under the No Action Alternative, noise levels at Mark Tain Lake would remain similar to existing conditions, with typical operation and maintenance (O&M) activities occurring unchanged, as well as customary recreational noise levels. No additional noise producing activities are anticipated, and typical sources of noise are expected to remain unchanged.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

Noise levels would increase slightly from ambient levels during the BHI actions. Equipment used to haul and move felled trees and the operation of chainsaws would create noise levels around 100 decibels in the immediate vicinity of the work. 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). Additionally, best management practices can be used to reduce the impact to recreational visitors, including quiet hours, work buffer zones, and restricting tree felling to the winter season (15 Nov – 15 Mar) when visitation is low. Noise levels would return to normal ambient levels following the work, leaving no permanent long-term noise impacts. Impacts to noise levels would be minorly adverse and short term.

3.2.4 WATER QUALITY

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. Missouri's 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. According to the most recent (2022) Missouri 303(d) List, the portion of Mark Twain Lake near the proposed actions is impaired for human health protection (fish consumption and secondary contact recreation) due to mercury in fish tissue from atmospheric deposition. The lake was first listed for this pollutant in 2018. Mark Twain Lake is considered unimpaired for the following beneficial uses: boating and canoeing, drinking water supply, protection of warm water aquatic life and human health-fish consumption, and whole body contact recreation (USEPA, 2024a). Insufficient information is available to assess water quality for irrigation and livestock and wildlife watering.

Alternative 1 – No Action (Future Without Project)

Under the No Action Alternative, future water quality conditions may change over time with contributions of pollutants from municipal point-source discharges, recreational pollution sources, crop production, lakeshore modifications, urban runoff/storm sewers, or runoff from forest, grassland, and parklands. However, not implementing the BHI actions in the

openland/grassland and forested areas around Mark Twain Lake would not result in an increased contribution to water quality pollution from any of these sources. Thus, water quality would not be affected by the No Action alternative.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

Under the BHI Alternative, water quality is anticipated to remain unchanged due to bat habitat improvement activities. All work would take place within forests and openland/grasslands surrounded by a minimum 50' buffer zone, and thus away from waterbodies. Best management practices to reduce soil disturbance and sedimentation would be implemented. Additionally, the pollutants identified in the 303(d) list would not increase as a result of the BHI actions. However, pollutants in the form of herbicide drift/contamination are possible. Therefore, all pertinent BMPs would be used to minimize the impact over-application, drift, and spills. Thus, any impacts to water quality are anticipated to be negligibly adverse and short term.

3.2.5 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 (PM₁₀ = less than 10 microns; and PM_{2.5} = less than 2.5 microns in diameter), sulfur dioxide, lead, carbon monoxide, and nitrogen dioxide (Table 4). The EPA Greenbook provides a list of the counties in Missouri which are in nonattainment for these pollutant criteria. Ozone is not emitted directly into the air by specific sources. Ozone is created by sunlight acting on nitrogen oxides (NO_x) and volatile organic compounds (VOC's) in the air. There are many sources of these gases. Some common sources include gasoline vapors, chemical solvents, fuel combustion products, and some consumer products. The project lies in Monroe and Ralls counties, Missouri; both counties are in attainment for all pollutant criteria (USEPA, 2024).

Table 4. USEPA NAAQS criteria for six regulated air pollutants.

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)	Primary	8 hours	9 ppm	Not to be exceeded more than once per year
		1 hour	35 ppm	
Lead (Pb)	Primary and secondary	Rolling 3 month average	0.15 µg/m	Not to be exceeded
Nitrogen Dioxide (NO₂)	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Primary and secondary	1 year	53 ppb	Annual Mean
Ozone (O₃)	Primary and secondary	8 hours	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Particle Pollution (PM)	PM _{2.5}	Primary	1 year	9.0 µg/m ³	annual mean, averaged over 3 years
		Secondary	1 year	15.0 µg/m ³	annual mean, averaged over 3 years
		Primary and secondary	24 hours	35 µg/m ³	98th percentile, averaged over 3 years
	PM ₁₀	Primary and secondary	24 hours	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO ₂)		Primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Alternative 1 – No Action (Future Without Project)

Not implementing the BHI actions in the openland/grassland and forested areas around Mark Twain Lake would not result in an increased contribution to air quality. The equipment needed for the proposed project are typical of those used in the operation and maintenance of vegetation at the lake. No additional air quality impacts are anticipated, and sources of impairment would remain unchanged as a result of taking no action on the bat habitat improvement activities.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

Bat habitat improvement activities would increase particulate matter in the general construction area. Increases in dust levels from tree cutting, vegetation removal, and establishment of access roads 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. Prescribed burning would have localized short-term impacts to air quality while the burning is taking place, however the smoke quickly dissipates. Impacts to air quality from vegetation management activities would be localized, moderately adverse, and short term, limited to the hours and site of activities and not expected to have long term impacts. No impacts to regional air quality would occur as a result of the bat habitat improvement activities.

3.2.6 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW) CONCERNS

The U.S. Army Corps of Engineers regulations (ER-1165-2-132, ER 200-2-3) (USACE, 1992) (USACE, 2022) 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 USACE Environmental Quality Section should be contacted immediately if HTRW material is encountered at any point during construction activities.

Alternative 1 – No Action (Future Without Project)

Under the No Action Alternative, there would be no bat habitat improvement activities or other work disturbances that could disturb known or unknown hazardous waste. Therefore, there are no HTRW concerns associated with the No Action alternative.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

A Phase I study was not recommended for this project because the likelihood of hazardous substances adversely affecting the project area is very low. There is still a potential of encountering hazardous substances during the proposed actions. If HTRW material is encountered at any point during the proposed BHI activities, the USACE Environmental Quality Section should be contacted to assess the conditions. USACE does not and cannot represent that the site contains no hazardous waste or material, including petroleum products. There are no HTRW concerns associated with the BHI alternative. Thus, impacts are considered negligible and short term.

3.3 BIOLOGICAL RESOURCES

3.3.1 TERRESTRIAL HABITAT AND ORGANISMS

There are many terrestrial habitat types within the Mark Twain Lake Project boundaries, including grassland, old fields, croplands, bottomland hardwood forest, and upland hardwood forest. Forest stands that have an overstocked basal area per acre (BA) show restricted tree growth and inhibit growth in the understory and forest floor. Basal area per acre describes the average amount of an acre that is covered by tree stems. It is defined as the total cross-sectional area of all stems in a stand measured at breast height and expressed as per unit of land area (typically square feet per acre) (Private Lands Habitat Program, 2021). Many of forest stands at Mark Twain Lake are overstocked. While fully stocked stands would have densities between 60-100 BA per acre, overstocked stands have a BA greater than 100 (Gingrich, 1971). Using this metric, 110 of the 156 (71%) of the non-cedar forest stands included in this plan at Mark Twain Lake would be considered overstocked. The primary upland forest cover of Mark Twain Lake is the White Oak-Black Oak- Northern Red Oak association (Forest Cover Type No. 52). The white oak association (Forest Cover Type No. 53) also occurs frequently. Shagbark Hickory and Mockernut Hickory (*Carya tomentosa*) comprises a substantial stocking on most upland sites. Dominant and co- dominant strata of the forests are comprised of the two cited Forest Cover types. Mid- story canopy strata is occupied by White Oak (*Quercus alba*), Black Oak (*Quercus velutina*), Northern Red Oak (*Quercus rubra*), Shagbark Hickory, Mockernut Hickory, Black Cherry (*Prunus serotina*), White Ash (*Fraxinus americana*), and Sugar Maple (*Acer saccharum*). The

predominant understory species include Sugar Maple, Elm (*Ulmus* spp.), Black Cherry, Eastern Red Bud (*Cercis canadensis*), Flowering Dogwood (*Cornus florida*), and Eastern Hop-Hornbeam (*Ostrya virginiana*). Understory shrub species include Fragrant Sumac (*Rhus aromatica*) and Corralberry (*Symphoricarpos orbiculatus*). The forest habitat currently occupying upland sites is uneven-aged with two distinct size classes currently being managed: poletimber/immature sawtimber size class; and mature size class.

Bottomland forests of the Salt River basin are predominately Silver Maple (*Acer saccharinum*) and American Elm (*Ulmus americana*) (Forest Cover Type No. 62); however, local variations do occur in the area with such species as Eastern Cottonwood (*Populus deltoides*), American Sycamore (*Platanus occidentalis*), River Birch (*Betula nigra*), Pin Oak (*Quercus palustris*), Green Ash (*Fraxinus pennsylvanica*), Persimmon (*Diospyros kaki*), Hackberry (*Celtis occidentalis*), and Black Willow (*Salix nigra*) being common. These habitats occur along the primary tributaries of the reservoir. The forest habitat occupying bottomland sites is managed as uneven aged with limited disturbance as they serve to provide riparian corridor stability and sustainability.

Openlands are all lands not occupied with dominant or co-dominant forest cover, nor severely impacted by the fluctuations of the reservoir elevations. Openlands are comprised of cool season/forb grasslands, warm season grasslands, and early to mid-successional fields. Mechanical manipulations (mowing, successional disking, forest mulching, and supplemental food resource development), chemical controls, planting establishments, and prescribed burning are employed to manage and maintain open lands to provide diverse wildlife habitat. Differing levels of woody succession are encouraged in the openlands to provide diversity in habitat for differing species of wildlife. Woody tree and shrub species such as Sumac, Blackberry, American Plum, Shingle Oak, and Sassafras are encouraged to occupy portions of the openland/grasslands to enrich habitat diversity. Invasive species removal is often required.

Many mammal species can be found at Mark Twain Lake, including White-tailed Deer (*Odocoileus virginianus*), Cottontail Rabbit (*Sylvilagus floridus*), Fox Squirrel (*Sciurus niger*), Gray Squirrel (*Sciurus carolinensis*), Southern Flying Squirrel (*Glaucomys volans*), River Otter (*Lontra canadensis*), American Mink (*Neovison vison*), Muskrat (*Ondatra zibethicus*), American Beaver (*Castor canadensis*), Raccoon (*Procyon lotor*), Opossum (*Didelphis virginiana*), Striped Skunk (*Mephitis mephitis*), Long-tailed Weasel (*Mustela frenata*), Bobcat (*Lynx rufus*), Coyote (*Canis latrans*), Red Fox (*Vulpes vulpes*), and Grey Fox (*Urocyon cinereoargenteus*). A variety of nocturnal species are also present, including Marsh Rice Rat (*Oryzomys palustris*), Deer Mouse (*Peromyscus maniculatus*), Prairie Vole (*Microtus ochrogaster*), Short-tailed Shrew (*Blarina brevicauda*), and many bats (*Myotis* spp.). 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 Mark Twain Lake. These open fields and forests are also important breeding and migratory stopover habitat for migratory birds.

Alternative 1 – No Action (Future Without Project)

Under the No Action Alternative, targeted improvements to bat roosting and foraging habitat at Mark Twain Lake would not occur. Areas would continue to be managed for the benefit of recreationists, and game and non-game wildlife. Indiana Bats typically forage in semi-open to closed forested habitats with open understory, forest edges, and riparian areas. The existing conditions of the terrestrial forest habitat require some amount of artificial intervention in order to eliminate invasive species and to improve the diversity and composition of tree species in the forest stands. A heavy invasive shrub layer restricts foraging movement for bats, while providing little in the way of food for wildlife compared to native vegetation. Without the regeneration of new Shagbark Hickory seedlings, when the existing mature trees die, there will be few individuals able to replace the dead hickories in the overstory. Overall impacts to terrestrial habitat would be moderately adverse, long term, and result in a less healthy forest.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

The BHI actions would result in substantial beneficial impacts to the condition of the openland and forest stands for bat roosting and foraging, as well as wildlife habitat in general around Mark Twain Lake by removing invasive species and allowing for the development of beneficial species compositions, open corridors for bat and bird foraging, and reduced competition for desirable species. Succession control in the form of mowing, disking, pesticide application, and prescribed burning suppresses woody plants while providing diversity among herbaceous plants, in contrast to adjacent untreated areas. The ratio of open land to forest creates the desirable edge effect where food and cover are both abundant and well-interspersed. Desirable tree species would include Shagbark Hickory, and other species which possess desirable characteristics. Indiana Bat roosts (trees used by reproductive female bats and their young) are most typically snags in early to mid-decay stages. When healthy live trees are used, they tend to be species with naturally sloughing bark, such as Shagbark Hickory. Generally, quality improves with tree height, diameter, amount of peeling bark, and solar exposure. Maternity roosts are typically high-quality roosts (i.e., large, tall trees with peeling bark and/or large cracks/crevices that receive a high degree of solar radiation). Invasive plants, both woody and herbaceous, negatively affect the forest community composition through competition for light, water, and nutrients. Common invasive shrubs and vines include Autumn Olive (*Eleagnus umbellata*), Multiflora Rose (*Rosa multiflora*), Bush Honeysuckle (*Lonicera maackii*), Sericea Lespedeza (*Lespedeza cuneata*), and Callery Pear (*Pyrus calleryana*). During BHI activities, prescribed burning would result in mobile wildlife leaving the area, and may result in casualty for immobile organisms. Additionally, the use of chainsaws, skid-steers, and other equipment would cause localized temporary minor adverse impacts as a result of noise, disturbance, soil compaction, and *de minimis* levels of air pollutants and sedimentation. However, beneficial impacts to the forest bat community and other wildlife would greatly offset unfavorable impacts. Overall impacts to terrestrial habitat and organisms are anticipated to be moderately beneficial and long term.

3.3.2 BALD EAGLES

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. Bald Eagles occur regularly in Missouri as both migrants and breeders, with some populations of year-round residents along major rivers and reservoirs in the state. There are seven known Bald Eagle nests within the proposed bat habitat improvement areas at Mark Twain Lake, of which two are known to be active as of 2025 (Figure 8).

Alternative 1 – No Action (Future Without Project)

Bald Eagle nests are typically built in large, tall, mature trees. Forest health must be maintained in order for mature trees to grow around the reservoir. The absence of mature trees would result in less available and suitable nesting habitat. The foraging opportunities for Bald Eagles at Mark Twain Lake are tied more to aquatic than terrestrial forest habitat, given the diet of Bald Eagles. Bald Eagle breeding efforts would be minorly adversely impacted over the long term by the No Action Alternative, whereas foraging needs would not be impacted by No Action.

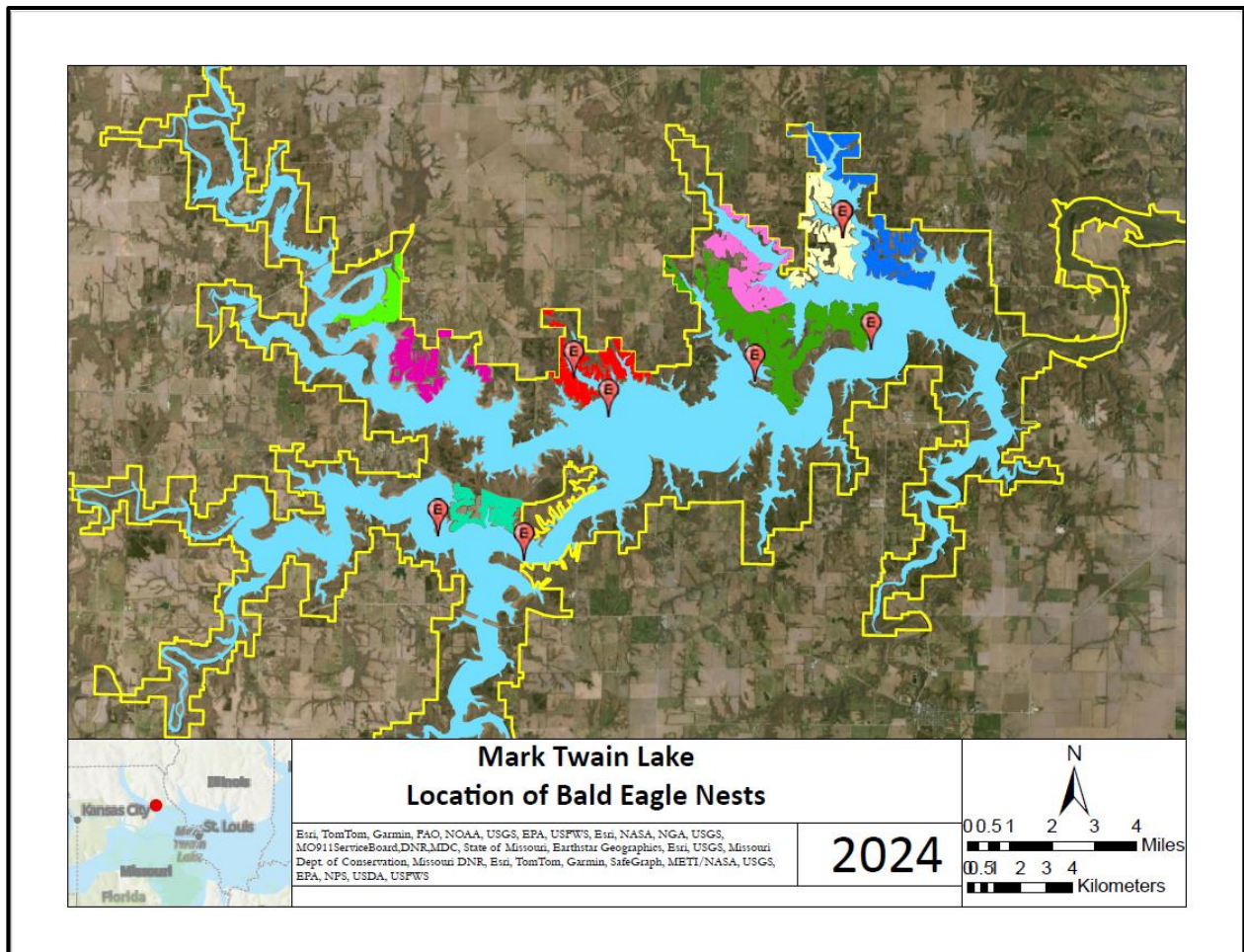


Figure 8. General location of Bald Eagle nests within the Mark Twain Lake boundary.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

The BHI actions are carefully designed to improve the quality of the forest habitat, which would, in turn, benefit the animals that rely on quality forest habitat, such as Bald Eagles. The operation

of loud equipment such as chainsaws and the use of skid-steers and hauling trucks would cause a minor short term adverse impact to nesting Bald Eagles within the vicinity of the work. Prescribed burning may result in mobile Bald Eagles leaving the area, and may result in take for immobile individuals. However, USACE would maintain a 660-foot buffer around all active Bald Eagle nests, per the Bald and Golden Eagle Protection Act (BGEPA) guidelines. USACE obtained an Eagle Disturbance Take Specific Permit (PER20919020) from the USFWS on 11 September 2025 for the seven known nests in the project footprint, and would follow all permit requirements (Appendix B - Coordination). No trees containing Bald Eagle nests would be removed. Overall impacts to Bald Eagles would be minor and short term.

3.3.3 MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) of 1918 provides protection for bird species native to North America. The Mark Twain 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 may occur in the project areas, some as migrants and some as breeders. Waterfowl, wading birds, shorebirds, passerines, and raptors use the Mark Twain Lake watershed for resting, feeding, nesting, and for other life-history needs. The Missouri Birding Society has recorded 442 species that are known to occur in the state of Missouri. Over 200 species have been documented at the Mark Twain Lake project including 24 species of waterfowl, 27 species of shorebird, 11 species of hawk, 3 species of owl, and 24 species of warbler (eBird, 2024). Many dozens of other migratory bird species are known to use the habitats in and around Mark Twain Lake for migration stopover and for breeding. There are 16 eBird hotspots at various locations around the lake. The hotspot with the most species is the John F. Spalding Recreation Area hotspot on the northeast side of the lake, with 148 species over 228 checklists. Large reservoir lakes like Mark Twain are important for migrating waterfowl.

Alternative 1 – No Action (Future Without Project)

Similar to the terrestrial habitat resource, the level to which forest stands at Mark Twain Lake provide for the life-history needs of migratory birds would suffer adverse impacts under the No Action Alternative. Forest bird species, like any forest-dependent species, require healthy forests to complete their life-history. While a heavy invasive component in the understory provides good cover, it does not provide sufficient food in the form of fruit, nuts, and associated insects. It also does not provide the required open foraging and nesting opportunities when compared to well managed oak-hickory forests. In addition, a lack of healthy regeneration would mean the forest itself may eventually be replaced by less desirable woody shrubs and young trees. Overall impacts to migratory birds would be moderate, adverse, and long term.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

The BHI actions are carefully designed to improve the quality of the forest habitat, which would, in turn, benefit the animals that rely on quality forest habitat, such as bats and migratory birds. As with the Bald Eagle, the operation of loud equipment like chainsaws and the use of skid-steers and hauling trucks may cause a short term minor impact to mobile migratory birds using the areas within the vicinity of the work. Direct adverse impacts would result from trees burned or felled that are currently used by wintering year-round residents. Per the USFWS guidance, “take” under

the MBTA is defined as "pursue, hunt, shoot, wound, kill, trap, capture, or collect" (*regulatory definition; no statutory definition*). Incidental take can result from the taking of migratory birds that results from, but is not the purpose of, an activity. In order to reduce threats to migratory birds, the following conservation measures would be implemented:

- Trees targeted for removal would be felled between 15 November and 15 March, limiting the impact to wintering year-round residents
- Contamination of natural aquatic and wetland systems with runoff would be avoided by limiting all equipment maintenance, landing laydown, and dispensing of fuel, oil, etc., to designated upland areas.
- Any use of pesticides, herbicides, or rodenticides shall comply with the applicable Federal and State laws. These shall be used only in accordance with their registered uses and within limitations imposed by USACE. Additionally, they should be used in accordance with the manufacturer's instructions to limit access to non-target species.
- Prescribed burns in forested areas would be limited to the bat non-roosting season, which would limit impacts to nesting birds as well.

Specific authorization for activities proposed under the BHI Alternative are coordinated with the USFWS in compliance with the MBTA. Overall impacts to migratory birds would be minor and short term.

3.3.4 AQUATIC HABITAT AND ORGANISMS

The Mark Twain Lake watershed is comprised of 2,318 square miles with an additional 29 square miles draining into the re-regulation pool. The North Fork of the Salt River is the major drainage channel, draining 626 square miles and is 88.0 miles in length. The Middle Fork, Elk Fork and South Fork of the Salt River are the other major tributaries to Mark Twain Lake. The Middle Fork drains 356 square miles and is 65.4 miles in length. The Elk Fork drains 262 square miles and is 34.8 miles in length. The South Fork drains 298 square miles and is 38.0 miles in length. Wetlands are present in the areas surrounding the lake. The primary wetland types include lake, riverine, freshwater forested/shrub, and ponds. Additionally, nine wetland sub-impoundments have been developed for waterfowl management.

The impoundment of Mark Twain Lake has caused a decrease in fast-water adapted fish species, and an increase in slow-water adapted fish species. Species found in the lake pool include Black Bass (*Micropterus salmoides*), White Bass (*Morone chrysops*), Black Crappie (*Pomoxis nigromaculatus*), White Crappie (*Pomoxis annularis*), Bluegill (*Lepomis macrochirus*), Green Sunfish (*Lepomis cyanellus*), Channel Catfish (*Ictalurus punctatus*), Blue Catfish (*Ictalurus furcatus*), Flathead Catfish (*Pylodictis olivaris*), Walleye (*Sander vitreus*), and several species of minnows including Common Carp (*Cyprinus carpio*), several species of suckers, gars, Freshwater Drum (*Aplodinotus grunniens*), and Gizzard Shad (*Dorosoma cepedianum*). The tailwater downstream of the re-regulation dam yields sizable concentrations of crappie, White Bass, Channel Catfish, Flathead Catfish and Walleye. Additionally, recent studies are examining the

possibility that Lake Sturgeon utilize the fast-moving tailwaters of the re-regulation dam for spawning. The Project possess the potential to perpetuate sustainable habitat for this Missouri state endangered species through carefully coordinate water release activities.

The lake and tail-water also have diverse forms of phytoplankton, zooplankton, aquatic insects, crustaceans, amphibians, reptiles, and mollusks. 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. Snapping Turtles (*Chelydra serpentina*), River Cooter (*Pseudemys concinna*) and Red-eared Slider (*Trachemys scripta*) are common in many palustrine waterbodies, including large reservoirs like Mark Twain 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*).

Alternative 1 – No Action (Future Without Project)

The lack of BHI management actions would not cause an adverse impact to aquatic habitats. The health and function of the aquatic habitats in the project area may change over time, but are unlikely to be related to the condition of forest habitat. Thus, no overall impacts to aquatic resources are anticipated as a result of the No Action Alternative.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

The BHI actions would alter only terrestrial habitats. While all habitats are ultimately connected, the BHI management actions would be unrelated to the health of aquatic habitats at Mark Twain Lake. Additionally, best management practices would be used to minimize sediment runoff and to prevent chemicals from entering the aquatic habitat. Bat habitat improvement activities would avoid wetlands. Therefore, adverse impacts to the health and function of aquatic habitats and organisms as a result of Alternative 4 are anticipated to be negligible and short term.

3.3.5 REGULATORY AUTHORIZATIONS

While some of the forested areas may be designated as forested/shrub wetland, this project does not propose to excavate or add fill to any such areas. No wetland habitat would be removed or destroyed because of the BHI activities. No Regulatory authorization is required because the project would be above the ordinary high-water mark of all waters and would not impact wetland habitat.

Furthermore, the Federal Clean Water Act, Section 404 (33 CFR Part 323.4 & 40 CFR Part 232.3), exempts normal established, ongoing silvicultural activities from the permitting process for discharges of dredged or fill material in wetlands, streams and/or other jurisdictional waters of the US. However, fifteen (15) baseline provisions for forest road construction and maintenance in and across waters of the US (33 CFR Part 328.3 & 40 CFR Part 230.3) are mandated to qualify for the forest road exemption. The burden of maintaining silvicultural exemptions through historical activity, current activities, and future plans falls on the landowner. The ultimate determination of whether activities are exempt can only be made by the USACE and the USEPA. In this case, the USACE has determined that the forest stand improvement activities are exempt.

3.3.6 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 & Wildlife Service, 2012). In accordance with Executive Order 13122 signed in 1999, the National Invasive Species Council was established. The National Invasive Species Council is comprised of Federal land management agencies and provides leadership regarding the control of invasive species. If a Federal agency action would affect the status of an invasive species, EO 13122 provides the following authorizations:

- Prevent the introduction of invasive species.
- Detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner.
- Monitor invasive species populations accurately and reliably.
- Provide for restoration of native species and habitat conditions in ecosystems that have been invaded.
- Conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species.
- Promote public education on invasive species and the means to address them.
- Do not authorize, fund, or carry out actions that the agency believes are likely to cause or promote the introduction or spread of invasive species.

Control of invasive species is an ongoing challenge at Mark Twain Lake, as it is in most of the country. Invasive species continue to pose significant threats to project resources. Infestations of invasive plants, diseases, animals, and insects are fast becoming one of the greatest threats to the earth's biological diversity, as well as human health. A number of invasive plant species suppress regeneration of other species by out competing the native vegetation for water, sunlight, nutrients, and space. Additionally, a well-developed invasive shrub layer in the understory of forested areas causes a lack of light at the forest floor that inhibits tree regeneration. Table 55 lists invasive and noxious species in and around the Mark Twain Lake Project Area.

Table 5. Invasive and noxious species in and around the Mark Twain Lake Project Area.

Invasive Species	Scientific Name	Category	Distribution
Fishes			
Common Carp	<i>Cyprinus carpio</i>	Non-native	Isolated Patches
Invasive Carp	<i>Hypophthalmichthys spp.</i>	Non-native	Isolated Patches
Plants			
Amur Honeysuckle	<i>Lonicera maackii</i>	Non-native	Isolated Patches
Autumn Olive	<i>Elaeagnus umbellata</i>	Non-native	Widely Distributed

Invasive Species	Scientific Name	Category	Distribution
Black Locust	<i>Robinia pseudoacacia</i>	Native	Isolated Patches
Brome Grass	<i>Bromus spp.</i>	Non-native	Isolated Patches
Callery Pear	<i>Pyrus calleryana</i>	Non-native	Isolated Patches
Crown Vetch	<i>Securigera varia</i>	Non-native	Isolated Patches
Fescue Grass	<i>Festuca spp.</i>	Non-native	Widely Distributed
Honey Locust	<i>Gleditsia triacanthos</i>	Native	Isolated Patches
Japanese Honeysuckle	<i>Lonicera japonica</i>	Non-native	Isolated Patches
Multiflora Rose	<i>Rosa multiflora</i>	Non-native	Isolated Patches
Poison Ivy	<i>Toxicodendron radicans</i>	Native	Isolated Patches
Purple Loose Strife	<i>Lythrum salicaria</i>	Non-native	Isolated Patches
Red Cedar	<i>Juniperus virginiana</i>	Native	Isolated Patches
Reed Canarygrass	<i>Phalaris arundinacea</i>	Non-native	Isolated Patches
Sericea Lespedeza	<i>Lespedeza cuneata</i>	Non-native	Widely Distributed
Tree of Heaven	<i>Ailanthus altissima</i>	Non-native	Isolated Patches
Invertebrates			
Emerald Ash Borer	<i>Agrilus planipennis</i>	Non-native	Widely Distributed
Japanese Beetle	<i>Popillia japonica</i>	Non-native	Widely Distributed
Zebra mussel	<i>Dreissena polymorpha</i>	Non-native	Isolated Patches
Pathogens			
Sudden Oak Death	<i>Phytophthora ramorum</i>	Native	Isolated Patches

Alternative 1 – No Action (Future Without Project)

Without the invasive species management proposed in the BHI actions, invasive and noxious plant species are likely to grow and spread through existing forest stands and open areas and colonize new sites where they are not already present. Additional invasive species not currently found at Mark Twain Lake may also appear and flourish unimpeded. This would result in poorer forest and openland/grassland health, which would lead to fewer resources for native wildlife species which depend on the forest and open grasslands for survival and reproduction. Overall impacts would be moderately adverse and long term.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

A major activity included in the BHI Alternative is the elimination of invasive trees and shrubs within select forest stands and openland/grassland units. This would reduce competition for native species, and result in healthier, more productive forests and openland/grasslands. Gaps created by elimination of densely growing invasive plants would provide open foraging areas for bats and birds. However, the BHI actions propose to eliminate only those invasive trees and shrubs within targeted areas. Non-plant invasive species, such as fishes, mollusks, and insect pests would not be targeted by this alternative. Overall invasive species management would moderately benefit the native plants and wildlife within the action area over the long term.

3.3.7 THREATENED AND ENDANGERED SPECIES BIOLOGICAL ASSESSMENT

3.3.7.1 Federally Listed Species

In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, an official updated list of species and critical habitat potentially occurring in the vicinity of the proposed project was acquired from the USFWS Information for Planning and Conservation (IPaC) website at (<https://ecos.fws.gov/ipac/>) on 04 December 2025 (Table 6) (Appendix B - Coordination). There are no designated Critical Habitat locations in the proposed action areas. Habitat requirements and impacts of the federal action are discussed for each listed species.

Table 6. Federally listed threatened and endangered species potentially occurring within the Proposed Project Area.

Species	Federal Status	Habitat
Gray Bat (<i>Myotis grisescens</i>)	Endangered	Caves and mines (hibernacula and roosting); rivers and reservoirs adjacent to forests (foraging).
Indiana Bat (<i>Myotis sodalis</i>)	Endangered	Caves, mines (winter hibernacula); trees (summer roosting); and small stream corridors with well-developed riparian woods; upland forests (foraging)
Northern Long-eared Bat (<i>Myotis septentrionalis</i>)	Endangered	Caves, mines (winter hibernacula); rivers and reservoirs adjacent to forests (foraging)
Tricolored bat (<i>Perimyotis subflavus</i>)	Proposed Endangered	Caves, mines, storm sewers, box culverts, surge tunnels at quarries, and rockfaces (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).
Monarch Butterfly (<i>Danaus Plexippus</i>)	Proposed Threatened	Uses milkweed plants as a reproductive host. Could occur anywhere in Missouri with host milkweed present
Western Regal Fritillary (<i>Argynnis idalia occidentalis</i>)	Proposed Threatened	Remnant native prairies, including disturbed or somewhat degraded examples and native pastures usually supporting sufficient populations of violets.

3.3.7.1.1 Conservation Measures

- Trees ≥ 3 " dbh targeted for removal would be felled between 15 November and 15 March, in order to limit impacts to roosting bats.
- Trees with characteristics of suitable roosts (i.e., dead or dying with exfoliating bark or large living trees with flaking bark) would be maintained wherever possible with regard for public safety and accomplishment of overall BHI goals and objectives.
- A minimum of five snag trees per acre would be maintained at preferred locations within identified stands.
- Adequate stocking of mature Shagbark Hickory trees would be preserved.
- All occupied bat maternity trees discovered would be protected from physical disturbance until they naturally fall to the ground.
- Stringent erosion and sedimentation controls to protect water quality and bat prey base in streams and wetlands would be developed and implemented. Forestry BMPs would be implemented in all timber harvest areas.
- Prescribed burns would not occur in forested areas during the bat active season.
- Forest species and size class diversity would be maintained in order to ensure a long-term supply of potential Indiana Bat trees.
- Openings in the forest canopy would be created or maintained for interior feeding/flight spaces.
- Shade tolerant mid-story tree species occurring in the forest habitat would be removed to encourage understory and forest floor vegetative diversity.
- Use of herbicides and pesticides would be minimized as much as feasible.
- Selective removal of woody plants and other invasive plants in openland/grassland areas would occur to promote the growth of native plants, such as milkweeds and violets.

Alternative 1 – No Action (Future Without Project)

Under the No Action Alternative, declining summer habitat quality may result in fewer suitable roost trees, a decline in the forage prey base, and /or unsuitable foraging areas. This would potentially lead to a decline in the population of threatened and endangered forest dwelling bat species, including the Indiana Bat, since a bat's energy resources are depleted by the need to travel farther from hibernacula to find adequate roosting habitat, or spend more time foraging, thereby leaving fewer resources to direct towards maternity care, mating, and health maintenance.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

Species specific impacts under alternative 4 are discussed below:

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 [ECOS species profile](#).

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 occupy karst features, often along rivers. Gray Bats may also occasionally occur 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 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 locations (U.S. Fish and Wildlife Service, 1982) (U.S. Fish and Wildlife Service, 2009). Gray Bats are known to use sites near the Sodalis Nature Preserve, however their numbers have dropped in recent years.

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 present (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. Surveys conducted since 2009 indicate that Gray Bats do not appear to be susceptible to white-nose syndrome to the same degree as other affected *Myotis* (USFWS, 2025).

Species Presence and Use

The proposed Mark Twain Lake BHI project is located in Missouri bat zone 1. According to 2022 data, the nearest zone 3 site is located approximately 16 miles away. Acoustic surveys conducted in 2024 in compartments 11, 48, and ES4 recorded the presence of Gray Bats within the proposed project area. In 2025 Gray Bats were detected in acoustic surveys in compartments 7, 9, and 48.

Potential Impacts to Gray Bats

Direct impacts to Gray Bats are not anticipated as no activities in or near caves, mines, or structures used for roosting or hibernacula are proposed. Indirect impacts, while unlikely, could result from noise disturbance from chainsaws, vehicles, and other equipment; as well as smoke from prescribed burns. Tree removal activities could also cause indirect impacts by manipulating travel corridors and migration habitat used by Gray Bats when moving to/from foraging and/or hibernacula. All tree cutting activities would take place between 15 November and 15 March of any given year, during the non-active season for woodland bat species. Prescribed burns in forested areas would also be limited to the non-roosting season.

Further impacts resulting from BHI activities would include interrelated activities such as the transport of trees using access roads and possible establishment of landings. Access roads would consist primarily of ridgetops, agricultural fields, and preexisting roads. Landings may be established on ridge tops and flat areas suitable for access and for minimizing soil disturbance. Landings would be established in locations in which removal of potential trees is unnecessary, and most landings would be sited in naturally open areas. Bat habitat improvement related activities may temporarily discourage bats from foraging in the immediate vicinity of the proposed action areas. We do not anticipate permanent adverse impacts to Gray Bats from interrelated activities.

Determination of Effects

Due to the conservation measures discussed in Section 2.5, no adverse or cumulative effects to the Gray Bat population are anticipated. Based on the site specific information which includes an extremely small potential for direct or indirect adverse effects to individual Gray Bats, the USACE St. Louis District has determined that the Mark Twain Lake Indiana Bat Habitat Improvement Project “*may affect, but not likely to adversely affect*” the Gray Bat.

Indiana Bats

Legal Status

The Indiana Bat is federally listed as 'Endangered' and additional information regarding its legal status can be found on the [ECOS species profile](#).

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. The largest known hibernating population of Indiana Bats is in Lime Kiln Mine at the Sodalis Nature Preserve in Hannibal, Missouri, less than 20 miles from Mark Twain Lake.

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 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

The proposed Mark Twain Lake project is located in Missouri bat zone 1. Site specific information includes suitable summer roosting and foraging habitat within the forested, openland/grassland, and lake/river areas within and surrounding the Mark Twin Lake boundaries, recorded Indiana Bat maternity roosts within 0.75 miles of the northern Shell Branch arm of Mark Twin Lake in 2021, no impacts to caves or mines, selective tree clearing, and removal of trees $\geq 3"$ dbh restricted to 15 Nov – 15 March. While there are a few documented instances of Indiana Bats using human-made non-mine or cave hibernacula, there are no plans to modify such structures during BHI activities. In 2024, acoustic surveys conducted in compartments 11, 48, and ES4 recorded the presence of Indiana Bats within the proposed project area. In 2025, Indiana Bats were detected in acoustic surveys conducted in compartments 7, 9, and 48.

Potential Impacts to Indiana Bats

Direct impacts could result from disturbance to roosting bats if an occupied tree is felled, or as a result of prescribed burning. Indirect impacts could result from noise disturbance from chainsaws, vehicles, and other equipment or activity, as well as prescribed burns. Tree removal activities could also cause indirect impacts by manipulating travel corridors and migration habitat used by Indiana Bats when moving to/from foraging areas in the summer or when moving to/from winter hibernacula in the fall and spring. All tree cutting activities would take place between 15 November and 15 March of any given year, during the non-active season for woodland bat species. Although prescribed burning may affect Indiana Bats by causing short-term disturbance if burning occurs while they are in their roosts, and may impact them more during critical points of their life cycle such as post-hibernation and the early pup-rearing phase (01 April-15 August in Missouri), USACE would limit prescribed burns in forested area to the non-roosting season. Overall, prescribed burns may both destroy and create roosts. However, several studies suggest that Indiana Bats select areas that have been burned for both roosting and foraging, indicating that prescribed burning may be beneficial for the species (Loeb & O'Keefe, 2014) (Luensmann, 2005). Further, prescribed burning may be critical for the long-term restoration of their preferred habitats (Luensmann, 2005). Other impacts resulting from BHI activities may include interrelated activities such as the transport of trees using access roads and possible establishment of landings. Access roads would consist of ridgetops, agricultural fields, and preexisting roads (agricultural, county, USACE, etc.). Landings may be established on ridge tops and flat areas suitable for access and for minimizing soil disturbance. Landings would be established in locations in which removal of potential roost trees is unnecessary, and most landings would be sited in naturally open areas. USACE does not anticipate permanent adverse impacts to the Indiana Bat from interrelated activities.

With the implementation of this Bat Habitat Improvement project, optimal foraging and roosting habitat would be created over a large area where BHI activities are proposed. Timber harvest that results in a somewhat lower basal area of standing trees, such as that proposed in this project, would benefit the Indiana Bat as it would allow individuals to move more easily in an “uncluttered” forest and still allow for some protection during flight. Indiana Bat habitat enhancement would be favored through forest thinning and formation of linear corridors to create open canopy structure for travel and foraging areas for a diversity of bat species. Thinning would improve travel corridors and allow sunlight to reach potential roost trees. Non-hazardous dead trees, split trees, trees with cavities, and trees with exfoliating bark would be favored for retention. Snags would be created as dictated by habitat type conditions to protect/provide a specific habitat for Indiana Bats as well as other forest dwelling bats. Loss of familiar trees and associated foraging habitat, while negative in the short term, are not expected to have long term consequences for a colony because of the remaining forested habitat nearby and the propensity of the species to utilize alternative sites (Carter & Feldhammer, 2005) (Luensmann, 2005). Additionally, BHI actions implemented in un- or under-managed forest habitat would serve to benefit bats in the long-term by improving the quality of forested areas they use for foraging and roosting.

Effects Determination – Indiana Bats

Based on conservation measures discussed in Section 2.5, no adverse or cumulative effects to the Indian Bat population are anticipated. Based on the specific site specific information which includes a an extremely small potential for direct or indirect adverse effects to individual Indiana Bats, the USACE St. Louis District has determined that the Mark Twain Lake Indiana Bat Habitat Improvement Project “*may affect, but not likely to adversely affect*” the Indiana Bat.

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 [ECOS species profile](#).

Recovery Plans

Available recovery plans for the Northern Long-eared Bat can be found on the [ECOS species 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 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 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

The proposed Mark Twain Lake project is located in Missouri bat zone 1. Surveys through 2022 showed Northern Long-eared Bats using the mine at the Sodalis Nature Preserve in extremely low numbers. Acoustic surveys conducted in compartments 11, 48, and ES4 recorded the presence of NLEBs within the proposed project area. In 2025, Northern Long-eared Bats were detected using acoustic surveys in compartments 7, 9, and 48.

Potential Impacts to Northern long-eared Bats

The potential impacts to Northern Long-eared Bats are consistent with those described for the Indiana Bat.

Effects Determination - Northern Long-eared Bats

Due to the small number of Northern Long-eared Bats believed to occur in the area, as well as the conservation measures discussed in Section 2.5, no adverse or cumulative effects to the Northern Long-eared Bat population are anticipated. Based on the site specific information which includes an extremely small potential for indirect adverse effects to individual Northern Long-eared Bats, the USACE St. Louis District has determined that the Mark Twain Lake Indiana

Bat Habitat Improvement Project “*may affect, but not likely to adversely affect*” the Northern Long-eared Bat.

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 [ECOS species profile](#).

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 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 one to two 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

The proposed Mark Twain Lake project is located in Missouri bat zone 1. Surveys through 2022 showed Tricolored Bats using the mine at the Sodalis Nature Preserve in moderate numbers. Studies reveal that Tricolored Bats have been observed overwintering in habitats with conditions similar to cave or mine hibernacula. Acoustic surveys conducted in compartments 11, 48, and ES4 recorded the presence of Tricolored Bats within the proposed project area. In 2025, Tricolored Bats were detected using acoustic surveys in compartments 7, 9, and 48.

Potential Impacts to Tricolored Bats

The potential impacts to Tricolored Bats are consistent with those described for the Indiana Bat.

Effects Determination - Tricolored Bats

Due to the conservation measures discussed in Section 2.5, no adverse or cumulative effects to the Tricolored Bat population are anticipated. Based on the site specific information which includes an extremely small potential for direct or indirect adverse effects to individual Tricolored

Bats, the USACE St. Louis District has determined that the Mark Twain Lake Indiana Bat Habitat Improvement Project “*may affect, but not likely to adversely affect*” the Tricolored Bat.

Monarch Butterfly

Legal Status

The Monarch Butterfly is federally listed as “Proposed Threatened” and additional information regarding its legal status can be found on the [ECOS species profile](#).

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 & Wilsey, 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 factors 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, vegetation management noise, and other disturbances. Some milkweed may be found along the access roads and in the more open areas where invasive species management is proposed. Some milkweed may be inadvertently destroyed as a consequence of the invasive species removal and prescribed burns. However, the seedbank would not be impacted, and permanent losses of milkweed are unlikely. Indirect impacts to the butterfly could result from noise and other disturbances, including prescribed burns. Any indirect disturbances would be minimized or avoided as most of the work would be conducted in the cold winter months when Monarchs are not present. Mark Twain 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 Mark Twain Lake Indiana Bat Habitat Improvement Project “*may affect, but not likely to adversely affect*” the Monarch Butterfly.

Western Regal Fritillary

Legal Status

The Western Regal Fritillary butterfly (*Argynnis idalia occidentalis*) is federally listed as “Proposed Threatened”, and additional information regarding its legal status can be found on the [ECOS species profile](#).

Recovery Plans

Available recovery plans for the Western Regal Fritillary butterfly can be found on [ECOS species profile](#).

Life History Information and Identified Resource Needs

Regal fritillaries begin their life cycle as eggs, which are oviposited singly by adult females in grassland landscapes, from late August to October. In early spring, surviving larvae emerge and search for young violets, their primary source of food. From late spring to early summer, the larvae pupate in nearby vegetation for approximately 2.5 weeks or longer if conditions are unfavorable. Mature larvae pupate in the vegetative litter of warm season grasses. Regal fritillary adults are first observed in June and become more common in July as more adults emerge and numbers of both sexes peak. The adult flight period typically spans several months from late spring to mid-autumn, varying annually, by location and by sex. The adult stage is relatively long, with some individuals surviving up to 90 days in the wild. During this period, adults rely on nectar sources for food and may also require moisture and nutrients from soils. In late August, stimulated by a rise in hormone levels coinciding with egg development about a week before laying eggs, females disperse again in search of areas to oviposit. Regal fritillaries are not migratory, but are capable of strong and rapid flight, and individuals may move long distances from breeding colonies. Individuals, particularly long-lived adult females, may be capable of moving more than 100 miles. Reproduction occurs once per year.

The following habitat factors are needed by individuals to successfully complete all stages of their life cycle:

- *Native grasses*, either tallgrasses or mixed grasses;
- *Violets*, as larval food;
- *Diverse floral resources*, as nectar and shelter sources for adults;
- *Shrubs and tall vegetation*, to provide shelter for adults;
- *Vegetative litter and grass tussocks*, as shelter for all life stages;
- *Ambient temperatures*, needed for larval and pupae development;
- *Moisture*, needed to prevent desiccation and support violets and nectar sources.

Potential Impacts to Western Regal Fritillary

Potential direct impacts may be direct mortality of larvae in burned vegetation, loss of vegetation that occurs with fire, including insulating leaf litter, violets used by larvae, and nectar sources used by adults. Similar effects may occur with mowing or other forms of grassland maintenance. However, fire and other grassland management techniques typically promote all the necessary habitat components required by regal fritillaries, such as the growth of forbs, including important nectar sources and larval host plants, and the dominant warm season grasses like big bluestem. Marginal habitat may be present the proposed action areas. If present, violets and other vegetation may be disturbed or destroyed during BHI activities.

Effects Determination – Western Regal Fritillary

Based on the site specific conditions, the USACE St. Louis District has determined that the Mark Twain Lake Indiana Bat Habitat Improvement Project “*may affect, but not likely to adversely affect*” the Western Regal Fritillary.

3.3.7.2 USFWS Consultation

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

3.3.8 STATE LISTED SPECIES

A Missouri Department of Conservation (MDC) Natural Heritage Review Level Three Report was generated on 7 November 2024. Level 3 reports identify public lands and records of sensitive resources located close to and/or potentially affected by the proposed project. On 7 November 2024, the MDC Natural Heritage Review program was contacted via email to provide a list of state threatened and endangered species which may occur in the proposed project area. On 11 November 2024, the Natural Heritage Review program responded with an email stating that the request had been added to the work queue, and may take 3 to 8 weeks to complete. On 31 January 2025, the MDC provided a Natural Heritage Review Report stating that records indicated the state-listed and state-ranked species listed in Table 77 may occur near the project area. There are no regulatory requirements associated with state listed status (S2, S3), however MDC encourages voluntary stewardship to minimize the risk of further decline that could lead to listing. Correspondence is shown in Appendix B.

Table 7. Missouri listed and state-ranked species which may occur near the project area.

Common Name	Scientific Name	Rank	Proximity (miles)	Habitat
Mammals				
Indiana Bat	<i>Myotis sodalis</i>	Endangered	X	In summer, and raise young under the bark of trees in riparian forests and upland forests near perennial streams. In winter, hibernate in caves and mines.
Northern Long-eared Bats	<i>Myotis sodalis</i>	Endangered	X	In summer, and raise young under the bark of trees in riparian forests and upland forests near perennial streams. In winter, hibernate in caves and mines.
Gray Bats	<i>Myotis grisescens</i>	Endangered	X	Forage over streams, rivers, and reservoirs. Roost and hibernate in caves and mines and some human-made structures.
Tri-colored Bats	<i>Perimyotis subflavus</i>	Proposed Endangered	X	In summer, in trees, bridges, culverts, in crannies about cliffs or buildings, in barns, or sometimes in high domes of caves. In winter, hibernate in caves and mines.
Little Brown Myotis	<i>Myotis lucifugus</i>	S2	<4	Forest matrix, cave, habitat generalist
American Badger	<i>Taxidea taxus</i>	S3	<4	Grassland matrix, savanna pasture/orchard, row/close grown crops
Fishes				
Ghost Shiner	<i>Notropis buechanani</i>	S2	<1	Large rivers over firm sand, gravel or rocky bottom
Mussels				
Wartyback	<i>Cyclonaias nodulata</i>	S3	<3	River/stream
Plants				
Western Wallflower	<i>Erysimum capitatum</i> var. <i>capitatum</i>	S2	<1	Glade complex, Bluff, Roadside/railroad

S2 – Imperiled; S3 – Vulnerable

Bats – Impacts to bat species are discussed in Section 3.3.6 - Federally Listed Species. Impacts to the Little Brown Bats are anticipated to be similar to those discussed for other forest dwelling bat species.

Badger – Minimal adverse impacts are anticipated for the American Badger as the project is intended to improve openland/grassland and forest habitats.

Fish and Mussels – No impacts to fish or mussel species are anticipated since all work would take place in uplands; no work would occur in or near rivers. A riparian buffer and use of BMPs would minimize any potential runoff or overspray of herbicides into waterbodies.

Western Wallflower – Minimal adverse impacts are anticipated for the Western Wallflower as the project is intended to improve openland/grassland and forest habitats.

3.4 SOCIAL AND ECONOMIC RESOURCES

3.4.1 ECONOMICS

Annual visitors to the recreational areas at Mark Twain Lake contribute substantially to the local economy by providing jobs and income. Surrounding the reservoir are resorts, hotels, RV parks, restaurants, campgrounds, marinas, pharmacies, grocery stores, convenience stores, gas stations, and other services that cater to visitors traveling to Mark Twain Lake. More indirectly, the participation in outdoor recreation involves large purchases of equipment like boats, fishing tackle, camping equipment, recreational vehicles, and other items too numerous to count. According to the 2023 USACE Value to the Nation Fast Facts (USACE, 2025), visitors to Mark Twain Lake spend approximately \$64,261,863 within 30 miles of the lake for things such as gas, food, and lodging. An additional \$45,603,986 in sales is generated for durable goods, such as boats and camping equipment. This spending supports approximately 401 jobs within 30 miles of the lake, resulting in labor income of about \$13,365,837, and \$21,507,189 in value added within 30 miles of the lake.

Alternative 1 – No Action (Future Without Project)

As described in the Economics section above, the recreational and natural setting experience at Mark Twain Lake contribute substantially to the local economy in Ralls and Monroe counties, Missouri. Any damage to the recreational and/or natural environment experience at Mark Twain Lake could translate into declining visitation. In the absence of BHI actions at Mark Twain Lake, the quality of the natural habitats and services they provide to wildlife in the forest stands and openland/grassland habitats enjoyed by recreational visitors would be expected to decrease. While boating, swimming, and other aquatic recreational activities would be less affected, the campgrounds, trails, and other upland areas may become less inviting. If this results in fewer visitors to these recreational areas, then the No Action alternative is anticipated to result in minor adverse impacts to the local economy.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

Bat habitat improvement is designed to result in forests and openlands/grasslands with improved conditions over existing conditions. If the reduction in invasive species in the understory and more open areas increases the quality of the visitor experience, this may translate into increased visitorship over time. Furthermore, some of the felled trees may be sold commercially. In this way, the BHI alternative is anticipated to result in minor beneficial long term impacts to the local economy.

3.4.2 AESTHETICS AND RECREATION

Aesthetics at the Mark Twain Lake project are important, given that the lake is used by thousands of visitors each summer day. It is for this reason that it is practical to consider both aesthetics and recreation together. The overall aesthetic features of the area include the moderate relief topography, exposed rock, the interspersed forest and open land constituting the majority of adjacent land, and moderately turbid waters. Recreational uses are one of the primary purposes of the Mark Twain Lake project. The primary mission of recreation is to manage and conserve natural resources, consistent with ecosystem management principles, while providing quality public outdoor recreation experiences to serve the needs of present and future generations. The Mark Twain Lake project contains 59 recreation areas, with 544 campsites, 55 picnic sites, 27 boat ramps, 536 marina slips and over 50 miles of trails (USACE, 2025). Each year, on average, approximately 1.2 million people visit the lake, with the majority being swimmers, walkers/hikers/joggers, boaters, picknickers, sightseers, anglers, and campers/overnight visitors (USACE, 2025). The existing aesthetics of the recreational areas are attained through regular maintenance and cleaning. Adverse impacts to aesthetics could result from docks, trails, buildings, and other infrastructure becoming degraded or damaged. The excessive growth of undesirable or invasive vegetation can both limit the ability of visitors to enjoy recreational opportunities and natural areas and adversely affect the overall aesthetics of the area.

Alternative 1 – No Action (Future Without Project)

The No Action alternative would have adverse impacts similar to those of the local economic conditions. In the absence of BHI actions at Mark Twain Lake, the quality of the natural habitats used by recreational visitors and wildlife would be expected to decrease. The decline in habitat condition and viewable wildlife may make the area less desirable to recreational visitors. This could result in a minor adverse impact to recreation. Similarly, the lack of BHI management would also decrease the overall aesthetics of the area. Overall, fields and forest understories choked with invasive plants may be viewed as moderately less aesthetic than diverse sites composed of healthy regenerating trees, saplings, forest wildflowers, and other herbaceous flowering plants over the long term.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

The improved openland/grassland and forest condition resulting from the BHI alternative would make the natural areas and viewable wildlife more desirable to visitors. Recreational opportunities provided by these areas include wildlife watching, photography, hiking, picnicking, and interpretive nature experiences. For many recreational visitors seeking these experiences, the aesthetics of an area is important, and is tied to the natural beauty of their surroundings.

Healthy natural areas present a more diverse and aesthetically pleasing experience to visitors seeking these recreational opportunities at Mark Twain Lake. In this way, recreation and aesthetics would benefit moderately from the BHI alternative over the long term.

3.4.3 CULTURAL RESOURCES

Archaeological investigations within the Salt River valley began in the late 1940s by members of the Missouri Archaeological Society. In 1959, the Division of American Archaeology, University of Missouri, conducted investigations in anticipation of the construction of the dam. Specifically, they were looking to identify and document as many prehistoric sites as possible. This initial investigation identified 140 sites throughout the 1960s, of which twenty-one sites underwent intensive excavations. During the 1970s, further archaeological investigations were conducted by the Division of Archaeological Research, University of Nebraska-Lincoln during the construction of the dam. These investigations documented 1,965 prehistoric and historic sites within what would become USACE fee-title land (O'Brien et al. 1979). Cultural resource investigations continue to occur to present.

A review of USACE and Missouri State Historic Preservation Office (SHPO) files reveal 84 archaeological sites have been previously identified within the eight compartments under consideration for the Indiana Bat habitat improvement. The majority of these sites are unevaluated for eligibility to the National Register of Historic Places (NRHP), indicating that they would need to be evaluated if they are directly or indirectly affected by the proposed actions. A cultural resource survey of the area of potential effects (APE) has been completed within Compartment 48. That survey recorded four previously unidentified archaeological sites and revisited one previously identified site. Three of the newly recorded sites were determined ineligible to the NRHP and the fourth was left unevaluated because it could be avoided. The previously identified site was determined eligible to the NRHP but is located outside of the APE.

Alternative 1 – No Action (Future Without Project)

Under the No Action Alternative, no BHI actions would be taken that would disturb existing known or unknown archeological sites or historic properties. Routine operation and maintenance activities would continue.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

The BHI project has the potential to impact cultural resources. The main areas of impact would come from haul roads, skid trails, and landing areas. A cultural resource survey would be completed within each compartment after the stand prescription has been determined and the APE has been identified. Since this project could take up to 10 years to complete, a programmatic agreement (PA) with the MO SHPO and consulting Tribal Nations has been sought by the St. Louis District.

On 15 January 2025, a letter was sent to the MO SHPO and the 20 Tribal Nations that have an interest within this area to ask if they were interested in working with the St. Louis District on a PA. The MO SHPO, Iowa Tribe of Kansas and Nebraska, The Osage Nation, and Sac and Fox Tribe of the Mississippi in Iowa agreed. A meeting took place between the St. Louis District, MO SHPO,

and consulting Tribes on 22 May 2025 to discuss the proposed project and the PA. On 11 August 2025, the St. Louis District invited the Advisory Council on Historic Preservation (ACHP) to consult on the development of the PA. The ACHP declined the invitation on 18 August 2025. The final PA was sent to MO SHPO and consulting Tribes on 26 September 2025 for approval. On 10 March 2026, the St. Louis District received the signed PA from the MO SHPO. Coordination can be found in Appendix B - Coordination.

3.4.4 TRIBAL RESOURCES

The majority of the 84 archaeological sites previously identified within the eight compartments and the four archaeological sites recently identified within Compartment 48 are prehistoric. Several of these sites are mounds. The St. Louis District has been previously informed by some of the Tribes that mounds are considered sacred sites to Native Americans.

Alternative 1 – No Action (Future Without Project)

The absence of BHI actions would not be expected to result in adverse impacts to Tribal Resources at Mark Twain Lake. No actions would be taken that would disturb existing known or unknown archeological or sacred sites.

Alternative 4 – Indiana Bat Habitat Improvement (Future With Project; Tentatively Selected Plan)

Similar to the Cultural Resources section, the main potential adverse impact would come from the construction of haul roads, skid trails, and landing areas. The *Indiana Bat Habitat Restoration Project PA* outlines the consultation process with Tribes for the St. Louis District to identify unknown Tribal resources within the APE (Appendix B - Coordination).

4 TENTATIVELY SELECTED PLAN

After careful review of the alternatives, the Tentatively Selected Plan for the Proposed Action is Alternative 4 – Indiana Bat Habitat Improvement Plan.

5 COMPLIANCE WITH ENVIRONMENTAL POLICY

The relationship of the Tentatively Selected Plan to environmental requirements, environmental acts, and /or executive orders is shown in Table 8.

Table 8. Relationship of the Tentatively Selected Plan to environmental requirements, environmental acts, and/or executive orders.

Environmental Requirement	Compliance
American Indian Religious Freedom Act, as amended, 42 USC § 1996	FC
Bald Eagle Protection Act, 42 USC 4151-4157	FC
Clean Air Act, 42 USC 7401-7542	FC
Clean Water Act, 33 USC 1251-1375	FC

Comprehensive Environmental Response, Compensation, and Liability Act, (HTRW) 42 USC 9601-9675	FC
Endangered Species Act, 16 USC 1531-1543	PC ¹
Farmland Protection Policy Act, 7 (Prime Farmland) USC 4201-4208	FC
Fish and Wildlife Coordination Act, 16 USC 661-666c	PC ¹
Food Security Act of 1985 (Swampbuster), 7 USC varies	FC
Land and Water Conservation Fund Act, (Recreation) 16 USC 460d-4601	FC
Migratory Bird Treaty Act of 1918, as amended, 16 USC § 703, et seq.	PC ¹
National Environmental Policy Act of 1969, as amended, 42 USC 4321-4347	PC ²
National Historic Preservation Act, 16 USC 470 et seq.	FC
Noise Control Act of 1972, 42 USC 4901-4918	FC
Resource, Conservation, and Rehabilitation Act, (Solid Waste) 42 USC 6901-6987	FC
Rivers and Harbors Appropriation Act, (Sec. 10) 33 USC 401-413	FC
Water Resources Development Acts of 1986 and 1990 (Sec 906 – Mitigation; Sec 307 - No Net Loss - Wetlands)	FC
Floodplain Management (EO 11988 as amended by EO 12148)	FC
Federal Compliance with Pollution Control Standards (EO 12088)	FC
Invasive Species, EO 13112, February 3, 1999, as amended	FC
Protection and Enhancement of Environmental Quality (EIS Preparation) (EO 11991)	FC
Protection and Enhancement of the Cultural Environment (Register Nomination) (EO 11593)	FC
Protection of Wetlands (EO 11990 as amended by EO 12608)	FC

FC = Full Compliance; PC¹ = Partial Compliance (on-going, will be accomplished prior to decision to sign the FONSI); PC² full compliance will be achieved upon signing of the NEPA document.

6 COORDINATION AND PUBLIC REVIEW

Notification of the DRAFT Environmental Assessment and unsigned Finding of No Significant Impact was sent to relevant officials, agencies, organizations, and individuals for review and comment. Additionally, an electronic copy of the EA was available on the St. Louis District's website during the 30-day public review period (01-30 April 2026) at the following url:

https://www.mvs.usace.army.mil/Portals/54/docs/pm/Reports/EA/MTLBHI EA_17Mar2026.pdf

Please note that the Finding of No Significant Impact is unsigned during the public review period. These documents would be signed into effect only after having carefully considered all written comments received as a result of the public review. All written comments received will become part of the public record. 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 Indiana Bat Habitat Improvement project.

Notification of Draft Environmental Assessment and unsigned Finding of No Significant Impact public review was sent to the following entities:

U.S. Senator Eric Schmitt (MO)	Wildlife Forever
U.S. Senator Joshua Hawley (MO)	Missouri Master Naturalist
U.S. Representative Sam Graves	Land Learning Foundation
Senator Cindy O’Laughlin	Audubon Society
State Representative Kent Haden	Washington University
State Representative Louis Riggs	Caddo Nation of Oklahoma
State Representative Greg Sharpe	Citizen Potawatomi Nation, Oklahoma
Monroe County Presiding Commissioner	Delaware Nation, Oklahoma
Ralls County Presiding Commissioner	Eastern Shawnee Tribe of Oklahoma
USFWS	Forest County Potawatomi Community,
US EPA, Region 7 (MO)	Wisconsin
Missouri Department of Conservation	Hannahville Indian Community, Michigan
Missouri Department of Natural Resources	Ho-Chunk Nation of Wisconsin
Mark Twain State Park	Iowa Tribe of Kansas and Nebraska
MO SHPO	Iowa Tribe of Oklahoma
Missouri State Highway Patrol, Troop B	Kickapoo Tribe of Indians of the Kickapoo
Southwestern Power Administration	Reservation in Kansas
USACE	Kickapoo Tribe of Oklahoma
Lake Gazette	Miami Tribe of Oklahoma
Hannibal Courier Post	Nottawaseppi Huron Band of the
Monroe County Appeal	Potawatomi, Michigan
Little Dixie Regional Libraries	Peoria Tribe of Indians of Oklahoma
Monroe City Public Library	Prairie Band Potawatomi Nation
Mark Twain Regional Council of	Sac & Fox Nation of Missouri in Kansas and
Governments	Nebraska
Paris Area Chamber of Commerce	Sac & Fox Nation, Oklahoma
The Nature Conservancy	Sac & Fox Tribe of the Mississippi in Iowa
Sierra Club, Osage Group	The Osage Nation
The Conservation Fund	United Keetoowah Band of Cherokee of
Missouri Conservation Heritage Foundation	Oklahoma

7 ENVIRONMENTAL ASSESSMENT PREPARERS

- Nicholas Allen (Natural Resource Specialist, USACE, Mark Twain Lake Project)
- Teri Allen, Ph.D. (Senior Technical Specialist; Aquatic Ecologist, USACE, St. Louis, MO)
- Aaron Eckelkamp (Natural Resource Specialist, USACE, Mark Twain Lake Project)
- Ben Greeling (Environmental Specialist, USACE, St. Louis, MO)
- Shelly Howald (Environmental Stewardship Program Leader; Biologist, Mark Twain Lake Project)
- Allen Meher (Assistant Operations Manager; Forester, USACE, Mark Twain Lake Project)
- Madeleine Thompson (Biological Science Technician – Wildlife, USACE, Mark Twain Lake Project)
- Meredith Trautt (Archaeologist and Tribal Liaison, USACE, St. Louis, MO)

8 REFERENCES

- Barbour, R. a. (1969). *Bats of America*. Lexington: University Press of Kentucky.
- Berger, E. H., Neitzel, R., & Kladden, C. A. (2015, June 26). *Noise Navigator Sound Level Database*. Retrieved April 28, 2025, from <https://multimedia.3m.com/mws/media/8885530/noise-navigator-sound-level-hearing-protection-database.pdf>
- Callahan, E. V., Drobney, R. D., & Clawson, R. L. (1997). Selection of summer roosting sites by Indiana bats (*Myotis sodalis*) in Missouri. *Journal of Mammalogy*, 78(3), 818-825.
- Carter, T. C., & Feldhammer, G. (2005). Roost tree use by maternity colonies of Indiana bats and northern long-eared bats in southern Illinois. *Forest Ecology and Management*, 259-268.
- DOD. (2025, Jun 30). Department of Defense National Environmental Policy Act Implementing Procedures.
- eBird. (2024, Nov 12). *eBird*. Retrieved from Bird Observations: <https://ebird.org/barchart?yr=all&bmo=1&emo=12&r=L330382,L4908417,L4821926,L4966184,L4887269,L5203128,L5064310,L4777285,L5603110,L3602691,L4922112,L4777250,L4777279,L4777299,L4950306,L20946172,L7639754>
- Elder, W. a. (1978). Sex ratios and seasonal movements of gray bats (*Myotis grisescens*) in southwestern Missouri and adjacent states. *American Midland Naturalist*, 99, 463-472.
- Gingrich, S. F. (1971). Stocking, Growth, and Yield of Oak Stands. *Oak Symposium Proceedings*. Columbus, OH: U.S. Forest Service.
- Harvey, M. (1975). Endangered Chiroptera of the southeastern United States. *Southeastern Association of Game and Fish Commissioners*, 29, 429-433.
- Hays, H. a. (1964). A colony of Gray bats in southeastern Kansas. *Journal of Mammalogy*, 45, 150. Retrieved from <https://doi.org/10.2307/jmammal/45.1.150-a>
- Kaul, A. D., & Wilsey, B. J. (2019). Monarch butterfly host plant (milkweed *Asclepias* spp.) abundance varies by habitat type across 98 prairies. *Restoration Ecology*, 27(6), 1274-1281.
- Keeley, B. a. (1999). *Bats in American Bridges*.
- Loeb, S. C., & O'Keefe, J. M. (2014). Indiana Bats, Northern Long-eared Bats, and Prescribed Fire in the Appalachians: Challenges and Considerations. In T. A. Waldrop (Ed.), *Proceedings, Wildland Fire in the Appalachians: Discussions among managers and scientists* (pp. 73-81). U.S. Department of Agriculture Forest Service, Southern Research Station.
- Luensmann, P. S. (2005). *Myotis sodalis*. In: *Fire Effects Information System*. U.S. Forest Service, U.S. Department of Agriculture. Rocky Mountain Research Station, Fire Sciences Laboratory. Retrieved from www.fs.usda.gov/database/feis/animals
- Mohr, C. (1972). The status of threatened species of cave-dwelling bats. *Bulletin of the National Speleological Society*, 34, 33-37.
- Occupational Safety and Health Administration. (2022). *Occupational Noise Exposure*. Retrieved April 28, 2025, from United States Department of Labor: <https://www.osha.gov/noise>
- Private Lands Habitat Program. (2021). *Basal Area - A Guide for Understanding the Relationships between Pine Forests and Wildlife Habitat*. Jackson, MS: The Mississippi Department of Wildlife, Fisheries, and Parks.
- Roby, P., & Birdsall, C. (2021). *Spring Migration of Indiana Bats from Lime Kiln Mine, Hannibal, MO*. Paint Lick, KY: Copperhead Environmental Consulting.

- Sasse, D. (2019). Gray Bat Day Roosts in Concrete Barriers on Bridges during Migration. *The American Midland Naturalist*, 182(1), 124-128. Retrieved from <https://doi.org/10.1674/0003-0031-182.1.124>
- Timmerman, L. a. (1992). Proceedings Arkansas Academy of Science. *Arkansas Academy of Science*, 46, 109.
- Tuttle, M. (1976). *Population ecology of the gray bat (Myotis grisescens): Philopatry, timing and patterns of movement, weight loss during migration and seasonal adaptive strategies. Occasional Paper 58*. Lawrence, KA: University of Kansas Museum of Natural History.
- Tuttle, M. (1979). Status, causes of decline, and management of endangered gray bats. *Journal of Wildlife Management*, 43, 1-17.
- U.S. Fish & Wildlife Service. (2012). *What is an Invasive Species*. Washington, DC: USFWS.
- U.S. Fish and Wildlife Service. (1982). *Gray Bat (Myotis grisescens) Recovery Plan*. Denver, CO.: U.S. Fish and Wildlife Service.
- U.S. Fish and Wildlife Service. (2007b). *Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision*. Fort Snelling, MN.: U.S. Fish and Wildlife Service. Retrieved from <http://www.mcrcc.osmre.gov/Bats/PDF/IN%20BAT%20DRAFT%20PLAN%20apr07.pdf>.
- U.S. Fish and Wildlife Service. (2009). *Gray Bat (Myotis grisescens) 5-Year Review: Summary and Evaluation*. Columbia, MO: U.S. Fish and Wildlife Service, Midwest Region, Missouri Ecological Services Field Office. Retrieved from <https://www.nrc.gov/docs/ML1802/ML18>
- U.S. Fish and Wildlife Service. (2019a). *Indiana Bat (Myotis sodalis) 5-Year Review: Summary and Evaluation*. Bloomington, IN: U.S. Fish and Wildlife Service, Indiana Ecological Services Field Office.
- U.S. Fish and Wildlife Service. (2020b). *Monarch (Danaus plexippus) Species Status Assessment Report. V 2.1*. U.S. Fish and Wildlife Service.
- U.S. Fish and Wildlife Service. (2021a). *Species Status Assessment Report for the Tricolored Bat (Perimyotis subflavus), Version 1.1*. Hadley, MA: U.S. Fish and Wildlife Service.
- U.S. Fish and Wildlife Service. (2022a). *Species Status Assessment Report for the Northern long-eared bat (Myotis septentrionalis) Version 1.1*. Bloomington, MN: U.S. Fish and Wildlife Service.
- USACE. (1985, Nov 20). ER 405-1-12. *Real Estate Handbook*.
- USACE. (1992, Jun 26). ER 1165-2-132. *Hazardous, Toxic and Radioactive Waste Guidance for Civil Works Projects*.
- USACE. (2022, Nov 30). ER 200-2-3. *Environmental Compliance Policies*.
- USACE. (2025, Dec 04). *Value To The Nation Fast Facts*. Retrieved from <https://usace.contentdm.oclc.org/utis/getfile/collection/p16021coll2/id/15640>
- USEPA. (2024, Nov 06). *Green Book*. Retrieved Nov 06, 2024, from Current Nonattainment Counties for All Criteria Pollutants: <https://www3.epa.gov/airquality/greenbook/ancl.html#MO>
- USEPA. (2024a, Nov 22). *How's My Waterway*. Retrieved from https://mywaterway.epa.gov/waterbody-report/MDNR/MO_7033.00/2022
- USFWS. (2025, Dec 04). *Gray Bat*. Retrieved Dec 04, 2025, from FWS.gov: <https://www.fws.gov/species/gray-bat-myotis-grisescens>

WSDOT. (2020). *Washington State Biological Assessment Guidance*. Retrieved April 28, 2025, from Washington State Department of Transportation: <https://safe.menlosecurity.com/doc/docview/viewer/docN1159D48F73DAc33fdf8e618dea65374448ab1534e2025140c6506a0c19043dcca3d55b6b2a30>

9 FINDING OF NO SIGNIFICANT IMPACT

Mark Twain Lake Indiana Bat Habitat Improvement Project Mark Twain Lake Monroe and Ralls Counties, Missouri

The U.S. Army Corps of Engineers, St. Louis District (USACE) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The draft Environmental Assessment (EA) dated **March 2026**, for the **Mark Twain Lake Indiana Bat Habitat Improvement Project** addresses **Indian Bat habitat improvement opportunities at Mark Twain Lake, Monroe and Ralls counties, Missouri.**

The Environmental Assessment evaluated various alternatives that would **improve the sustainability, health, and suitability of openland/grassland and forest stands for Indiana Bat roosting and foraging and wildlife habitat** in the study area. The Tentatively Selected Plan is Alternative 4 - Indiana Bat Habitat Improvement Plan and includes:

- Openland/grassland and forest management would be implemented to provide semi-open areas for bat foraging as well as suitable summer roosting habitat.
- Application of prescribed burning would be extensively utilized to improve/maintain grassland composition, density, and quality.
- Height of successional woody species within management areas would be limited to maintain clear flight paths.
- Forbs and pollinator vegetation that support moths, butterflies, and other winged insect (prey) species would be promoted.
- Maintaining a minimum of five snag trees per acre at preferred locations within identified stands;
- Preserving standing dead trees and increasing solar exposure where practical;
- Preserving adequate stocking of mature Shagbark Hickory;
- Reducing the basal area of overstory and mid-story canopy of overstocked forest stands to improve flight travel corridor and solar exposure;
- Creating clear lanes of travel at forest and field transition areas;
- Creating/maintaining gaps in the forest canopy for interior feeding/flight spaces;
- Applying prescribed burning to remove forest floor debris, to impact fire intolerant species, and to modify understory composition;
- Reducing shade tolerant mid-story tree species in the forest habitat to encourage understory and forest floor vegetative diversity;

- Managing for woodland/semi-savannah conditions on limestone bluff tops.
- The Operations Element would prepare the determination of availability for forest products to be sold on Mark Twain Lake Project lands. Timber available for sale would be incidental to the Indiana Bat Habitat Improvement Alternative, and would be utilized to perpetuate habitat improvement over a longer temporal scale.

In addition to Alternative 1 – No Action, three other alternatives were evaluated, including: Alternative 2 – Openland/Grassland Management; Alternative 3 - Forest Management; and Alternative 4 - Indiana Bat Habitat Improvement Plan (TSP). Chapter 2 discusses alternative formulation and selection.

For all alternatives, the potential effects were evaluated as appropriate. A summary assessment of the potential effects of the Tentatively Selected Plan are listed below:

	Beneficial effects	Less than significant effects	Less than significant effects as a result of mitigation	Resource unaffected by action
Aesthetics	☒	☐	☐	☐
Air quality	☐	☒	☐	☐
Wetlands	☐	☐	☐	☒
Aquatic habitat and organisms	☐	☒	☐	☐
Terrestrial habitat and organisms	☒	☐	☐	☐
Threatened/Endangered species/critical habitat	☒	☐	☐	☐
Migratory Birds and Bald Eagles	☐	☒	☐	☐
Invasive species	☒	☐	☐	☐
Historic properties	☐	☒	☐	☐
Other cultural resources	☐	☒	☐	☐
Tribal trust resources	☐	☒	☐	☐
Floodplains	☐	☐	☐	☒
Hazardous, toxic & radioactive waste	☐	☐	☐	☒
Hydrology	☐	☐	☐	☒
Land use / Land cover	☒	☐	☐	☐
Navigation	☐	☐	☐	☒
Noise levels	☐	☒	☐	☐
Public infrastructure	☒	☐	☐	☐
Recreation	☒	☐	☐	☐
Socio-economics	☒	☐	☐	☐
Soils	☐	☒	☐	☐
Water quality	☐	☒	☐	☐

SUMMARY OF POTENTIAL EFFECTS:

For all alternatives, the potential effects were evaluated as appropriate. Potential adverse impacts include minor temporary adverse impacts from the use of access roads and landing areas, prescribed burning, the use of chainsaws, skid steers, trucks, and other equipment, and minor temporary adverse impact risk from the use of pesticides to treat invasive species. There would be minor amounts of emissions and particulates. Temporary noise impacts during management activities are also expected. Beneficial impacts resulting from the management activities would include improved forest species diversity, a more suitable and sustainable composition of tree species, fewer invasive species, an open understory, oak and hickory regeneration, increased number of suitable bat roosting trees, reduction of fuel load amid the forest floor, creation of gaps within the forest canopy, and restoration of grasslands/openlands. These beneficial impacts would increase the suitability and capacity of forested and grassland areas within the Mark Twain Lake Project to provide for the life-history needs of the federally endangered Indiana Bat, as well as other forest dwelling bats species and forest-dependent wildlife.

Conservation Measures

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the Tentatively Selected Plan. The following conservation measures are incorporated into the Proposed Action to avoid or minimize adverse impacts to specific protected natural resources:

- Trees ≥ 3 " dbh targeted for removal would be felled between 15 November and 15 March, in order to limit impacts to roosting bats, migratory birds, and wintering year-round residents.
- Trees with characteristics of suitable roosts (i.e., dead or dying with exfoliating bark or large living trees with flaking bark) would be maintained wherever possible with regard for public safety and accomplishment of overall BHI goals and objectives.
- All trees that are girdled would be left standing for wildlife habitat and allowed to fall down naturally unless they pose a hazard to public safety or property.
- All occupied bat maternity trees discovered would be protected from physical disturbance until they naturally fall to the ground.
- A minimum of five snag trees per acre would be maintained at preferred locations within identified stands.
- Adequate stocking of mature Shagbark Hickory trees would be preserved.
- Forest species and size class diversity would be maintained in order to ensure a long-term supply of potential Indiana Bat trees.
- Gaps in the forest canopy would be created or maintained for interior feeding/flight spaces.

- Shade tolerant mid-story tree species occurring in the forest habitat would be removed to encourage understory and forest floor vegetative diversity.
- Resources such as wetlands and cultural sites would be excluded from tree removal areas.
- Selective removal of woody plants and other invasive plants in openland/grassland areas would occur to promote the growth of native plants, such as milkweeds and violets.
- Stringent erosion and sedimentation controls to protect water quality and bat prey base in streams and wetlands would be developed and implemented. Forestry BMPs would be implemented in all timber harvest areas.
- Forested buffers with a minimum width of 50 feet would be retained on each side of all perennial and intermittent streams to prevent any soil, bank, and bed disturbance.
- Contamination of natural aquatic and wetland systems with runoff would be avoided by limiting all equipment maintenance, landing laydown, and dispensing of fuel, oil, etc., to designated upland areas.
- Prescribed burns to remove forest floor debris, to impact fire intolerant species, and to modify understory composition would not occur in forested areas during the bat active season.
- Use of herbicides and pesticides would be minimized as much as feasible. Any use of pesticides, herbicides, or rodenticides shall comply with the applicable Federal and State laws. These shall be used only in accordance with their registered uses and within limitations imposed by USACE. Additionally, they should be used in accordance with the manufacturer's instructions to limit access to non-target species.
- Maintain a spill containment and cleanup kit appropriate for the materials used and report all spills.
- Follow all EPA product label instructions on chemical containers.
- Mix and load chemicals in a landing area that is outside streamside management zones or other sensitive areas.
- Apply chemicals only under favorable weather conditions to prevent drift.
- Calibrate spray equipment to apply chemicals uniformly and in the correct quantities.
- Dispose of chemical containers according to label instructions.
- Prevent chemical leaks from equipment. Do preventative maintenance and repair on all equipment for leaking hoses, connections, and nozzles.
- Existing road systems and landing areas would be used when possible.
- Traffic would be kept to a minimum during wet and muddy conditions.
- Access roads would consist of ridge tops, agricultural fields, interior and existing roads. Landings would be established where necessary on ridge tops and flat areas suitable for

access and appropriate to minimize soil disturbance. Tree removal would cease during periods of saturated soil conditions to protect against excessive compaction.

- Landing areas would be located on currently disturbed areas, when possible. Otherwise, landing areas would be limited to areas with firm, well-drained soils with a slight slope to allow for drainage.

COMPENSATORY MITIGATION:

No compensatory mitigation is required as part of the recommended plan.

PUBLIC REVIEW:

Public review of the draft EA and FONSI was conducted between **01-30 Apr 2026**. All comments submitted during the public review period were taken into consideration when preparing the Final EA and FONSI.

OTHER ENVIRONMENTAL AND CULTURAL COMPLIANCE REQUIREMENTS:

ENDANGERED SPECIES ACT INFORMAL CONSULTATION:

Pursuant to section 7 of the Endangered Species Act of 1973, as amended, the U.S. Army Corps of Engineers determined that the Tentatively Selected Plan *“may affect, but is not likely to adversely affect”*, the following federally listed species or their designated critical habitat: Gray Bat, Indiana Bat, Northern Long-eared Bat, Tricolored Bat, Monarch Butterfly, and Western Regal Fritillary Butterfly. The U.S. Fish and Wildlife Service (FWS) concurred with the USACE determinations on **DATE 2026**.

NATIONAL HISTORIC PRESERVATION ACT:

Pursuant to section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that historic properties may be adversely affected by the recommended plan. The Corps, the **Missouri SHPO**, and Iowa Tribe of Kansas and Nebraska, The Osage Nation, and Sac and Fox Tribe of the Mississippi in Iowa entered into a Programmatic Agreement (PA), dated 10 March 2026. All terms and conditions resulting from the agreement shall be implemented in order to minimize adverse impacts to historic properties.

CLEAN WATER ACT SECTION 401 COMPLIANCE:

The Tentatively Selected Plan does not propose to add dredged or fill material to any water of the United States.

OTHER SIGNIFICANT ENVIRONMENTAL COMPLIANCE:

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed. No issues were raised relative to other environmental laws and/or EOs that are not listed here.

NEPA CERTIFICATION

I certify that the resulting EA represents the following: the USACE's good-faith effort to prioritize documentation of the most important considerations and factors required by NEPA within the congressionally mandated page limits and timeline; that this prioritization reflects the USACE's expert judgment; the document is substantially complete; that any considerations addressed briefly or left unaddressed were, in the USACE's judgment, comparatively not of a substantive nature that meaningfully informed the consideration of environmental effects and the resulting decision on how to proceed; and that in the USACE's judgment the analysis contained therein is adequate to inform and reasonably explain the USACE's final decision regarding the proposed federal action.

FINDING

Technical, environmental, and scientific criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. 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 Tentatively Selected 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

**Mark Twain Lake Indiana Bat Habitat Improvement Project
Monroe and Ralls Counties, Missouri
NEPA Unique ID: EAXX-202-00-B3P-1768392247**

Appendices

Table 3. Habitat management areas and prescribed actions with proposed treatment years.

BA – Basal area; STS - Single tree

[illegible]

[illegible]

Compartment	Stand or Unit #	BHI Acres	Cover	BA	Size Class	Target Treatment Year												
						Basal Area Reduction	Forest Stand Improvement	Invasive Treatment	Cedar Removal	Edge Feathering	Crop Tree Release	STS	Forest Canopy Opening	Snag Development	Forest Inventory	Succession Control	Prescribed Burning	Wildlife Habitat Assessment
11	16N	33	Oak-Hickory	110	Poletimber	10	9 & 10					9	9				3	
11	16S	36	Oak-Hickory	110	Sawtimber	10	9 & 10					9	9				6	
48	1	38	Oak-Hickory	102	Poletimber	3	3	3									5	
48	2	35	Oak-Hickory	123	Poletimber	3	3	3									3	
48	3	61	Oak-Hickory	110	Poletimber	2	2	3									3	
48	3	16	WS Grass	N/A	N/A			4									3	3
48	4	4	Oak-Hickory	N/A	Sawtimber												6	3 & 6
48	4	98	CS Grass	121	N/A	1	1 & 4					4	4					
48	5	8	Oak-Hickory	90	Poletimber	2	2										5	
48	5	12	WS Grass	N/A	N/A												3	3
48	6	49	Oak-Hickory	113	Sawtimber	2	2 & 4	3				4	4				5	
48	7	19	Oak-Hickory	128	Sawtimber	2	2 & 4					4					5	
48	7	3	WS Grass	N/A	N/A			6								5		3
48	8	24	Oak-Hickory	110	Poletimber	7	7	1									5	
48	8	3	X	N/A	N/A													3
48	9	27	Mixed Hardwoods/ Cedar	80	Poletimber		7	3	7		7						5	
48	9	8	WS Grass	N/A	N/A												3	3
48	10	29	Oak-Hickory	110	Sawtimber	5	4 & 5					4					5	
48	10	10	WS Grass	N/A	N/A												3	3
48	11	2	Oak-Hickory	N/A	Sawtimber											3		3
48	11	12	CS Grass	110	N/A	5	4 & 5					4					5	
48	12	21	Oak-Hickory	100	Poletimber	5	5										5	
48	12	12	WS Grass	N/A	N/A											4	7	3 & 7
ES3	1	24	Oak-Hickory	110	Poletimber	6	6										7	
ES3	1	20	WS Grass	N/A	N/A											3,4,5		3
ES3	2	47	Oak-Hickory	115	Poletimber	6	6										7	
ES3	2	4	WS Grass	N/A	N/A											5		3
ES3	3	34	Oak-Hickory	120	Sawtimber	9	8 & 9					8	8				7	
ES3	3	1	WS Grass	N/A	N/A											4	7	3 & 7
ES3	4	26	Oak-Hickory	115	Sawtimber	9	8 & 9					8	8				7	
ES3	4	13	WS Grass	N/A	N/A			5		5							4	3 & 4
ES3	5	37	Oak-Hickory	95	Sawtimber	9	8 & 9					8	8				3	
ES3	5	17	WS Grass	N/A	N/A			4								3		3
ES3	6	30	Oak-Hickory	115	Poletimber	7	7										3	
ES3	6	8	WS Grass	N/A	N/A			4								3		3
ES3	7	19	Oak-Hickory	100	Sawtimber	9	8 & 9					8					3	
ES3	7	6	WS Grass	N/A	N/A			4								3		3
ES3	8	108	Oak-Hickory	110	Sawtimber	9	8 & 9					8	8				3	
ES3	9	24	Oak-Hickory	105	Sawtimber	9	8 & 9					8	8				6	
ES3	9	2	WS Grass	N/A	N/A			5								4		3
ES3	10	18	Oak-Hickory	100	Poletimber	9	9										6	
ES3	11	54	Oak-Hickory	110	Sawtimber	9	8 & 9					8	8				6	

Compartment	Stand or Unit #	BHI Acres	Cover	BA	Size Class	Target Treatment Year												
						Basal Area Reduction	Forest Stand Improvement	Invasive Treatment	Cedar Removal	Edge Feathering	Crop Tree Release	STS	Forest Canopy Opening	Snag Development	Forest Inventory	Succession Control	Prescribed Burning	Wildlife Habitat Assessment
ES3	44	2	Oak-Hickory	120	Poletimber	9	9										6	
ES3	47	52	Oak-Hickory	105	Poletimber	9	9										6	
ES3	49	42	Oak-Hickory	100	Sawtimber	9	8 & 9					8	8				6	
ES4	1	1	WS Grass	N/A	N/A												5	2 & 5
ES4	2	26	Oak-Hickory	135	Sawtimber	5	5 & 6					6	6	6	3			
ES4	2	2	WS Grass	N/A	N/A											3 & 6		2
ES4	3	13	Mixed Hardwoods/ Cedar	110	Poletimber	11	11	5	11		11			11	3			
ES4	3	5	WS Grass	N/A	N/A			6								5	4	2 & 4
ES4	4	37	Oak-Hickory	130	Sawtimber	5	5 & 6					6		6	2			
ES4	4	3	WS Grass	N/A	N/A											3	6	2 & 6
ES4	5	6	Oak-Hickory	110	Sawtimber	7	7							7	2			
ES4	5	2	SFRF	N/A	N/A											4 & 6		
ES4	6	35	Oak-Hickory	100	Poletimber	7	7							7	3		6	
ES4	6	16	WS Grass	N/A	N/A												4	2 & 4
ES4	7	10	Oak-Hickory	130	Sawtimber	7	7							7	3		6	
ES4	7	7	WS Grass	N/A	N/A											4	3	2 & 3
ES4	8	10	Mixed Hardwoods/ Cedar	100	Poletimber	11	11	5	11		11			11	3		6	
ES4	8	1	WS Grass	N/A	N/A												5	2 & 5
ES4	9	1	WS Grass	N/A	N/A											3	6	2 & 6
ES4	10	47	Oak-Hickory	105	Sawtimber	5	5 & 6					6	6	9	2		6	
ES4	10	3	WS Grass	N/A	N/A											5	4	2 & 4
ES4	11	7	Oak-Hickory	110	Poletimber	9	9							9	2		6	
ES4	11	1	SFRF	N/A	N/A											4 & 6		
ES4	12	9	Oak-Hickory	110	Poletimber	11	11							11	2		8	
ES4	12	6	WS Grass	N/A	N/A												3	2 & 3
ES4	13	5	Oak-Hickory	90	Poletimber	11	11							11	2		8	
ES4	13	3	Old Field	N/A	N/A			4								3	7	2 & 7
ES4	14	13	Oak-Hickory	95	Poletimber	11	11							12	2		8	
ES4	15	3	Oak-Cedar	95	Poletimber	11	11							11	2		8	
ES4	16	2	Cedar	70	Poletimber	11	11		11					11	2		8	
ES4	17	2	Oak-Hickory	100	Poletimber	11	11							11	2		8	
ES4	18	16	Oak-Hickory	110	Poletimber	11	9							9	2		8	
ES4	19	8	Mixed Hardwoods	125	Sawtimber	5	5 & 6					6		9	2		8	
ES4	20	15	Cedar-Hickory	110	Poletimber	11	11		4					6	2		8	
ES4	21	15	Oak-Hickory	125	Poletimber	11	11						11	11	2			
ES4	22	9	Oak-Hickory	130	Sawtimber	5	6 & 6					6		9	2			
ES4	23	7	Oak-Hickory	125	Sawtimber	5	6 & 6					6		9	2			
ES4	24	22	Oak-Hickory	110	Sawtimber	5	6 & 6					6	6	9	2			

Compartment	Stand or Unit #	BHI Acres	Cover	BA	Size Class	Target Treatment Year												
						Basal Area Reduction	Forest Stand Improvement	Invasive Treatment	Cedar Removal	Edge Feathering	Crop Tree Release	STS	Forest Canopy Opening	Snag Development	Forest Inventory	Succession Control	Prescribed Burning	Wildlife Habitat Assessment
ES4	25	14	Oak-Hickory	125	Sawtimber	9	9							9	2			
ES4	26	10	Oak-Hickory	105	Poletimber	12	12	5						11	2		6	
ES4	27	14	Oak-Cedar-Hickory	130	Poletimber	12	12							12	3		11	
ES4	28	27	Oak-Cedar-Hickory	130	Poletimber	12	12						12	12	3		11	
ES4	29	7	Oak-Hickory	90	Poletimber	7	7	5		7				7	3		12	
ES4	30	15	Oak-Hickory	105	Poletimber	7	7	5		7				7	3		12	
ES4	31	20	Oak-Hickory	130	Sawtimber	5	5 & 6			7		6		6	3		12	
ES4	32	8	Mixed Hardwoods	110	Poletimber	7	7	5		7				7	3		12	
ES4	33	9	Mixed Hardwoods	105	Poletimber	12	12	5		7				7	3		11	



Eagle Disturbance Take Specific Permit

Permit Number: MBPER20919020

Version Number: 0

Effective: 2025-09-11 **Expires:** 2030-08-31

Issuing Office:

Department of the Interior

U.S. FISH AND WILDLIFE SERVICE

MB Bloomington Permit Office

5600 American Blvd West, Suite 990

Bloomington, Minnesota 55437-1458

permitsR3MB@fws.gov

Tel: 612-713-5436

Digitally signed by

Migratory Bird Permit
Specialist

Permittee:

US ARMY CORPS OF ENGINEERS

1222 SPRUCE ST

ST. LOUIS, Missouri 63103

U.S.A.

Name and Title of Principal Officer:

Justin Garrett Chief, Environmental Planning Section

Authority: Statutes and Regulations: 16 U.S.C. 668-668(d) 50 CFR Part 13, 50 CFR 22.280

Location where authorized activity may be conducted:

Mark Twain Lake, Monroe and Ralls Counties, Missouri

Latitude	Longitude	Nest Name
39.55960	-91.69998	Route N Eagle Nest
39.53023	-91.69036	Indian Creek Eagle Nest
39.48084	-91.83864	Middle Fork Eagle Nest
39.47455	-91.80919	Buzzard's Roost Eagle Nest
39.52260	-91.79213	Shell Branch Eagle Nest
39.51251	-91.78024	Second Shell Branch Eagle Nest
39.521667	-91.7301472	Indian Creek Marina Eagle Nest

Reporting requirements:



Eagle Disturbance Take Specific Permit

Permit Number: MBPER20919020

Version Number: 0

Effective: 2025-09-11 **Expires:** 2030-08-31

Annual Report Due September 30. If no eagle activity is observed at the nest, or if project activities were delayed in implementation or were not conducted, an annual report is still required.

Authorizations and Conditions:

Definitions

(as defined in 50 CFR 22.6 and available at [50 CFR 22.6 \(https://www.ecfr.gov/current/title-50/section-22.6\)](https://www.ecfr.gov/current/title-50/section-22.6)):

Alternate Nest means one of potentially several nests within a nesting territory that is not an in-use nest at the current time. When there is no in-use nest, all nests in the territory are alternate nests.

Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

Eagle nest means any assemblage of materials built, maintained, or used by bald eagles or golden eagles for the purpose of reproduction. An eagle nest remains an eagle nest until it becomes so diminished, or the nest substrate upon which it is built fails, that the nest is no longer usable and is not likely to become usable to eagles, as determined by a Federal, Tribal, or State eagle biologist.

In-use nest means a bald eagle or golden eagle nest that contains one or more viable eggs or dependent young.

Incidental take means take that is foreseeable and results from, but is not the purpose of, an activity.

Nesting territory means the area that contains one or more eagle nests within the home range of a mated pair of eagles, regardless of whether such nests were built by the current resident pair.

Practicable means available and capable of being done after taking into consideration existing technology, logistics, and cost in light of a mitigation measure's beneficial value to eagles and the activity's overall purpose, scope, and scale.

Definitions for the purposes of these permit conditions:

Breeding season refers to the period of time where eagles are breeding or are preparing to breed. Actual breeding season dates can vary slightly between breeding pairs and from year to year. **For bald eagles, in Missouri, the Service uses December 15-July 31. The nest may be occupied before or after these dates.**

Occupied nest means an in-use bald eagle nest or an alternate bald eagle nest that has had attending adults within the past 10 days during the first 3 months of the breeding season.

A. Authorization

You are authorized to disturb bald eagles at the nest locations listed above under "Location where authorized activity may be conducted."

1. The authorization applies only to disturbance take resulting from activities described in your permit application and conducted in accordance with the terms of this permit.

B. Prohibited

This permit does not authorize:

1. Take of eagle nests, including by substantively modifying nesting substrate sufficient to render the substrate unsuitable for eagle nesting, except as authorized in C(3) for prescribed burn operations.



Eagle Disturbance Take Specific Permit

Permit Number: MBPER20919020

Version Number: 0

Effective: 2025-09-11 **Expires:** 2030-08-31

2. Disturbance of golden eagles.
3. Incidental or intentional take that results in injury or death of eagles.
4. Possession of eagles, nestlings, or eggs.
5. Permanent take of any eagle territory. Your activities must not eliminate the potential for future nesting activity within any eagle territory.

C. Avoidance and Minimization

You must implement the avoidance and minimization measures set forth below.

1. All Activities:

- a. You must avoid activities that may affect the survivability of the nest tree or other natural nesting substrate. The nest location must be identified on plans and communicated to contractors or other third parties doing work at your site. You must preserve the root integrity of the nest tree by avoiding heavy equipment operation, soil compaction, or ground disturbance greater than 12 inches deep within the nest tree's dripline or 50 feet, whichever is greater.
- b. You must avoid conducting activities that may disturb eagles during severe weather such as heavy rain, severe thunderstorms, high winds, or extreme temperatures (high or low) to ensure adult eagles can provide necessary warmth and shelter for eggs and nestlings while they are vulnerable to such weather events.

2. Alteration of Vegetation.

- a. Minimize the amount of tree or significant vegetation removal within 660 feet of the nest.
- b. Avoid clearcutting trees within 330 feet of the nest tree at any time.
- c. Retain the maximum number of mature trees practicable within 660 feet of the nest. Prioritize retaining mature trees within 330 feet of the nest, trees adjacent to foraging areas, and trees with documented use as perch or roost trees.
- d. Take precautions, such as using a professional tree service, to fell trees near the nest tree in such a way that they do not contact the nest tree, especially the crown of the nest tree.
- e. Remove vegetation for chipping, burning, or other disposal methods that may cause disturbance at least 660 feet from the nest.
- f. For any vegetation removal that must occur during the breeding season within 660 feet of the nest, begin at the furthest possible distance from the nest and work toward the nest such that any removal to be conducted nearest to the nest occurs last.

3. Prescribed burns.

- a. Conduct prescribed burns outside of the breeding season. If prescribed burns are conducted during the breeding season, you must document in writing with a justification as to why (e.g., human safety, federal mandates).
- b. Remove fuels (e.g., leaves, woody debris) near the nest tree to avoid fire climbing the tree. This includes fuels that present a hazard to the nest tree, fuels that are on or close to the bole of the nest tree, and fuels that may loft embers near the nest tree such as high shrubs or bushes.
- c. Avoid creating new fire breaks or fire lines within 660 feet of any bald eagle nest at any time of year. Perform maintenance on any pre-existing fire breaks within 660 feet of a bald eagle nest outside of the breeding season or when the eagle nest is not occupied.
- d. Utilize smoke management and ignition techniques that minimize the amount and duration of flame and smoke impacts to the nest (e.g., igniting a backing or flank fire).
- e. Minimize the presence of and any activities of ground crews within 660 feet of the nest.
- f. Do not conduct a prescribed burn during weather and wind conditions that are likely to expose the nest to fire or smoke.



Eagle Disturbance Take Specific Permit

Permit Number: MBPER20919020

Version Number: 0

Effective: 2025-09-11 **Expires:** 2030-08-31

g. You are authorized for the incidental take of eagle nests that occurs during a prescribed burn, provided that incidental take occurs after application of all avoidance and minimization measures. This authorization does not include take caused by lack of due diligence or negligence; for example, failure to identify nest locations prior to conducting an activity.

D. Monitoring

You must, observe the permitted nests, sufficient to determine nest status (i.e. occupied or unoccupied) during the breeding season, and if occupied, determine nest fate (i.e., fledged young or failed to fledge young).

1. Find a place where the eagle nest can be observed. This observation point (OP) must be at least 660 feet from the nest. An OP may be closer than 660 feet if eagles have demonstrated tolerance for human presence at that distance.
2. You must monitor while project activities are being conducted and until the nest is no longer occupied for the year. No additional monitoring is required once eaglets have fledged from the nest or nest failure is documented.
3. Monitoring must occur at a time of day when eagles are most likely to be in the area and must be conducted beginning ½ hour before sunrise or ½ hour before sunset for a minimum of 60-90 minutes.
4. You must fill out a separate report form for each nest.
5. Monitoring reports must include the following information:
 - a. Date and length of time Bald Eagles were observed;
 - b. Time of day monitoring started and ended;
 - c. Number and age of eagles observed (i.e. juvenile, immature, subadult, adult); if age is not known, provide description;
 - d. Observed behavior (e.g. perching, feeding, sitting on or attending nest, in flight);
 - e. If a new eagle nest is built on or adjacent to your property, the new location and whether eagles produced young at that site;
 - f. If any eagle nesting attempt was successful, failed or the eagles abandoned the area; and
 - g. A description of any human activity occurring during the observation period, (e.g. construction, road building, use of machinery, etc.).

E. Reporting

1. You must submit an annual report of nest status (occupied/unoccupied) and, if occupied, nest fate (fledged/did not fledge young) using Form 3-202-15 (Eagle Incidental Take Annual Report) found online at <http://www.fws.gov/forms/3-202-15.pdf>
2. Reports must be submitted electronically into ePermits under this permit record or sent, via email, to the issuing office, permitsR3MB@fws.gov
3. An annual report is required, even if no eagle activity was observed or no activities were conducted. If project activities were delayed or not conducted, an annual report indicating that "no activities occurred" is required.

F. Subpermittees

You may designate subpermittees to conduct some or all of your permitted activities. A subpermittee is an individual to whom you have provided written authorization to conduct some or all of the permitted activities in your absence. Authorized subpermittees are any person who is (1) employed by or under contract to you for the activities specified in this permit, or (2) otherwise designated a subpermittee by you in writing. As the permittee, you are legally responsible for ensuring that your subpermittees are adequately trained and adhere to the terms of your permit.



Eagle Disturbance Take Specific Permit

Permit Number: MBPER20919020

Version Number: 0

Effective: 2025-09-11 **Expires:** 2030-08-31

You and any subpermittees must carry a legible paper or electronic copy of this permit and subpermittee designation letter and display it upon request whenever you are exercising its authority. Subpermittees must be at least 18 years of age. You are responsible for maintaining current records of who you have designated as a subpermittee, including copies of any designation letters provided to individuals not named above.

G. Other Conditions

1. You must comply with all of the regulations and permit conditions in 50 CFR parts 10, 13, 21, and 22.
2. You must keep records of all activities conducted under this permit, including any subpermittee activities carried out under the authority of this permit (see 50 CFR § 13.46).
3. By accepting this permit, you are authorizing the Service to inspect the location and records relating to the activity (see 50 CFR § 13.21(e)). Service or Service contractors may require access to your project site to ensure permitting is consistent with eagle preservation. The Service will provide reasonable notice for requests to access sites and negotiate with the permittee about practicable and appropriate access conditions to protect human health and safety and address physical, logistical, or legal constraints.
4. You are responsible for ensuring that the permitted activity complies with all Federal, Tribal, State, and local laws. This permit is not valid if implementing any of its provisions may affect a listed, proposed, or candidate species or designated or proposed critical habitat under the federal Endangered Species Act, nor has the potential to cause effects to cultural resources or historic properties protected by the National Historic Preservation Act.
5. The Service may amend, suspend, or revoke a permit issued under this subpart if new information indicates that revised permit conditions are necessary, or that suspension or revocation is necessary, to safeguard local or regional eagle populations. This provision is in addition to the general criteria for amendment, suspension, and revocation of Federal permits set forth in 50 CFR § 13.23, 13.27, and 13.28.
6. Notwithstanding the provisions of 50 CFR § 13.26, you remain responsible for all outstanding monitoring requirements and mitigation measures required under the terms of the permit for take that occurs prior to cancellation, expiration, suspension, or revocation of the permit.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Missouri Ecological Services Field Office
101 Park Deville Drive
Suite A
Columbia, MO 65203-0057
Phone: (573) 234-2132 Fax: (573) 234-2181



In Reply Refer To:

03/03/2026 22:43:43 UTC

Project Code: 2025-0004920

Project Name: Mark Twain Lake Indian Bat Habitat Improvement Project

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Threatened and Endangered Species

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and may be affected by your proposed project. The species list fulfills the requirement for obtaining a Technical Assistance Letter from the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. **Note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days.** The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Consultation Technical Assistance

Refer to the Midwest Region [S7 Technical Assistance](#) website for step-by-step instructions for making species determinations and for specific guidance on the following types of projects: projects in developed areas, HUD, pipelines, buried utilities, telecommunications, and requests

for a Conditional Letter of Map Revision (CLOMR) from FEMA. Please contact the [appropriate POC](#) at Missouri Ecological Services for any additional consultation needs.

Using the IPaC Official Species List to Make No Effect and May Affect Determinations for Listed Species

1. If IPaC returns a result of “There are no listed species found within the vicinity of the project,” then project proponents can conclude the proposed activities will have **no effect** on any federally listed species under Service jurisdiction. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records. An example ["No Effect" document](#) also can be found on the S7 Technical Assistance website.
2. If IPaC returns one or more federally listed, proposed, or candidate species as potentially present in the action area of the proposed project then project proponents can conclude the proposed activities **may affect** those species. For assistance in determining if suitable habitat for listed, candidate, or proposed species occurs within your project area or if species may be affected by project activities, you can obtain [Life History Information for Listed and Candidate Species](#) through the Species website.

Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records. An example ["No Effect" document](#) also can be found on the S7 Technical Assistance website.

Other Trust Resources and Activities

Bald and Golden Eagles - Although the bald eagle has been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. Should bald or golden eagles occur within or near the project area please contact our office for further coordination. For communication and wind energy projects, please refer to additional guidelines below.

Migratory Birds - The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Service. The Service has the responsibility under the MBTA to proactively prevent the mortality of migratory birds whenever possible and we encourage implementation of recommendations that minimize potential impacts to migratory birds. Such measures include clearing forested habitat outside the nesting season (generally March 1 to August 31) or conducting nest surveys prior to clearing to avoid injury to eggs or nestlings.

Communication Towers - Construction of new communications towers (including radio, television, cellular, and microwave) creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. However, the Service has developed [voluntary guidelines for minimizing impacts](#).

Transmission Lines - Migratory birds, especially large species with long wingspans, heavy bodies, and poor maneuverability can also collide with power lines. In addition, mortality can

occur when birds, particularly hawks, eagles, kites, falcons, and owls, attempt to perch on uninsulated or unguarded power poles. To minimize these risks, please refer to [guidelines](#) developed by the Avian Power Line Interaction Committee and the Service. Implementation of these measures is especially important along sections of lines adjacent to wetlands or other areas that support large numbers of raptors and migratory birds.

Wind Energy - To minimize impacts to migratory birds and bats, wind energy projects should follow the Service's [Wind Energy Guidelines](#). In addition, please refer to the Service's [Eagle Conservation Plan Guidance](#), which provides guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities.

Next Steps

If your project is eligible, you may choose to use the [Missouri Determination Key](#) (Dkey) within IPaC. The Dkey provides an optional, streamlined process to help you evaluate potential effects and, when appropriate, generate the documentation needed for section 7 consultation. Projects that reach a "may affect" outcome through the key will still require coordination with our office. Otherwise, if you determine that any part of your project may affect a federally listed species or any other trust resource identified in this Official Species List, please [contact the Missouri Ecological Services Field Office](#) to continue coordination. When you write to request consultation or submit project correspondence, include the Consultation Tracking Number in the header of your letter. Electronic submission is preferred.

If you have not already done so, please contact the Missouri Department of Conservation (Policy Coordination, P. O. Box 180, Jefferson City, MO 65102) for information concerning Missouri Natural Communities and Species of Conservation Concern.

We appreciate your concern for threatened and endangered species. Please feel free to contact our office with questions or for additional information.

John Weber

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Missouri Ecological Services Field Office

101 Park Deville Drive

Suite A

Columbia, MO 65203-0057

(573) 234-2132

PROJECT SUMMARY

Project Code: 2025-0004920

Project Name: Mark Twain Lake Indian Bat Habitat Improvement Project

Project Type: Forest Management Plan

Project Description: FSI for I-bat habitat improvement.

Project Location:

The approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@39.53088805,-91.79529628777672,14z>



Counties: Monroe and Ralls counties, Missouri

ENDANGERED SPECIES ACT SPECIES

There is a total of 6 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Gray Bat <i>Myotis grisescens</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329 General project design guidelines: https://ipac.ecosphere.fws.gov/project/ATWSFL5TWBANRG5OLCZKI4VT3A/documents/generated/9456.pdf	Endangered
Indiana Bat <i>Myotis sodalis</i> There is final critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949 General project design guidelines: https://ipac.ecosphere.fws.gov/project/ATWSFL5TWBANRG5OLCZKI4VT3A/documents/generated/9456.pdf	Endangered
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045 General project design guidelines: https://ipac.ecosphere.fws.gov/project/ATWSFL5TWBANRG5OLCZKI4VT3A/documents/generated/9456.pdf	Endangered
Tricolored Bat <i>Perimyotis subflavus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515 General project design guidelines: https://ipac.ecosphere.fws.gov/project/ATWSFL5TWBANRG5OLCZKI4VT3A/documents/generated/9456.pdf	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> There is proposed critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened
Western Regal Fritillary <i>Argynnis idalia occidentalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/12017	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency: Army Corps of Engineers
Name: Teri Allen
Address: 1222 Spruce Street
Address Line 2: REPDN CEMVS-PD-C
City: St. Louis
State: MO
Zip: 63103
Email: teri.c.allen@usace.army.mil
Phone: 3143318084



Missouri Department of Conservation

Missouri Department of Conservation's Mission is to protect and manage the forest, fish, and wildlife resources of the state and to facilitate and provide opportunities for all citizens to use, enjoy and learn about these resources.

Natural Heritage Review Level Three Report: Species Listed Under the Federal Endangered Species Act

There are records of species listed under the Federal Endangered Species Act, and possibly also records for species listed Endangered by the state, or Missouri Species and/or Natural Communities of Conservation Concern within or near the the defined Project Area. Please contact the U.S. Fish and Wildlife Service and the Missouri Department of Conservation for further coordination.

Foreword: Thank you for accessing the Missouri Natural Heritage Review Website developed by the Missouri Department of Conservation with assistance from the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, Missouri Department of Transportation and NatureServe. The purpose of this report is to provide information to federal, state and local agencies, organizations, municipalities, corporations, and consultants regarding sensitive fish, wildlife, plants, natural communities, and habitats to assist in planning, designing, and permitting stages of projects.

PROJECT INFORMATION

Project Name and ID Number: Mark Twain Lake Indian Bat Habitat Improvement #15560

Project Description: Mark Twain Lake, Monroe and Ralls Counties, MO

Project Type: Conservation Easement

Contact Person: Teri Allen

Contact Information: Teri.C.Allen@usace.army.mil or 314-331-8084

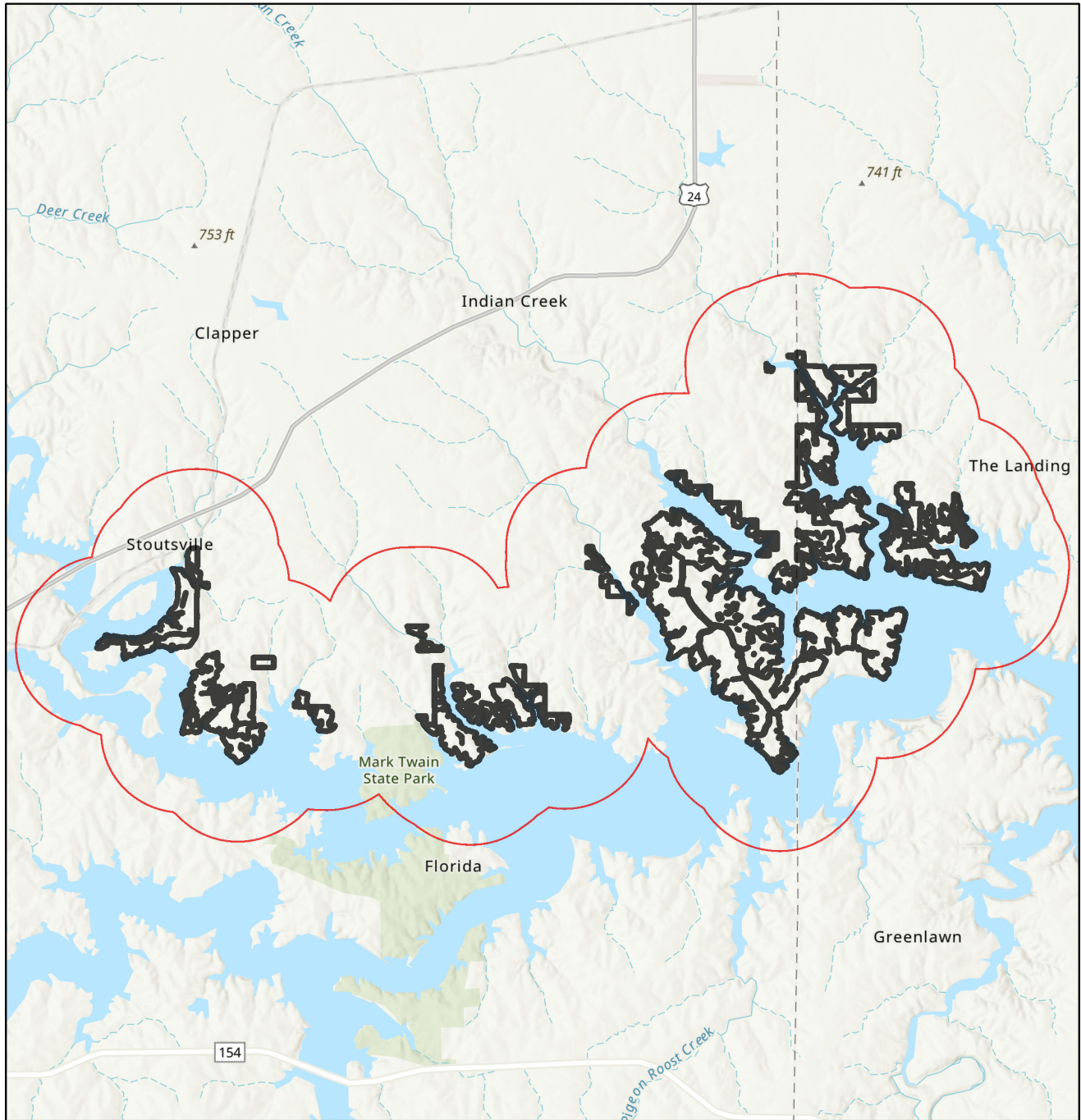
Disclaimer: This NATURAL HERITAGE REVIEW REPORT identifies if a species or natural community tracked by the Natural Heritage Program is known to occur within or near the project area submitted, and shares recommendations to avoid or minimize project impacts to sensitive species or natural habitats. Incorporating information from the Natural Heritage Program into project plans is an important step in reducing impacts to Missouri's sensitive natural resources. If an occurrence record is present, or the proposed project might affect federally listed species, the user must contact the Department of Conservation or U.S. Fish and Wildlife Service for more information.

This Natural Heritage Review Report is not a site clearance letter for the project. Rather, it identifies public lands and records of sensitive resources located close to and/or potentially affected by the proposed project. If project plans or location change, this report may no longer be valid. Because land use conditions change and animals move, the existence of an occurrence record does not mean the species/habitat is still present. Therefore, reports include information about records near but not necessarily on the project site. Lack of an occurrence record does not mean that a sensitive species or natural community is not present on or near the project area. On-site verification is the responsibility of the project. However, the Natural Heritage Program is only one reference that should be used to evaluate potential adverse project impacts and additional information (e.g. wetland or soils maps, on-site inspections or surveys) should be considered. Reviewing current landscape and habitat information, and species' biological characteristics would additionally ensure that Missouri Species of Conservation Concern are appropriately identified and addressed in planning efforts.

U.S. Fish and Wildlife Service – Endangered Species Act (ESA) Coordination: Lack of a Natural Heritage Program occurrence record for federally listed species in your project area does not mean the species is not present, as the area may never have been surveyed. Presence of a Natural Heritage Program occurrence record does not mean the project will result in negative impacts. This report does not fulfill Endangered Species Act consultation with the U.S. Fish and Wildlife Service (USFWS) for listed species. Direct contact with the USFWS may be necessary to complete consultation and it is required for actions with a federal connection, such as federal funding or a federal permit; direct contact is also required if ESA concurrence is necessary. Visit [IPaC: Home \(fws.gov\)](https://www.fws.gov/ipac) to initiate USFWS Information for Planning and Conservation (IPaC) consultation. Contact the Columbia Missouri Ecological Field Services Office (573-234-2132, or by mail at 101 Park Deville Drive, Suite A, Columbia, MO 65203) for more information.

Transportation Projects: If the project involves the use of Federal Highway Administration transportation funds, these recommendations may not fulfill all contract requirements. Please contact the Missouri Department of Transportation at 573-526-4778 or visit [Home Page | Missouri Department of Transportation \(modot.org\)](https://www.modot.org) for additional information on recommendations.

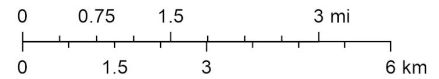
Mark Twain Lake Indian Bat Habitat Improvement



November 7, 2024

1:111,887

- Buffered Project Boundary
- Project Boundary



Esri, NASA, NGA, USGS, Missouri Dept. of Conservation, Missouri DNR, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS

There are records of species listed under the Federal Endangered Species Act, and possibly also records for species listed Endangered by the state, or Missouri Species and/or Natural Communities of Conservation Concern within or near the defined Project Area. Please contact the U.S. Fish and Wildlife Service and the Missouri Department of Conservation for further coordination.

U.S. Fish and Wildlife Service
Ecological Service
101 Park Deville Drive
Suite A
Columbia, MO
65203-0007
Phone: 573-234-2132

The project occurs on or near public land, MARK TWAIN LAKE USACOE, Mark Twain State Park, please contact COE, DNR.

No recommendations have been identified for this project type.

Endangered Species Act Coordination - If this project has the potential to alter habitat (e.g. tree removal, projects in karst habitat) or cause direct mortality of bats, please coordinate directly with U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132 Ext. 100 for Ecological Services) for further coordination under the Endangered Species Act. **Indiana bats** (*Myotis sodalis*, federal- and state-listed endangered) and **Northern long-eared bats** (*Myotis septentrionalis*, federal-listed threatened) may occur near the project area. Both of these species of bats hibernate during winter months in caves and mines. During the summer months, they roost and raise young under the bark of trees in wooded areas, often riparian forests and upland forests near perennial streams. During project activities, avoid degrading stream quality and where possible leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor Indiana bats or Northern long-eared bats, especially from September to April.

Bald Eagle: The project location submitted and evaluated is within the geographic range of nesting Bald Eagles in Missouri. Bald Eagles (*Haliaeetus leucocephalus*) may nest near streams or water bodies in the project area. Nests are large and fairly easy to identify. Adults begin nesting activity in late December and January and young birds leave the nest in late spring to early summer. While no longer listed as endangered, eagles continue to be protected by the federal government under the Bald and Golden Eagle Protection Act. Work managers should be alert for nesting areas within 1500 meters of project activities, and follow federal guidelines at: [Do I need an eagle take permit? | U.S. Fish & Wildlife Service \(fws.gov\)](#) if eagle nests are seen.

Gray Bat: The submitted project location is within the range of the Gray Myotis (i.e., Gray Bat) in Missouri. Depending on habitat conditions of your project's location, Gray Myotis (*Myotis grisescens*, federal and state-listed endangered) could occur within the project area, as they forage over streams, rivers, lakes, and reservoirs. Avoid entry or disturbance of any cave inhabited by Gray Myotis and when possible retain forest vegetation along the stream and from the cave opening to the stream. Please see [Best Management Practices for Construction and Development Projects Gray bat \(mo.gov\)](#).

Karst: This county has known karst geologic features (e.g., caves, springs, and sinkholes, all characterized by subterranean water movement). Few karst features are recorded in Natural Heritage records, and ones not noted here may be encountered at the project site or affected by the project. Cave fauna (many of which are Species of Conservation Concern) are influenced by changes to water quality; please check your project site for any karst features and make every effort to protect groundwater in the project area. Additional information and specific recommendations are available at [Management Recommendations for Construction and Development Projects Affecting Missouri Karst Habitat \(mo.gov\)](#).

Invasive exotic species are a significant issue for fish, wildlife and agriculture in Missouri. Seeds, eggs, and larvae may be moved to new sites on boats or construction equipment. Please inspect and clean equipment thoroughly before moving between project sites. See [Managing Invasive Species in Your Community | Missouri Department of Conservation \(mo.gov\)](#) for more information.

- Remove any mud, soil, trash, plants or animals from equipment before leaving any water body or work area.
- Drain water from boats and machinery that have operated in water, checking motor cavities, live-well, bilge and transom wells, tracks, buckets, and any other water reservoirs.
- When possible, wash and rinse equipment thoroughly with hard spray or HOT water (>140° F, typically available at do-it-yourself car wash sites), and dry in the hot sun before using again.

Streams and Wetlands – Clean Water Act Permits: Streams and wetlands in the project area should be protected from activities that degrade habitat conditions. For example, soil erosion, water pollution, placement of fill, dredging, in-stream activities, and riparian corridor removal, can modify or diminish aquatic habitats. Streams and wetlands may be protected under the Clean Water Act and require a permit for any activities that result in fill or other modifications to the site. Conditions provided within the U.S. Army Corps of Engineers (USACE) Clean Water Act Section 404 permit ([Kansas City District Regulatory Branch \(army.mil\)](#)) and the Missouri Department of Natural Resources (DNR) issued Clean Water Act Section 401 Water Quality Certification ([Section 401 Water Quality Certification | Missouri Department of Natural Resources \(mo.gov\)](#)), if required, should help minimize impacts to the aquatic organisms and aquatic habitat within the area. Depending on your project type, additional permits may be required by the Missouri Department of Natural Resources, such as permits for stormwater, wastewater treatment facilities, and confined animal feeding operations. Visit [Wastewater Permits | Missouri Department of Natural Resources \(mo.gov\)](#) for more information on DNR permits. Visit both the USACE and DNR for more information on Clean Water Act permitting.

For further coordination with the Missouri Department of Conservation and the U.S. Fish and Wildlife Services, please see the contact information below:

Email (preferred): NaturalHeritageReview@mdc.mo.gov
MDC Natural Heritage Review
Science Branch
P.O. Box 180
Jefferson City, MO
65102-0180
Phone: 573-522-4115 ext. 3182

U.S. Fish and Wildlife Service
Ecological Service
101 Park Deville Drive
Suite A
Columbia, MO
65203-0007
Phone: 573-234-2132

Miscellaneous Information

FEDERAL Concerns are species/habitats protected under the Federal Endangered Species Act and that have been known near enough to the project site to warrant consideration. For these, project managers must contact the U.S. Fish and Wildlife Service Ecological Services (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132; Fax 573-234-2181) for consultation.

STATE Concerns are species/habitats known to exist near enough to the project site to warrant concern and that are protected under the Wildlife Code of Missouri (RSMo 3 CSR 10). "State Endangered Status" is determined by the Missouri Conservation Commission under constitutional authority, with requirements expressed in the Missouri Wildlife Code, rule 3CSR 10-4.111. Species tracked by the Natural Heritage Program have a "State Rank" which is a numeric rank of relative rarity. Species tracked by this program and all native Missouri wildlife are protected under rule 3CSR 10-4.110 General Provisions of the Wildlife Code.

See [Missouri Species and Communities of Conservation Concern Checklist \(mo.gov\)](#) for a complete list of species and communities of conservation concern. Detailed information about the animals and some plants mentioned may be accessed at [Mofwis Search Results](#). Please contact the Missouri Department of Conservation to request printed copies of any materials linked in this document.

From: [Natural Heritage Review](#)
To: [Allen, Teresa C \(Teri\) CIV USARMY CEMVP \(USA\)](#)
Subject: [Non-DoD Source] RE: Mark Twain Lake Indian Bat Habitat Improvement Project #15560
Date: Monday, November 11, 2024 8:22:19 AM

Hello,

We have received your request and added it to the work queue. Reports are processed as they are received and may take 3 to 8 weeks to complete. Response time can vary based on request traffic, the size of a project, the species nearby, and MDC's internal review processes.

If you have further questions, please reply to this email or call 573-522-4115 ext 3182.

Thank you for using the Natural Heritage Review Program,

Dillon Freiburger

Environmental Review Analyst

Missouri Department of Conservation

(573) 522-4115 ext 3151

Dillon.Freiburger@mdc.mo.gov

From: Allen, Teresa C (Teri) CIV USARMY CEMVP (USA) <Teresa.C.Allen@usace.army.mil>
Sent: Thursday, November 7, 2024 4:33 PM
To: Natural Heritage Review <NaturalHeritageReview@mdc.mo.gov>
Subject: Mark Twain Lake Indian Bat Habitat Improvement Project #15560

MDC,

Please provide a list of state threatened and endangered species which may be in the proposed project area. The MDC Natural Heritage Review Level Three Report is attached.

Thanks,

Teri

Teri C. Allen, Ph.D.

Senior Technical Specialist

Aquatic Ecologist

Certified Fisheries Professional (AFS)

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

Phone 314-331-8084

E-mail Teri.C.Allen@usace.army.mil



Missouri Department of Conservation Natural Heritage Review Report

January 31, 2025

Science Branch
P. O. Box 180
Jefferson City, MO 65102
Prepared by: Dillon Freiburger
NaturalHeritageReview@mdc.mo.gov
(573) 522 - 4115 ext. 3182

Terri Allen
USACE
Teri.C.Allen@usace.army.mil

NHR ERT ID:	15560	NHR ERT Level:	3
Project type:	Conservation Easement		
Location/Scope:	Mark Twain Lake		
County:	Monroe and Ralls		
Project Title:	Mark Twain Lake Indian Bat Habitat Improvement		
Query received:	11/7/2024		

This NATURAL HERITAGE REVIEW is **not a site clearance letter**. Rather, it identifies public lands and records of sensitive resources located close to and/or potentially affected by the proposed project. If project plans or location change, this report may no longer be valid. Because land use conditions change and animals move, the existence of an occurrence record does not mean the species/habitat is still present. Therefore, reports include information about records near but not necessarily on the project site. Lack of an occurrence record does not mean that a sensitive species or natural community is not present on or near the project area. On-site verification is the responsibility of the project. These records serve as one reference and additional information (e.g. wetland or soils maps, on-site inspections or surveys) should be considered. Look for additional information about the biological and habitat needs of records listed to avoid or minimize impacts. More information is at [Natural Areas | Missouri Department of Conservation \(mo.gov\)](#) and [Missouri Fish and Wildlife Information System \(MOFWIS\)](#).

Level 3: Records of federal-listed (also state-listed) species or critical habitats near the project site:

Natural Heritage records identify Bald Eagles within the project area:

- **Bald Eagles:** Bald Eagles (*Haliaeetus leucocephalus*) nest near streams or water bodies in the project area. Nests are large and fairly easy to identify. While no longer listed as endangered, eagles continue to be protected by the federal government under the Bald and Golden Eagle Protection Act. Work managers should be alert for nesting areas within 1500 meters of project activities, and follow federal guidelines at: [Do I need an eagle take permit? | U.S. Fish & Wildlife Service \(fws.gov\)](#) if eagle nests are seen.

Following USFWS Incidental Take Guidelines: To avoid the incidental take of bald eagles we recommend:

- a buffer of at least 660 feet between project activities and the nests (including active and inactive nests).
- If project activities are within 660 feet of the nest, please restrict activities to outside the nesting season. The nesting season in Missouri is January 1 – July 15.
- If these recommendations cannot be implemented, incidental take of bald eagles may occur and a permit from USFWS may be necessary.
- Do not clear nests or nest trees.

FEDERAL LIST species/habitats are protected under the Federal Endangered Species Act. **Contact U.S. Fish & Wildlife Service** (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; 573-234-2132) for Endangered Species Act coordination and concurrence information).

Level 2: Records of state-listed (not federal-listed) endangered species AND / OR state-ranked (not state-listed endangered) species and natural communities of conservation concern. The Department tracks these species and natural communities due to population declines and/or apparent vulnerability.

Natural Heritage records indicate the following state-ranked species near the project area:

Scientific Name	Common Name	State Rank	Proximity (miles)	Primary Habitat
<i>Myotis lucifugus</i>	Little Brown Myotis	S2	<4	Forest matrix, Cave, Habitat generalist
<i>Taxidea taxus</i>	American Badger	S3	<4	Grassland matrix, Savanna pasture/orchard, Row/close grown crops
<i>Erysimum capitatum</i> var. <i>capitatum</i>	Western Wallflower	S3?	<1	Glade complex, Bluff, Roadside/railroad
<i>Cyclonaias nodulata</i>	Wartyback	S3	<3	River/stream
<i>Notropis buchanani</i>	Ghost Shiner	S2	<1	River/stream

State Rank Definitions:

- S1: Critically imperiled in the state because of extreme rarity of or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically, 5 or fewer occurrences or very few remaining individuals (<1,000).
- S2: Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state (6 to 20 occurrences or few remaining individuals).
- S3: Vulnerable in the state either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.
- S4: Uncommon but not rare, and usually widespread in the nation or state. Possible cause of long-term concern. Usually more than 100 occurrences and more than 10,000 individuals.
- S#S#: Range Rank: A numeric range rank (e.g., S2S3) is used to indicate the range of uncertainty about the exact status.
- ?: Denotes inexact or uncertain numeric rank.
- SU: Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

There are no regulatory requirements associated with this status, however we encourage voluntary stewardship to minimize the risk of further decline that could lead to listing.

STATE ENDANGERED species are protected under the Wildlife Code of Missouri (3CSR10-4.111).

See the [Missouri Species And Communities Of Conservation Concern Checklist \(mo.gov\)](#) for a complete list.

General recommendations related to this project or site, or based on information about the historic range of species (unrelated to any specific Natural Heritage records):

- **Indiana Bats, Northern Long-eared Bats, and Tri-colored Bats** occur in Ralls and Monroe Counties and could occur in the project area. These species have been significantly impacted by White-nose syndrome. During project activities, avoid degrading stream quality and where possible leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor these species, especially from September to April. **If any trees need to be removed by your project, please contact the U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132 Ext. 100) for further coordination under the Endangered Species Act.**

- Indiana Bats (*Myotis sodalis*, federal and state-listed endangered) and Northern Long-eared Bats (*Myotis septentrionalis*, federal-listed endangered) hibernate during winter months in caves and mines. During the summer months, they roost and raise young under the bark of trees in riparian forests and upland forests near perennial streams.
- Tri-colored bats (*Perimyotis subflavus*, federally proposed endangered) hibernate in winter in the most humid and warm parts of caves and mines. In summer, they roost in trees, bridges, culverts, in crannies about cliffs or buildings, in barns, or sometimes in high domes of caves.
- **Gray Bats:** Gray Bats (*Myotis grisescens*, federal and state-listed endangered) occur in Ralls County and could occur in the project area, as they forage over streams, rivers, and reservoirs. Avoid entry or disturbance of any cave inhabited by gray bats and when possible retain forest vegetation along the stream and from the gray bat cave opening to the stream. Please see [Best Management Practices for Construction and Development Projects Gray bat \(mo.gov\)](#).
- **Karst:** Monroe and Ralls Counties have known karst geologic features (e.g. caves, springs, and sinkholes, all characterized by subterranean water movement). Few karst features are recorded in Natural Heritage records, and ones not noted here may be encountered at the project site or affected by the project. Cave fauna (many of which are species of conservation concern) are influenced by changes to water quality, so maintaining a buffer zone of at least 100 feet on all sides of any karst features within the project area will mitigate impacts to these species. Please see [Management Recommendations for Construction and Development Projects Affecting Missouri Karst Habitat \(mo.gov\)](#)
- Invasive exotic species are a significant issue for fish, wildlife and agriculture in Missouri. Seeds, eggs, larvae, and aquatic plant material may be moved to new sites on boats or construction equipment, so inspect and clean equipment thoroughly before moving between project sites.
 - ◆ Remove any mud, soil, trash, plants (or plant material) or animals from equipment before leaving any water body or work area.
 - ◆ Drain water from boats and machinery that has operated in water, checking motor cavities, live-well, bilge and transom wells, tracks, buckets, and any other water reservoirs.
 - ◆ When possible, wash and rinse equipment thoroughly with hard spray or HOT water ($\geq 140^{\circ}$ F, typically available at do-it-yourself carwash sites), and dry in the hot sun before using again.

These recommendations are ones project managers might prudently consider based on a general understanding of species needs and landscape conditions. Natural Heritage records largely reflect sites visited by specialists in the last 30 years. Many privately owned tracts have not been surveyed and could host remnants of species once but no longer common.



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

January 15, 2025

Engineering and Construction Division
Curation and Archives Analysis Branch

Subject: Indiana Bat Habitat Improvement Project Programmatic Agreement, Mark Twain Lake, Ralls and Monroe Counties, Missouri

Amy Rubingh
Missouri state Historic Preservation Office
Missouri Department of Natural Resources
1659 E Elm Street
Jefferson city, Missouri 65101

Dear Ms. Rubingh:

The U.S. Army Corps of Engineers, St. Louis District (District) is proposing an Indiana Bat Improvement Project at Mark Twain Lake to promote and perpetuate environmental conditions that contributes to high-quality Indiana Bat (*Myotis sodalist*) habitat. Mark Twain Lake is proposing to alter the current forested habitat in eight compartments (Figure 1). The District is contacting your office to initiate consultation under the National Environmental Policy Act (NEPA) of 1970 and Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations 36 CFR 800.

Mark Twain Lake proposes to implement grassland and forest management area in eight compartments to provide semi-open areas for bat foraging as well as suitable summer roosting habitat. The exact management will vary per compartment; however, it could include the following:

- Prescribed fire to improve/maintain grassland composition, density, and quality;
- Limit height of successional woody species to maintain clear flight paths;
- Forbs and pollinator vegetation that support moths, butterflies, and other winged insect species will be promoted;
- Maintaining a minimum of five snag trees per acre at preferred locations within identified stands;
- Preserve standing dead trees and increasing solar exposure where practical;
- Preserving adequate stocking of mature Shagbark Hickory (*Carya ovata*);
- Reducing the basal area of overstory and mid-story canopy of overstocked forest stands to improve flight travel corridor and solar exposure;
- Creating clear lanes of travel at forest and field transition areas;
- Creating/maintaining gaps in the forest canopy for interior feeding/flight spaces;
- Applying prescribed burning to remove forest floor debris, to promote fire intolerant species, and to modify understory composition;
- Reducing shade tolerant mid-story tree species to encourage understory and forest floor vegetative diversity; and
- Managing for woodland/semi-savannah conditions on limestone bluff tops.

Modifications to the basal area overstory and mid-story canopy density modifications would be restricted to non-active bat periods (November 15-March 15). This project is expected to take 5 to 10 years to complete. The compartments being considered are:

- Route U Habitat Management area, 480 acres, Compartment 05 (Figure 2);
- Stoutsville Habitat Management Area, 340 acres, Compartment 06 (Figure 3);
- Northfork Habitat Management Area, 864 acres, Compartment 07 (Figure 4);
- Shell Branch Habitat Management Area, 899 acres, Compartment 09 (Figure 5);
- Indian Creek Habitat Management Area, 3,160 acres, Compartments 11 and ES-3 (Figures 6-7);
- Route N Habitat Management Area, 864 acres, Compartment 48 (Figure 8); and
- Joanna Ridge Habitat Management Area, 589 acres, Compartment ES-4 (Figure 9).

Route N Habitat Management Area, Compartment 48, has been identified as the first compartment for the proposed grassland and forest management (Figure 8). Ground disturbing activities will be limited to haul and skid roads and log landings (Redacted). No previously identified archaeological sites are within the area of potential effect and an archaeological survey for these haul and skid roads and log landings is expected to take place in Spring 2025.

The District is drafting a NEPA compliance document for bat habitat improvement activities within the eight compartments; however, the District is not capable of completing its Section 106 responsibilities within the timeframe legally required for completion of the NEPA document. The District is requesting that your office enter into a Programmatic Agreement for the Indiana Bat Habitat Improvement Project at Mark Twain Lake.

If you have any questions, comments, or areas of concern, please contact Meredith Hawkins Trautt (Archaeologist) by phone at 314-925-5031 or by email at Meredith.M.Trautt@usace.army.mil.

Respectfully,



Jennifer L. Riordan
Chief, Curation and Archives
Analysis Branch

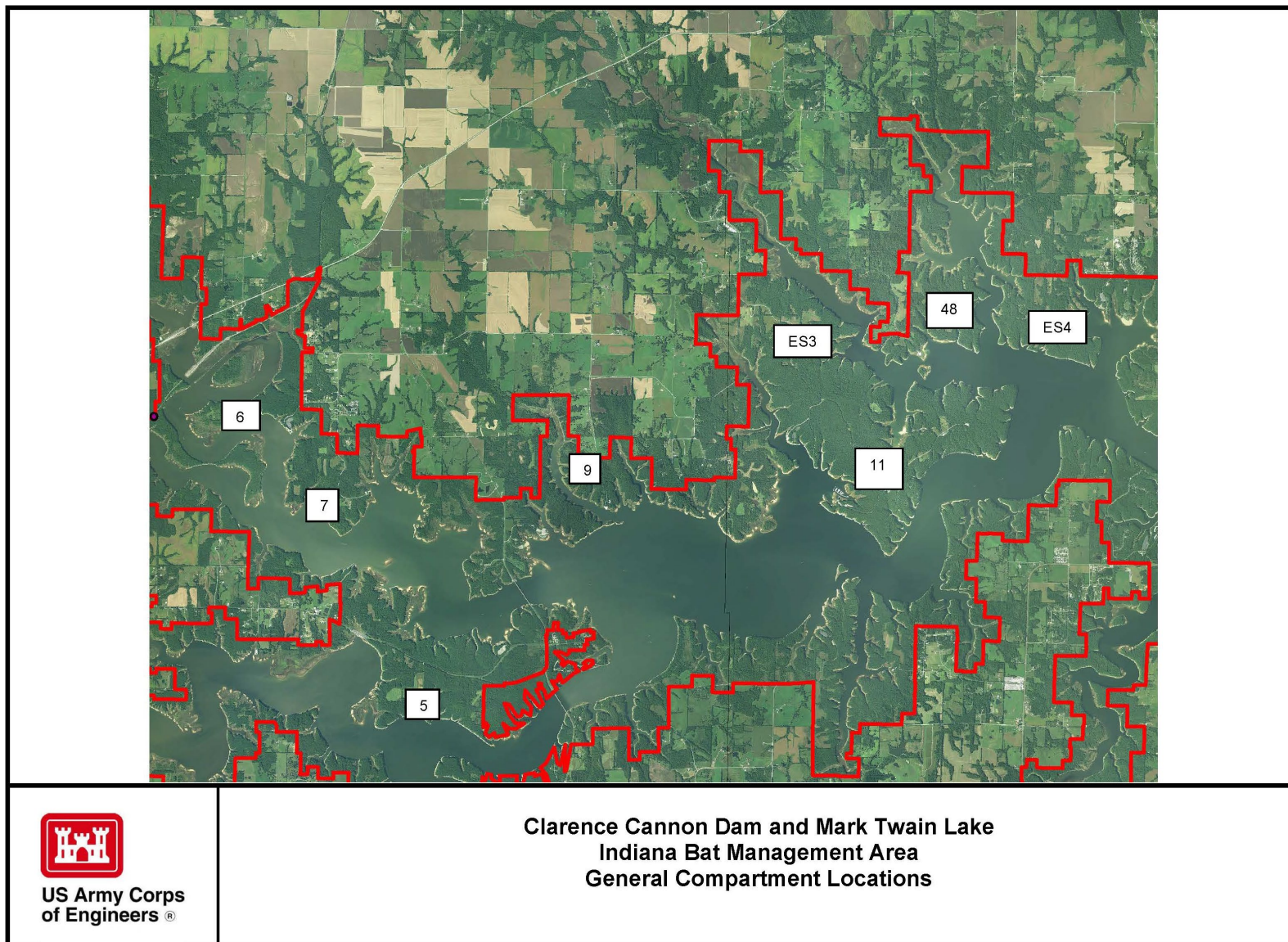


Figure 1. Overall location of compartments.

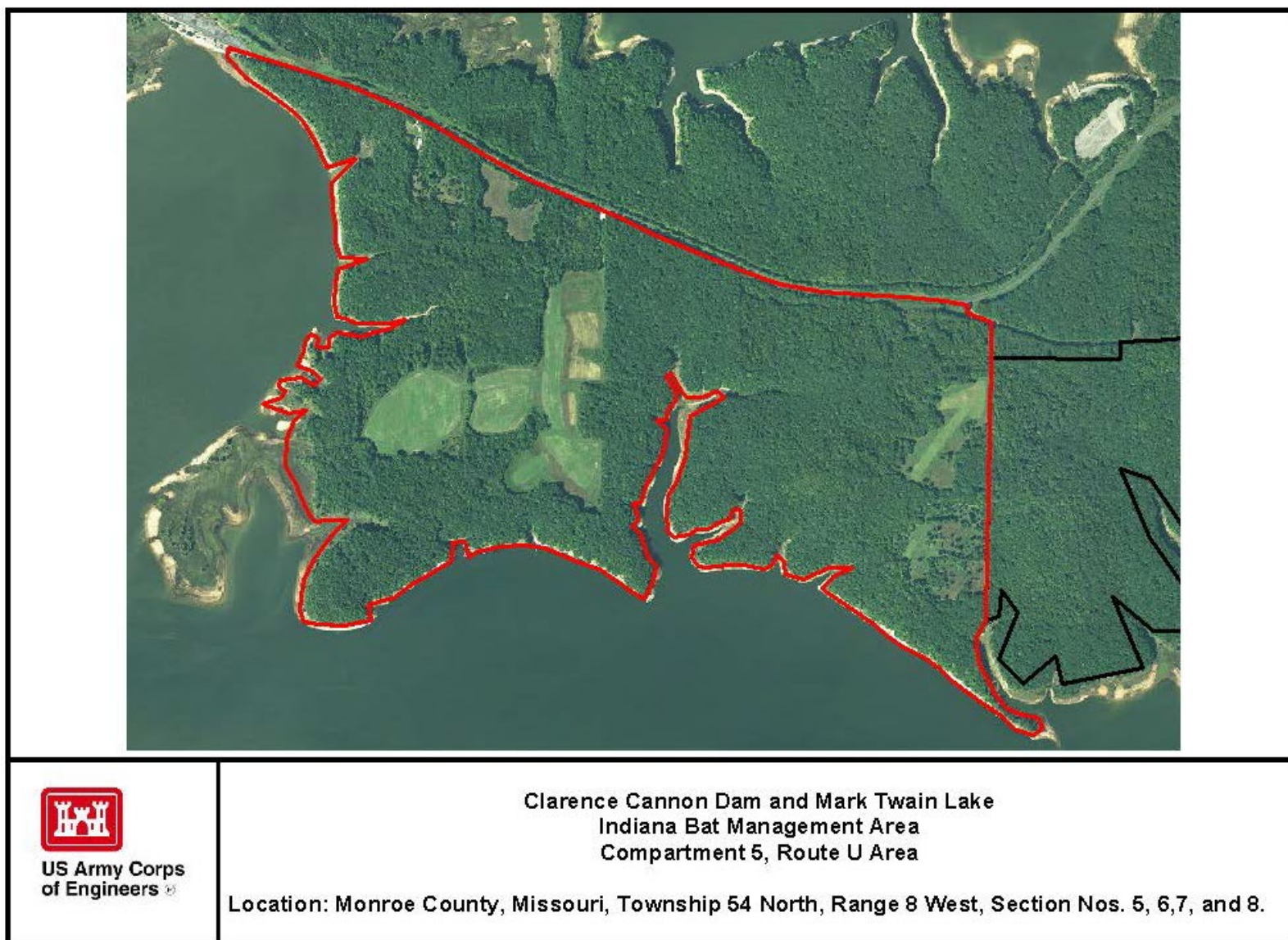


Figure 2. Route U Mitigation Area, Compartment 5.

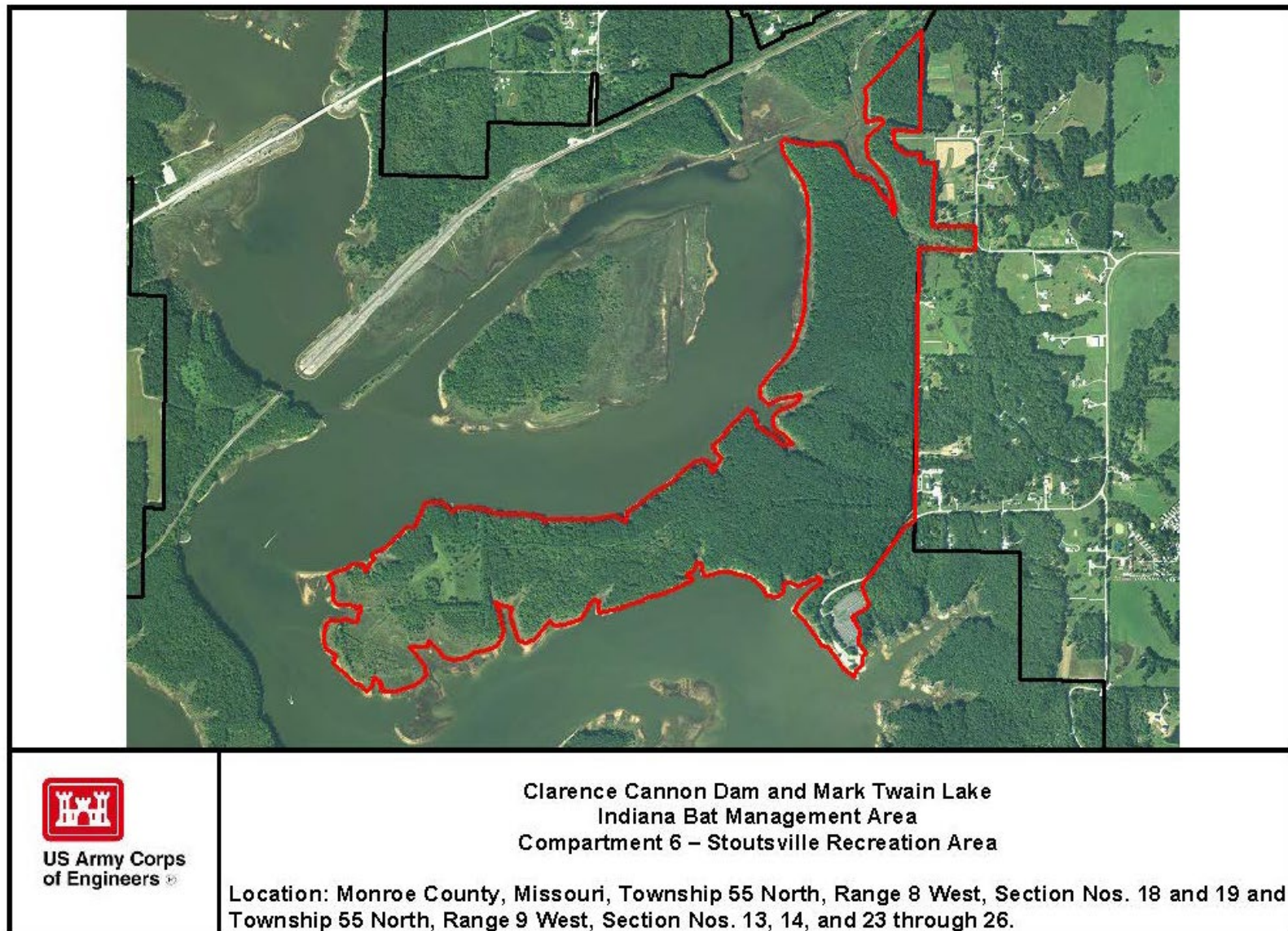


Figure 3. Stoutsville Mitigation Area, Compartment 6.

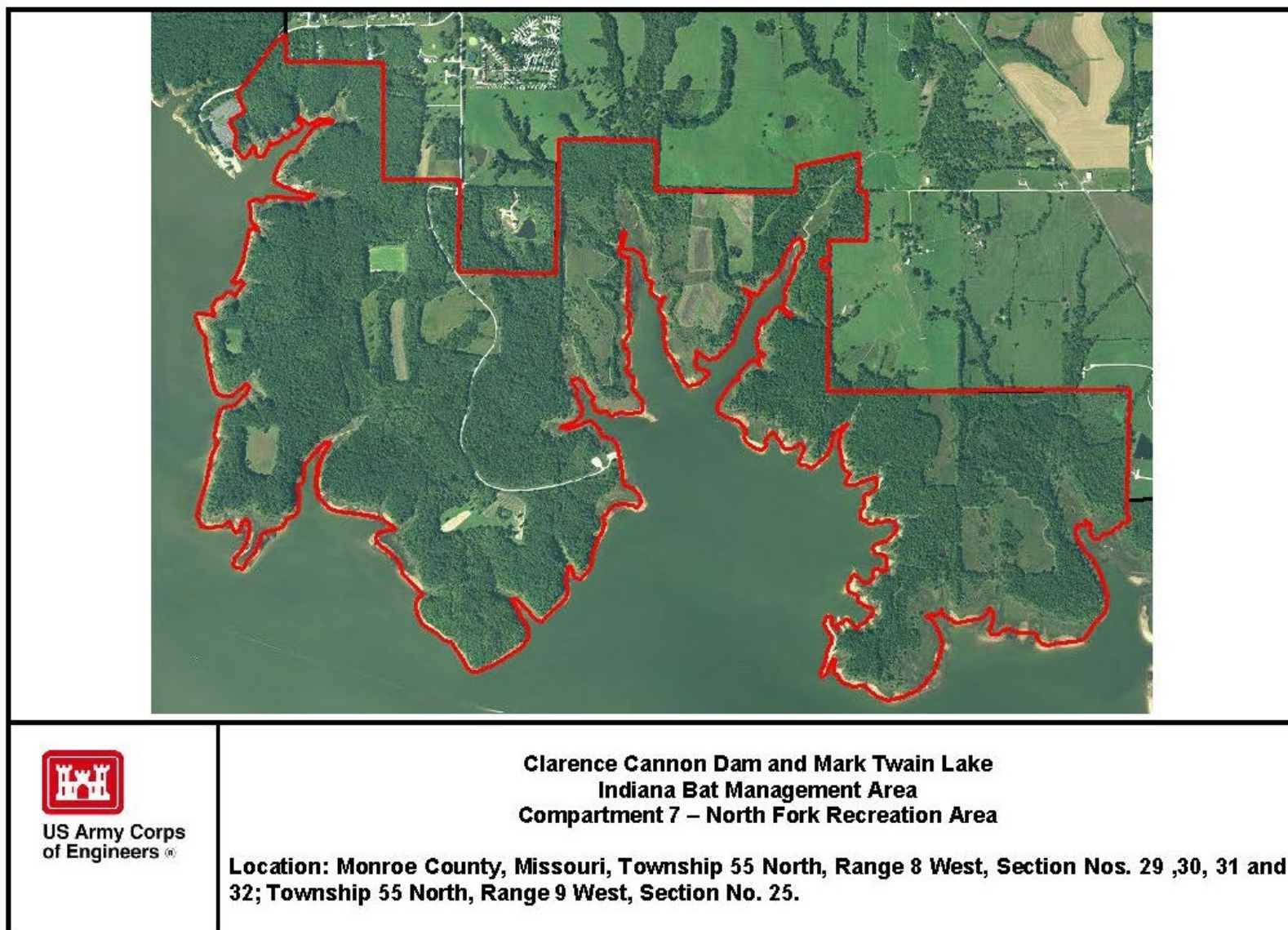


Figure 4. North Fork Mitigation Area, Compartment 7.

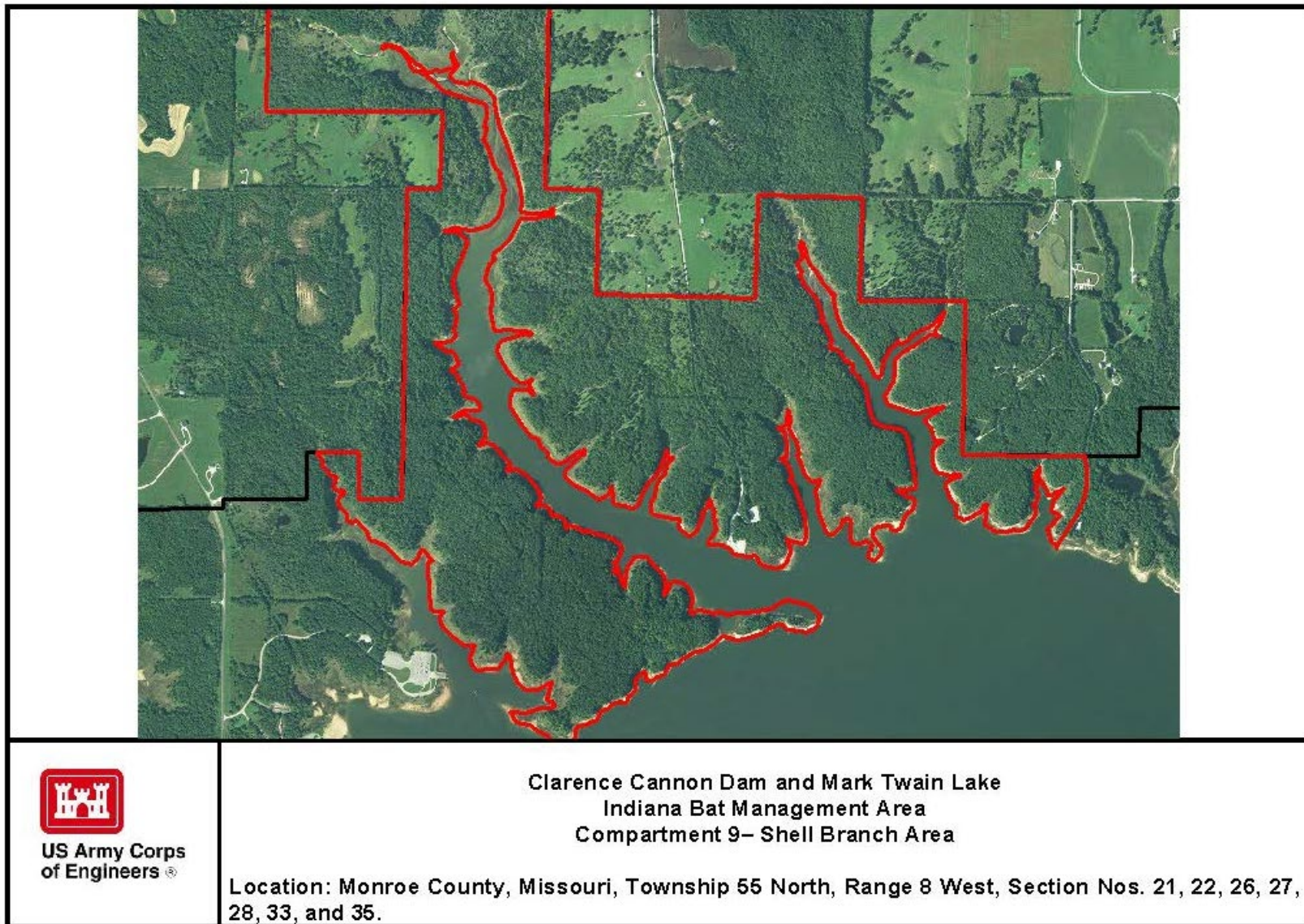


Figure 5. Shell Branch Area, Compartment 9.

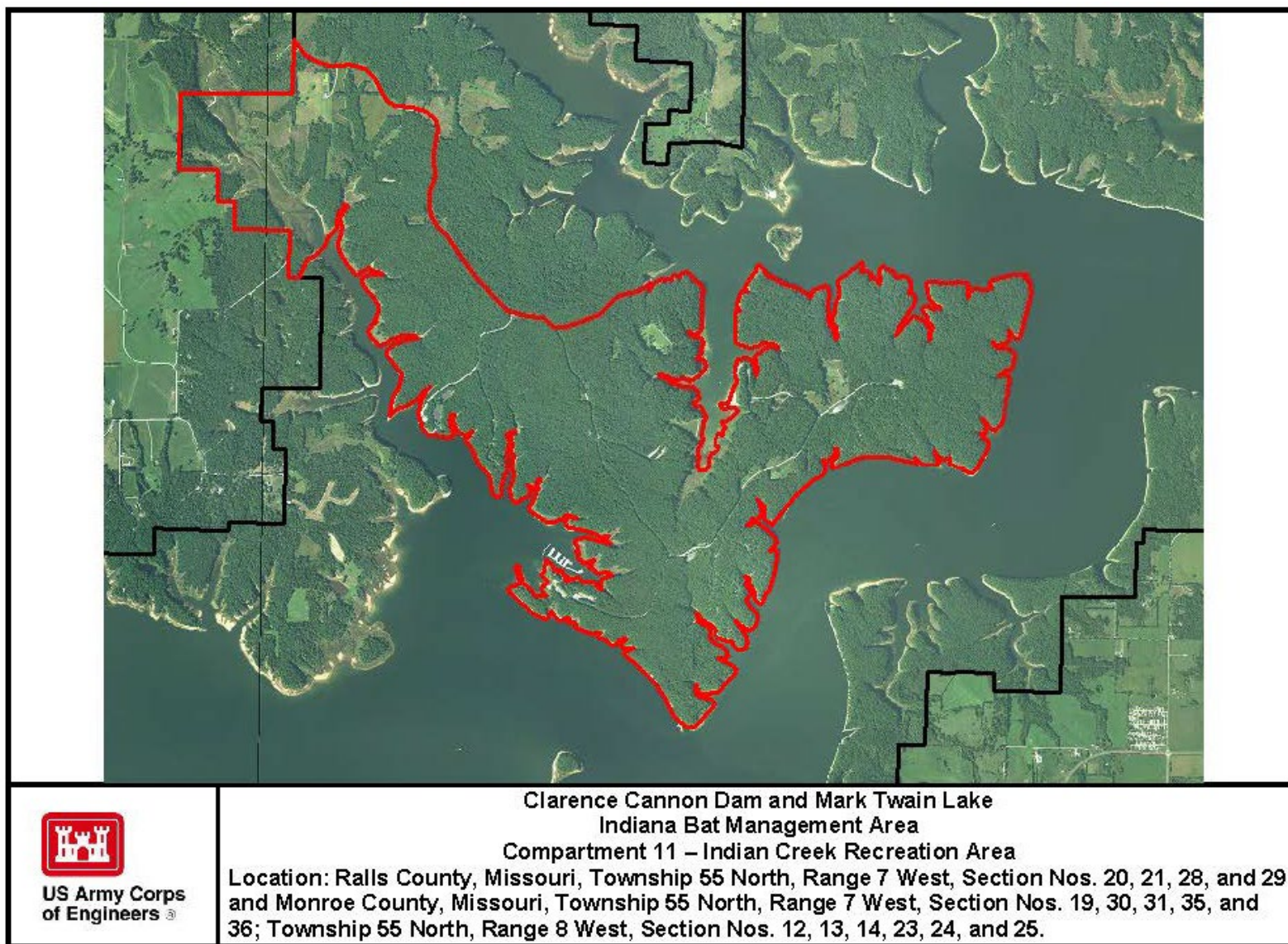


Figure 6. Indian Creek Recreation Area, Compartment 11.

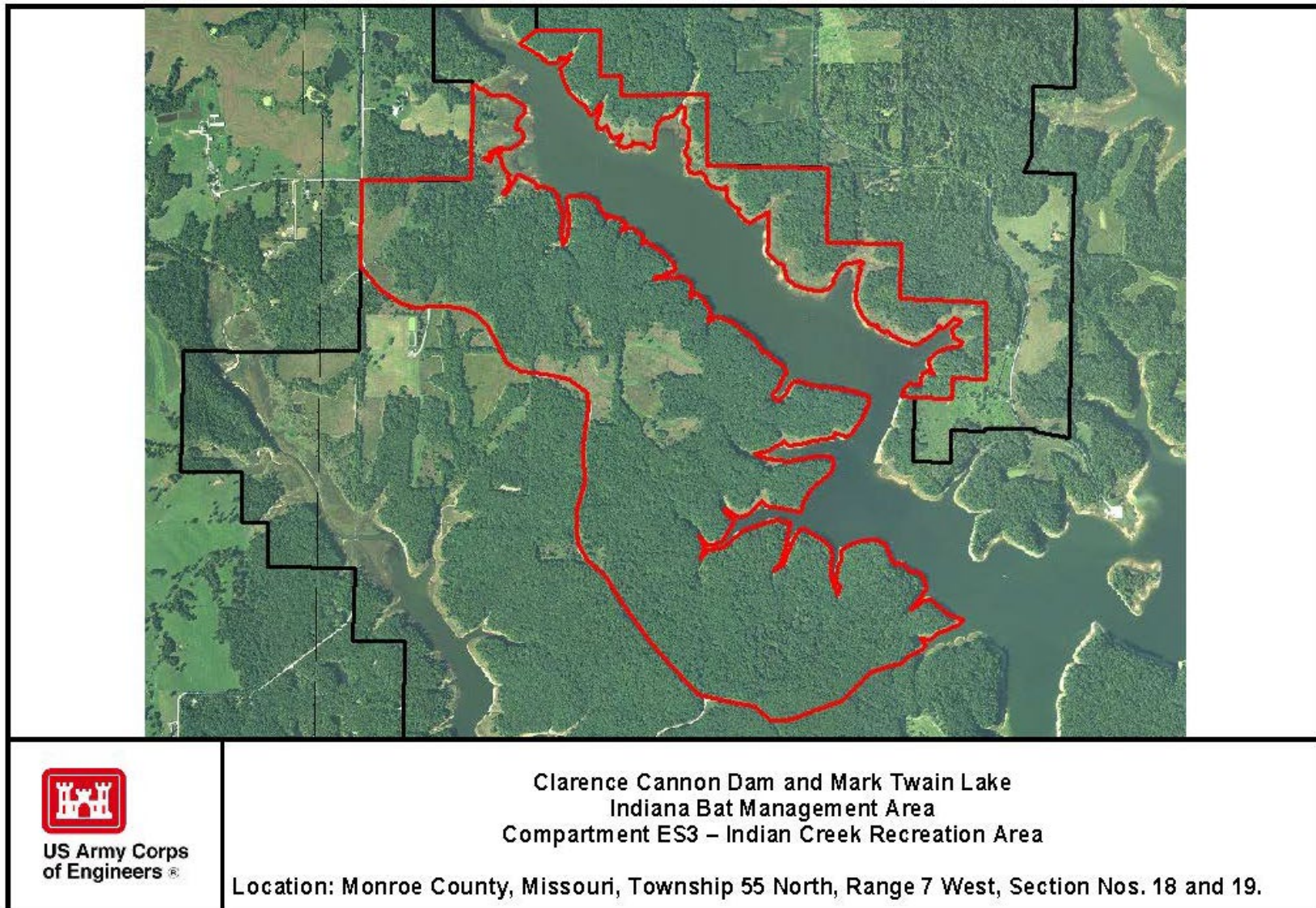


Figure 7. Indian Creek Recreation Area, Compartment ES-3.

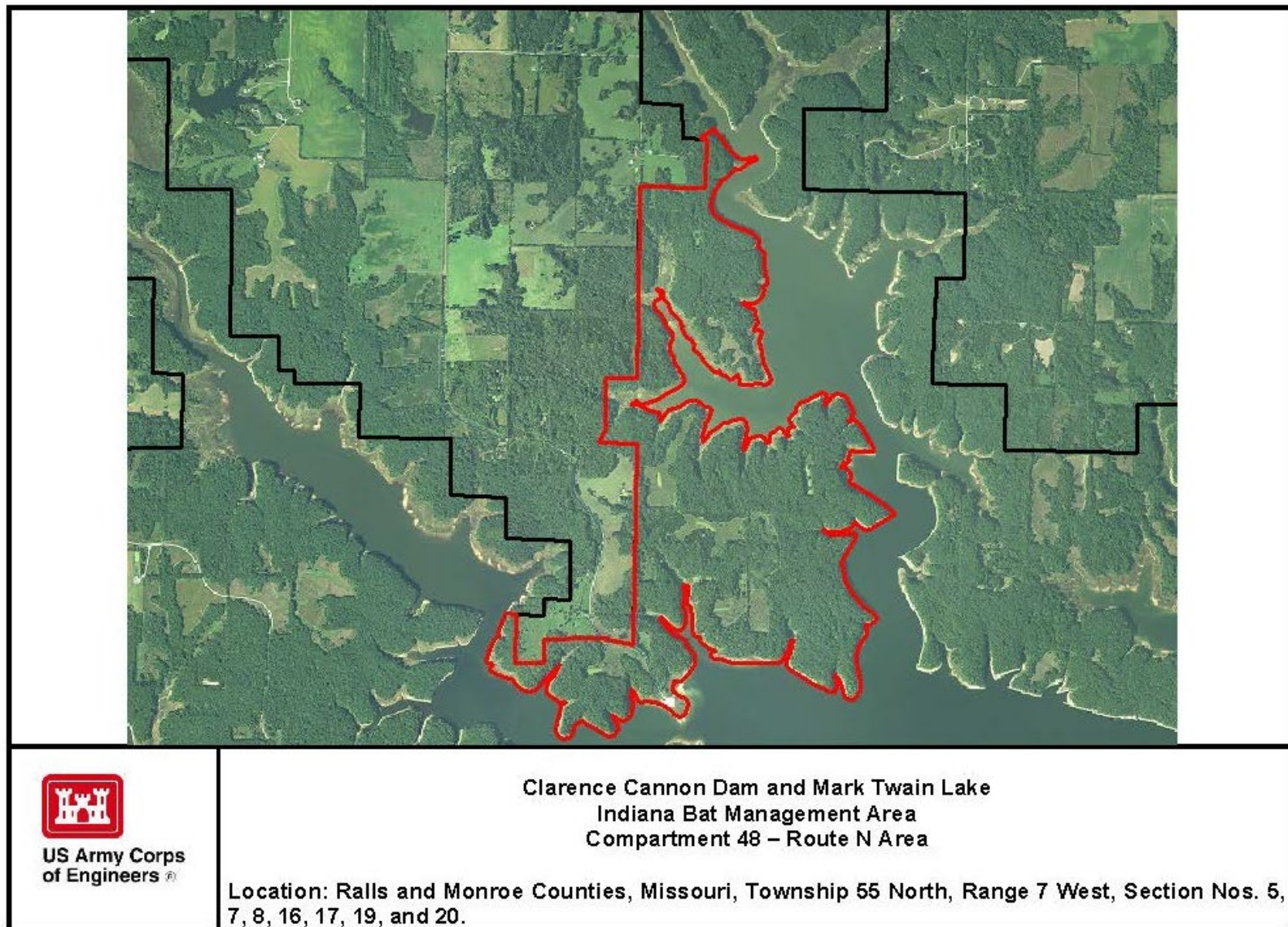


Figure 8. Route N Management Area, Compartment 48.

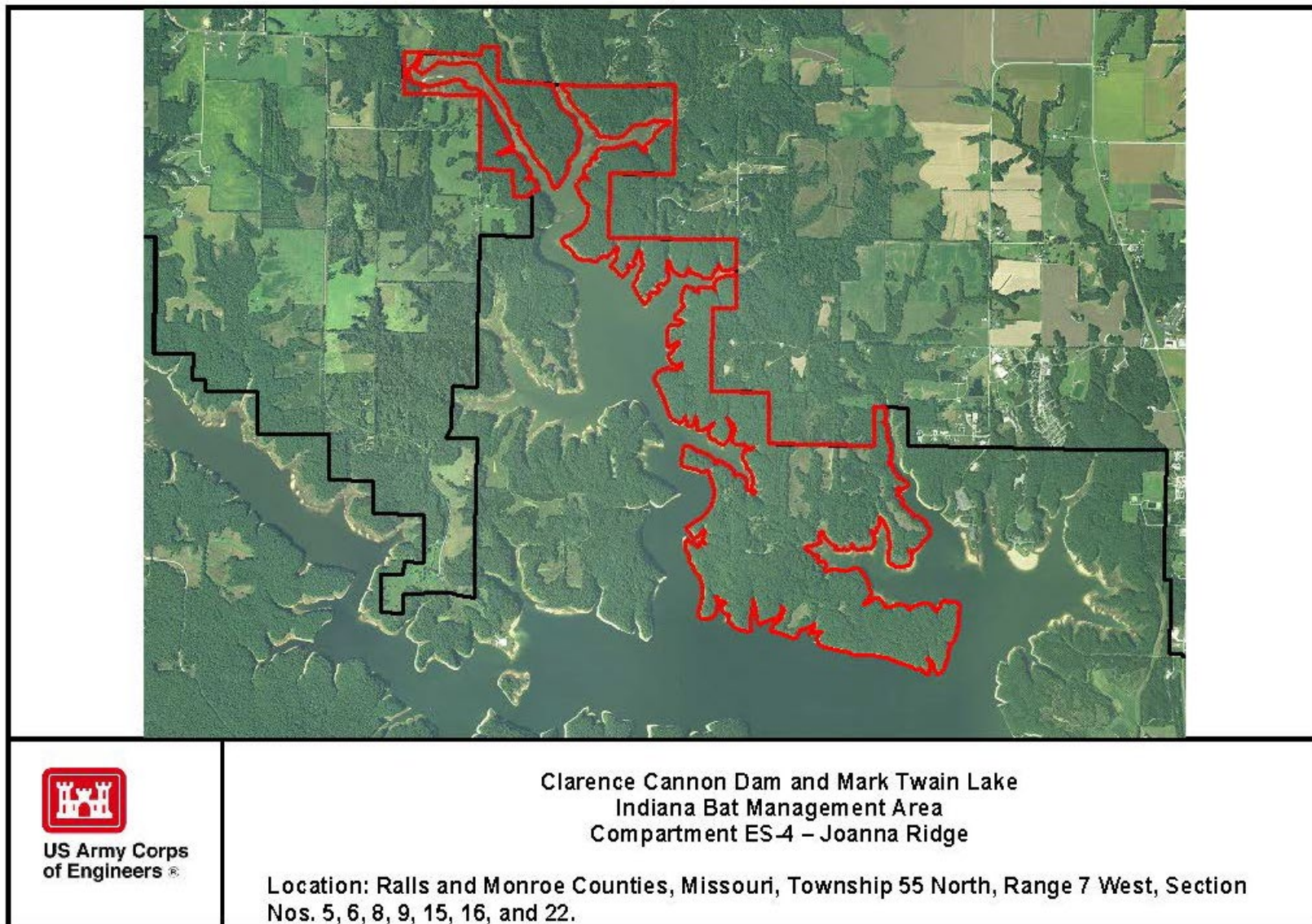


Figure 9. Joanna Ridge Mitigation Area, Compartment ES-4.



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

January 15, 2025

Engineering and Construction Division
Curation and Archives Analysis Branch

Subject: Indiana Bat Habitat Improvement Project Programmatic Agreement, Mark Twain Lake, Ralls and Monroe Counties, Missouri



Dear Chairman [REDACTED]:

The U.S. Army Corps of Engineers, St. Louis District (District) is proposing an Indiana Bat Improvement Project at Mark Twain Lake to promote and perpetuate environmental conditions that contributes to high-quality Indiana Bat (*Myotis sodalists*) habitat. Mark Twain Lake is proposing to alter the current forested habitat in eight compartments (Figure 1). The District is contacting your Tribe to initiate consultation under the National Environmental Policy Act (NEPA) of 1970 and Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations 36 CFR 800.

Mark Twain Lake proposes to implement grassland and forest management area in eight compartments to provide semi-open areas for bat foraging as well as suitable summer roosting habitat. The exact management will vary per compartment; however, it could include the following:

- Prescribed fire to improve/maintain grassland composition, density, and quality;
- Limit height of successional woody species to maintain clear flight paths;
- Forbs and pollinator vegetation that support moths, butterflies, and other winged insect species will be promoted;
- Maintaining a minimum of five snag trees per acre at preferred locations within identified stands;
- Preserve standing dead trees and increasing solar exposure where practical;
- Preserving adequate stocking of mature Shagbark Hickory (*Carya ovata*);
- Reducing the basal area of overstory and mid-story canopy of overstocked forest stands to improve flight travel corridor and solar exposure;
- Creating clear lanes of travel at forest and field transition areas;
- Creating/maintaining gaps in the forest canopy for interior feeding/flight spaces;
- Applying prescribed burning to remove forest floor debris, to promote fire intolerant species, and to modify understory composition;
- Reducing shade tolerant mid-story tree species to encourage understory and forest floor vegetative diversity; and
- Managing for woodland/semi-savannah conditions on limestone bluff tops.

Modifications to the basal area overstory and mid-story canopy density modifications would be restricted to non-active bat periods (November 15-March 15). This project is expected to take 5 to 10 years to complete. The compartments being considered are:

- Route U Habitat Management area, 480 acres, Compartment 05 (Figure 2);
- Stoutsville Habitat Management Area, 340 acres, Compartment 06 (Figure 3);
- Northfork Habitat Management Area, 864 acres, Compartment 07 (Figure 4);
- Shell Branch Habitat Management Area, 899 acres, Compartment 09 (Figure 5);
- Indian Creek Habitat Management Area, 3,160 acres, Compartments 11 and ES-3 (Figures 6-7);
- Route N Habitat Management Area, 864 acres, Compartment 48 (Figure 8); and
- Joanna Ridge Habitat Management Area, 589 acres, Compartment ES-4 (Figure 9).

Route N Habitat Management Area, Compartment 48, has been identified as the first compartment for the proposed grassland and forest management (Figure 8). Ground disturbing activities will be limited to haul and skid roads and log landings (Redacted). No previously identified archaeological sites are within the area of potential effect and an archaeological survey for these haul and skid roads and log landings is expected to take place in Spring 2025.

The District is drafting a NEPA compliance document for bat habitat improvement activities within the eight compartments; however, the District is not capable of completing its Section 106 responsibilities within the timeframe legally required for completion of the NEPA document. The District is requesting that Tribal Nations enter into a Programmatic Agreement for this project.

The District is requesting your office to notify us if you would like to enter into a Programmatic Agreement for the Indiana Bat Habitat Improvement Project at Mark Twain Lake. If you have any questions, comments, or areas of concern, please contact me at (314) 331-8855 or Meredith Hawkins Trautt (Archaeologist and Tribal Liaison) by phone at 314-925-5031 or by email at Meredith.M.Trautt@usace.army.mil. A copy of this letter has been furnished to [REDACTED].

Respectfully,



Jennifer L. Riordan
Chief, Curation and Archives
Analysis Branch

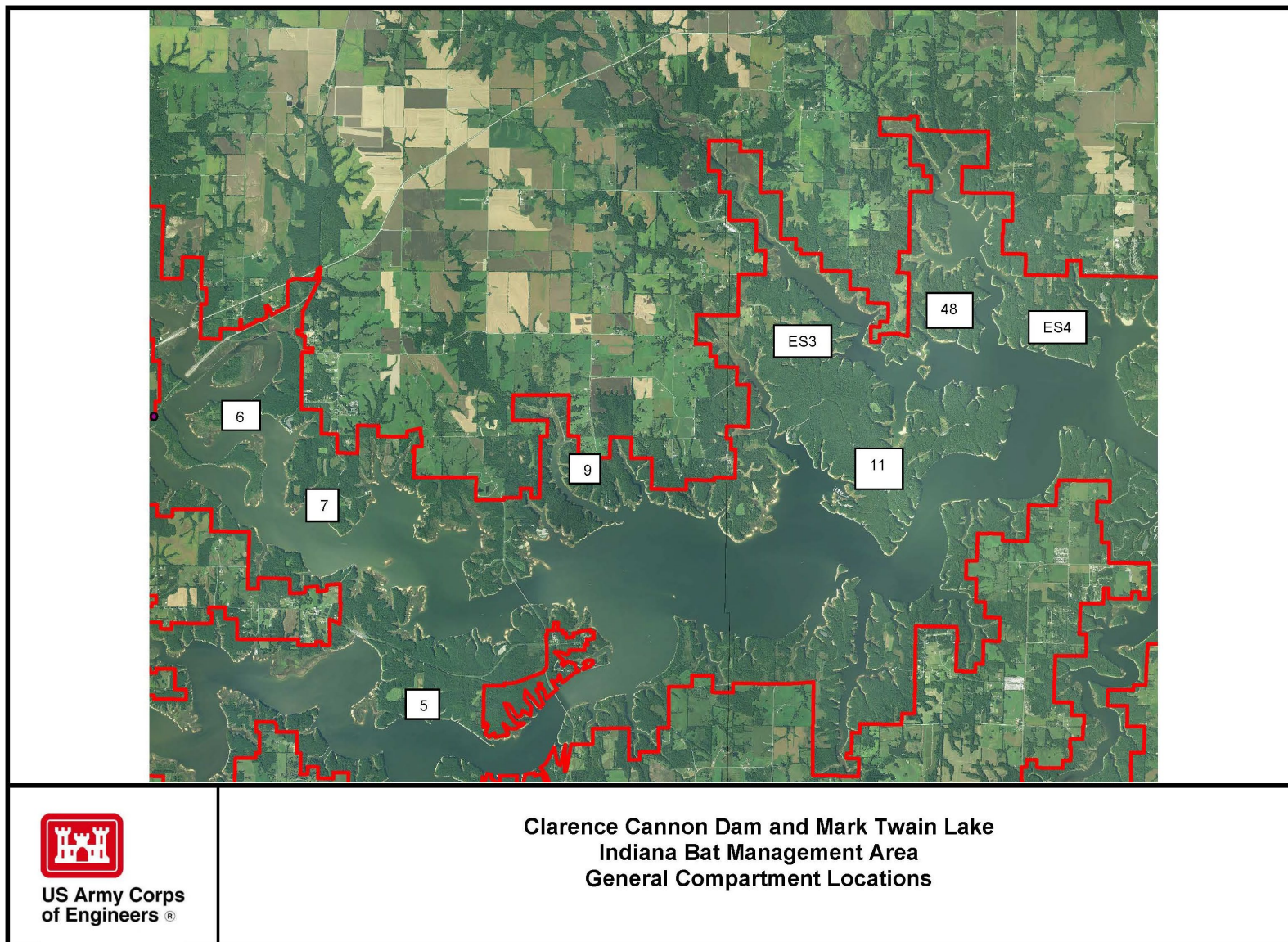


Figure 1. Overall location of compartments.

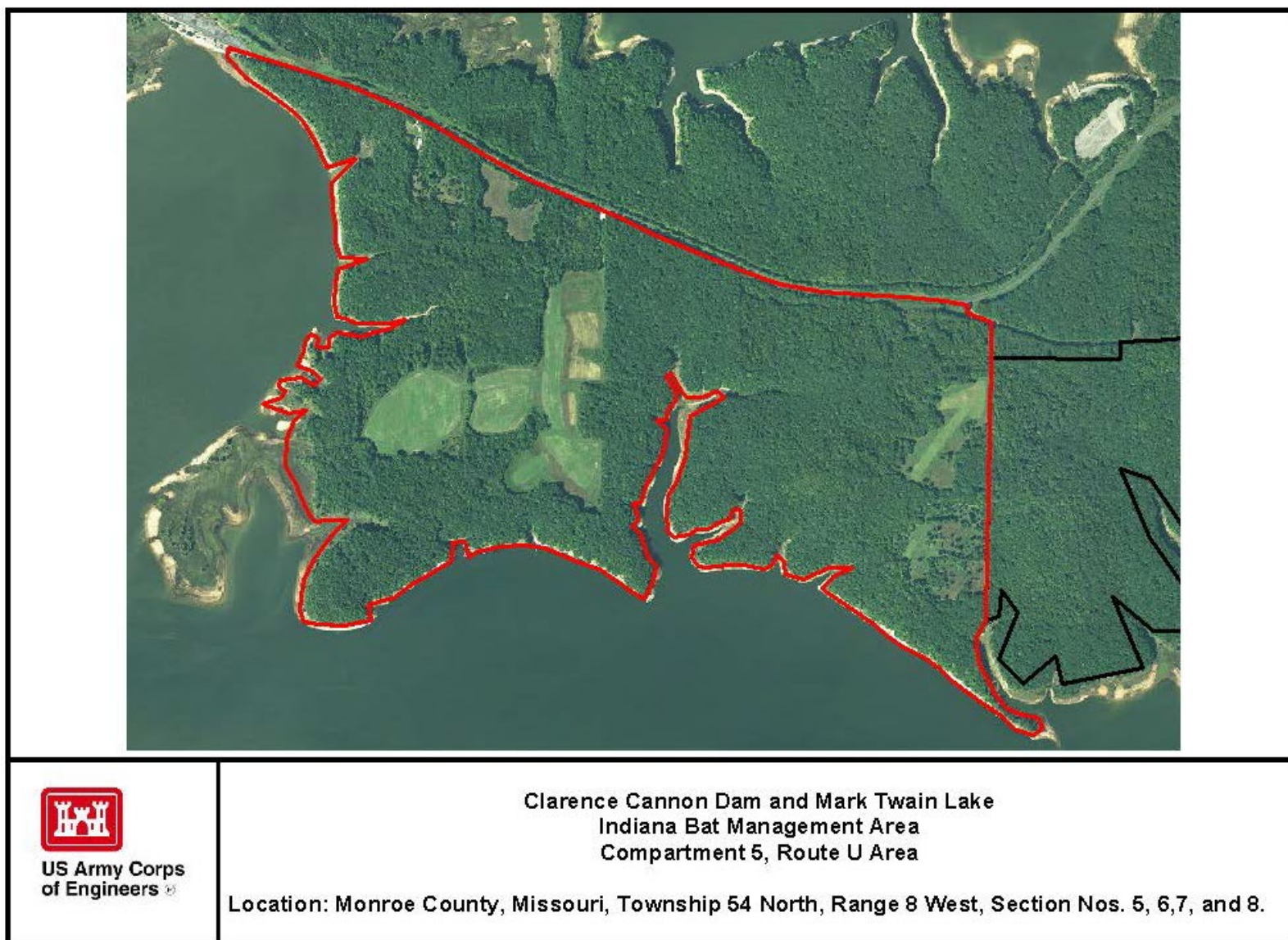


Figure 2. Route U Mitigation Area, Compartment 5.

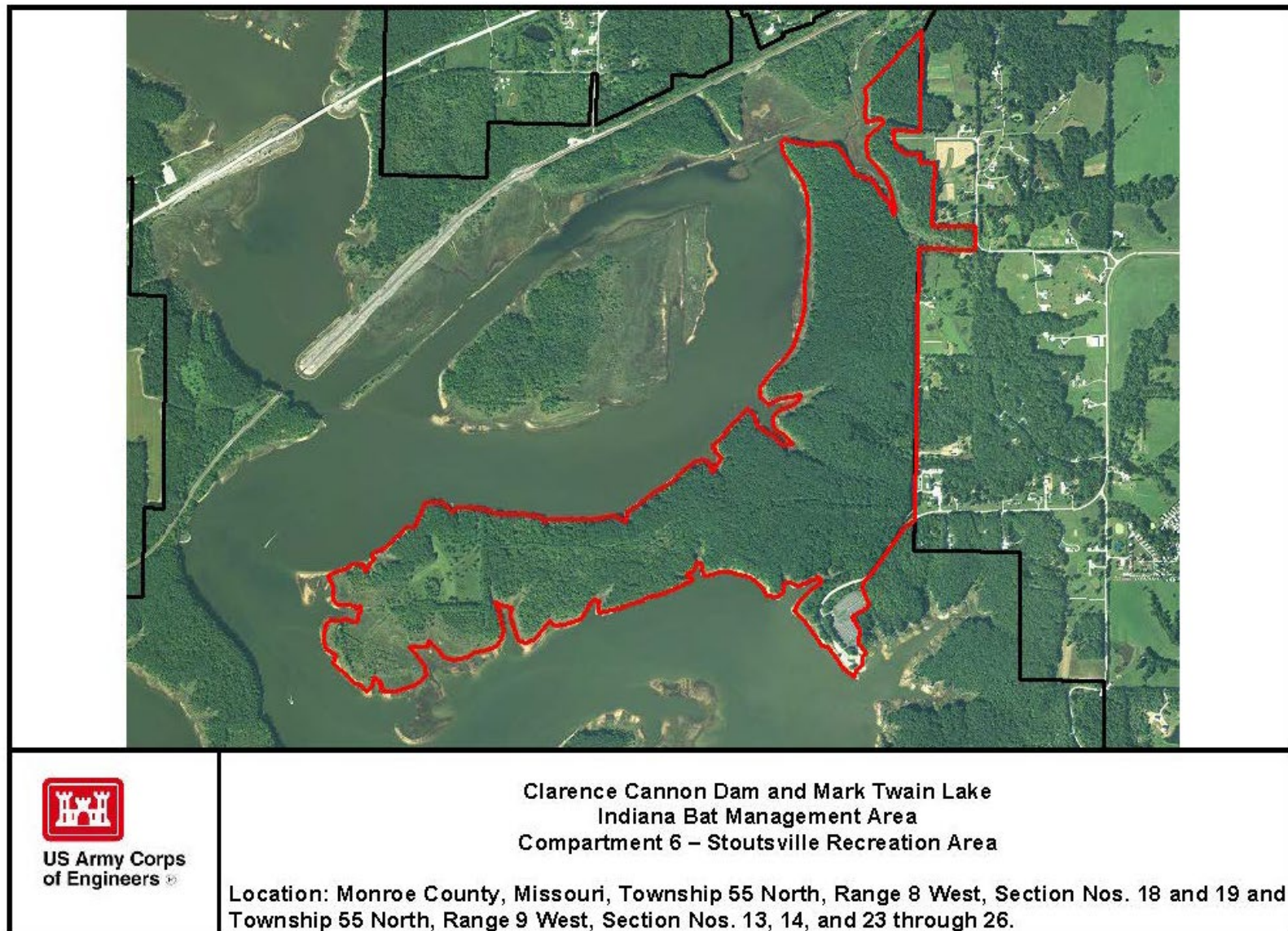


Figure 3. Stoutsville Mitigation Area, Compartment 6.

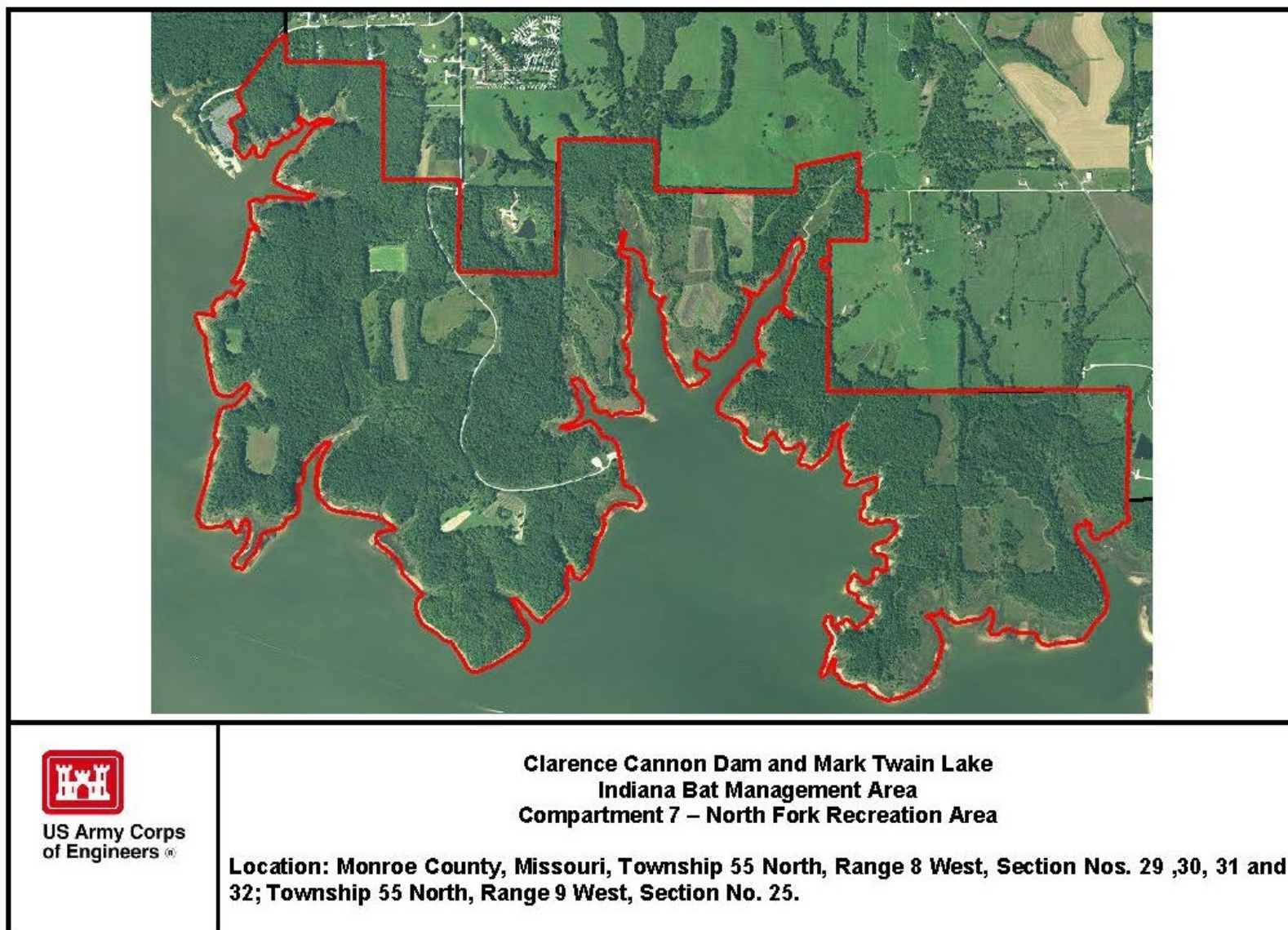


Figure 4. North Fork Mitigation Area, Compartment 7.

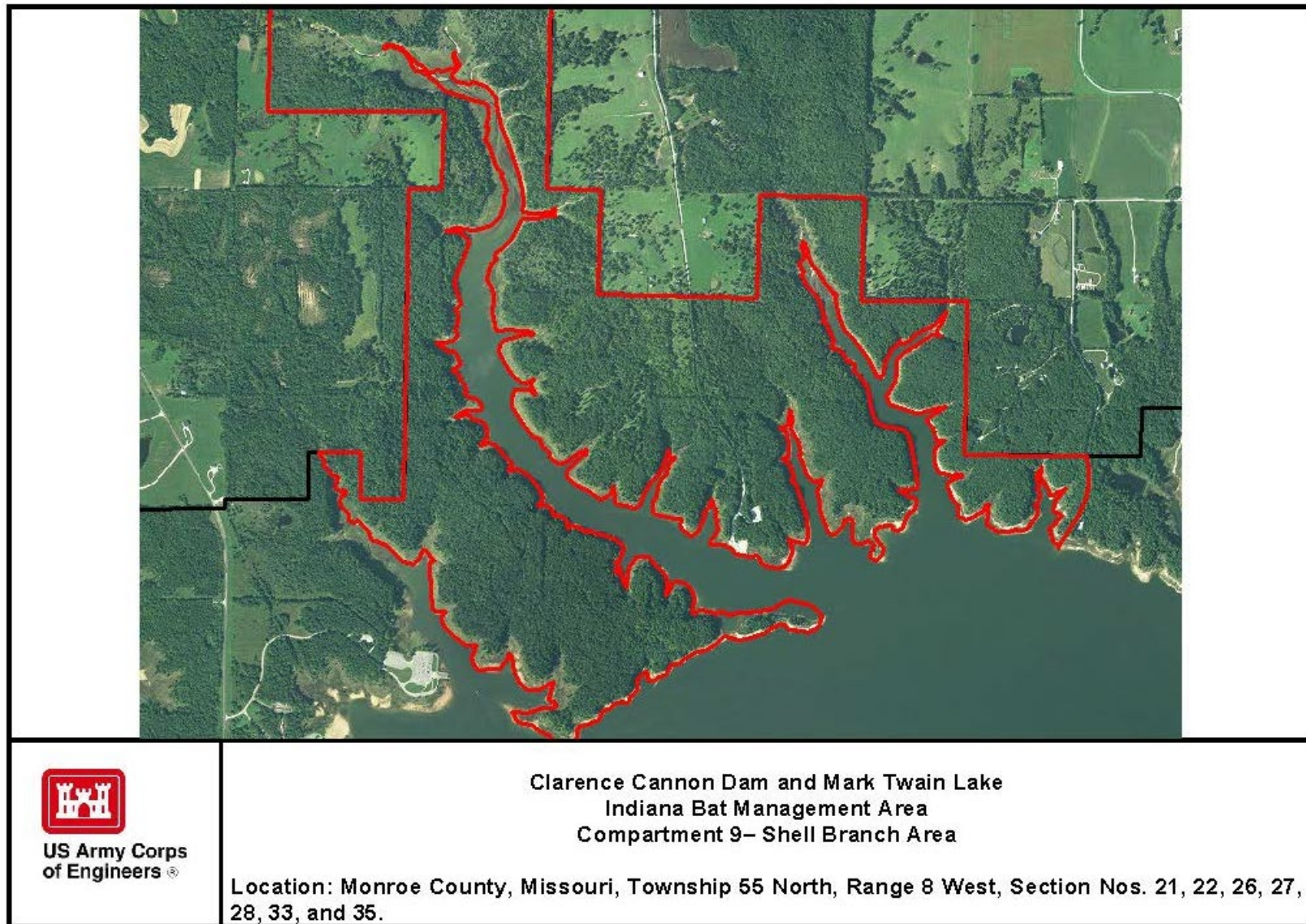


Figure 5. Shell Branch Area, Compartment 9.

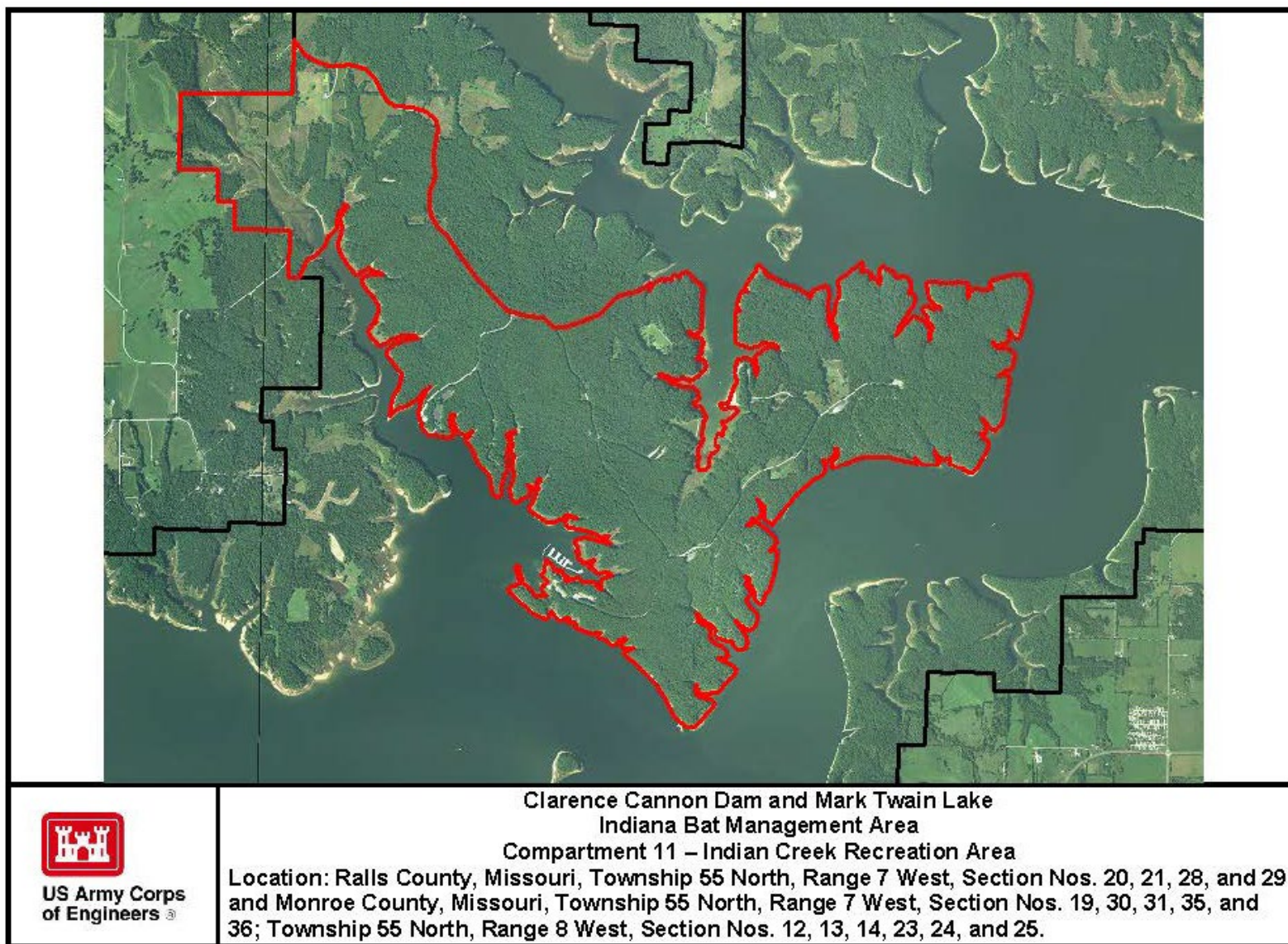


Figure 6. Indian Creek Recreation Area, Compartment 11.

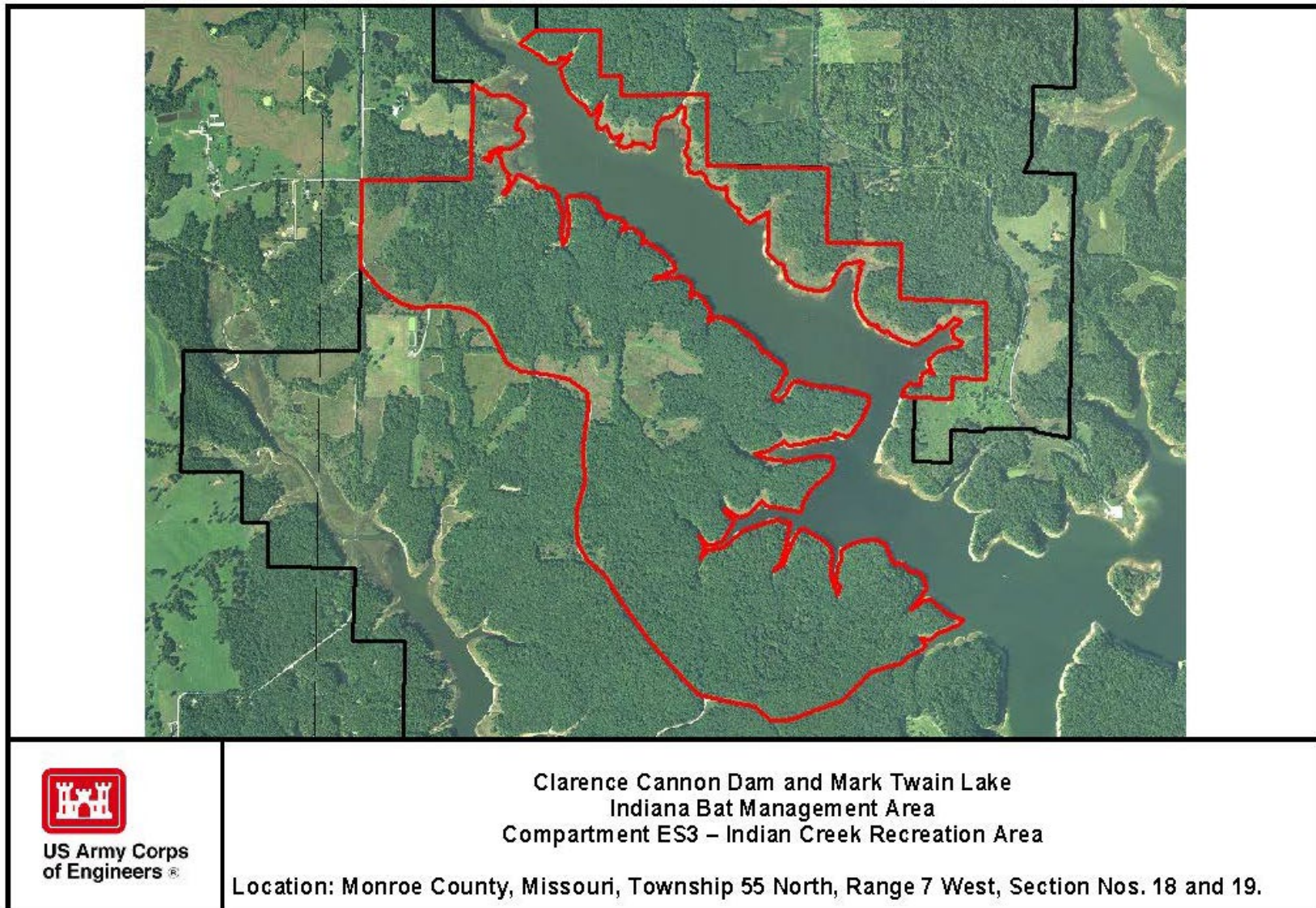


Figure 7. Indian Creek Recreation Area, Compartment ES-3.

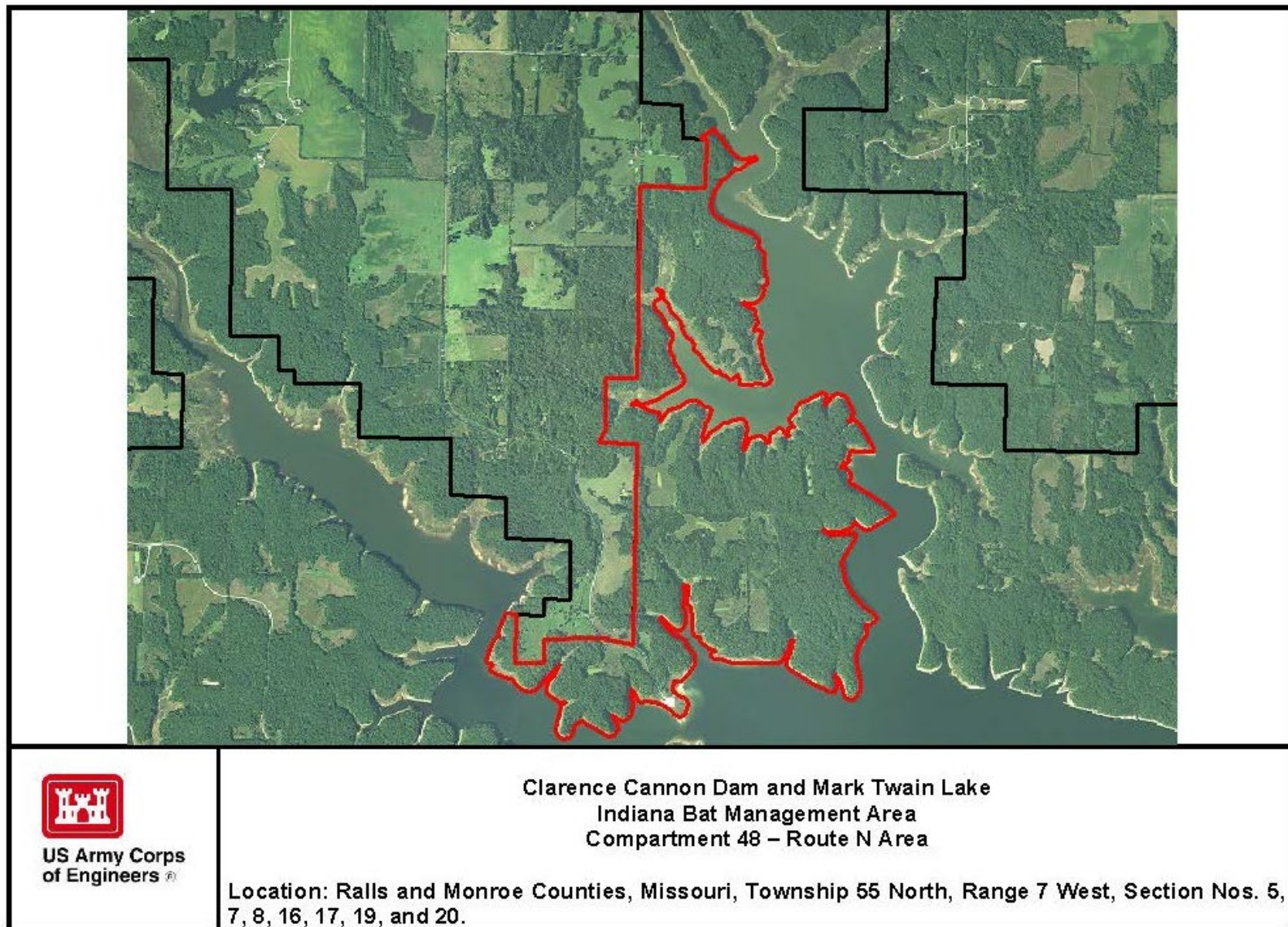


Figure 8. Route N Management Area, Compartment 48.

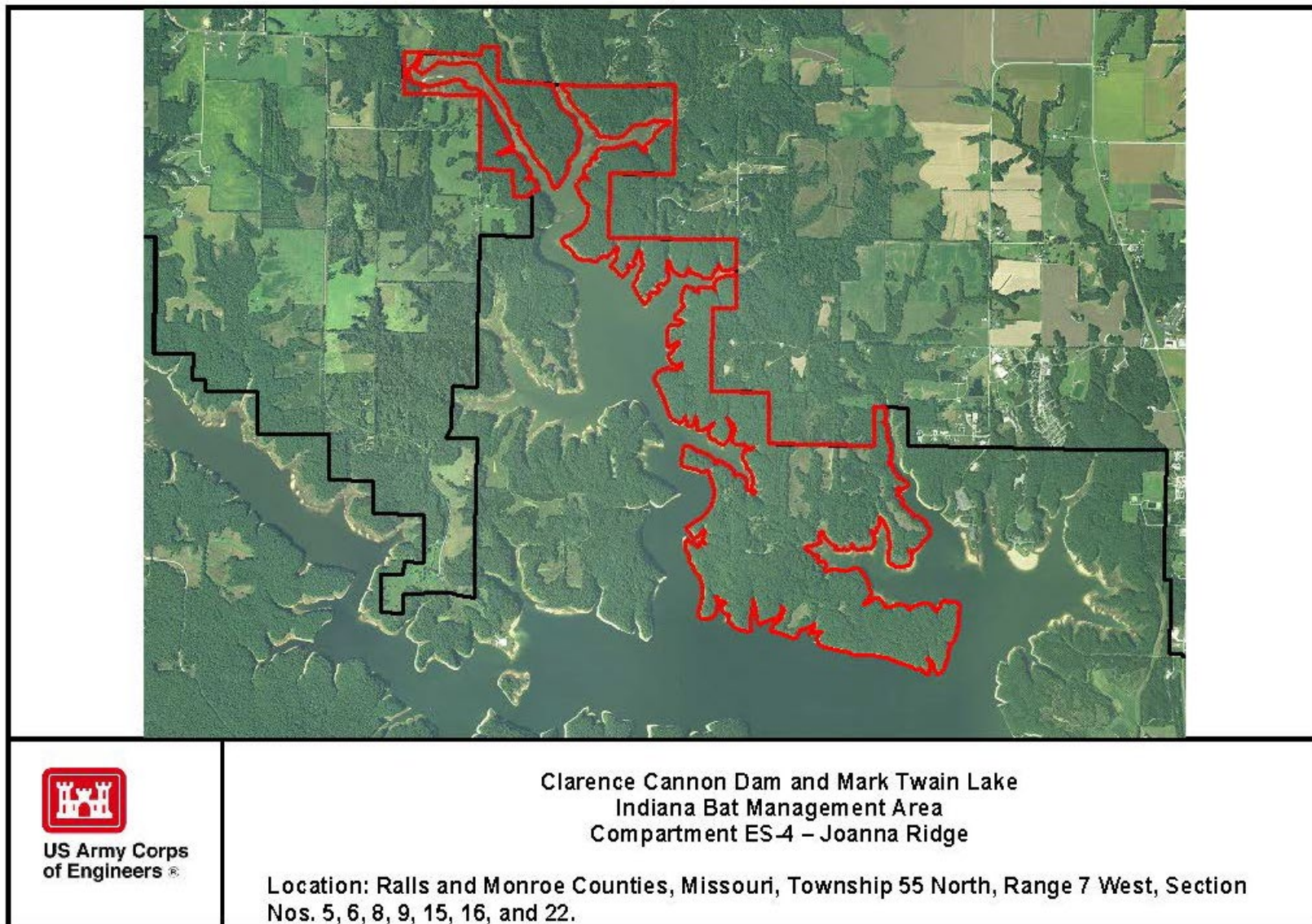


Figure 9. Joanna Ridge Mitigation Area, Compartment ES-4.



August 18, 2025

Meredith Hawkins Trautt
Archaeologist and Tribal Liaison
U.S. Army Corps of Engineers
St. Louis District
1222 Spruce Street
St. Louis, MO 63103

Ref: *Indiana Bat Habitat Restoration Project*
Monroe and Ralls Counties, Missouri
ACHP Project Number: 023495

Dear Ms. Trautt:

On August 11, 2025, the Advisory Council on Historic Preservation (ACHP) received your notification and supporting documentation regarding the potential adverse effects of the referenced undertaking on a property or properties listed or eligible for listing in the National Register of Historic Places. Based upon the information you provided, we have concluded that Appendix A, *Criteria for Council Involvement in Reviewing Individual Section 106 Cases*, of our regulations, "Protection of Historic Properties" (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act, does not apply to this undertaking. Accordingly, we do not believe our participation in the consultation to resolve adverse effects is needed.

However, if we receive a request for participation from the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer, affected Indian Tribe, a consulting party, or other party, we may reconsider this decision. Should the undertaking's circumstances change, consulting parties cannot come to consensus, or you need further advisory assistance to conclude the consultation process, please contact us.

Pursuant to Section 800.6(b)(1)(iv), you will need to file the final Section 106 agreement document (Agreement), developed in consultation with the Missouri SHPO and any other consulting parties, and related documentation with the ACHP at the conclusion of the consultation process. The filing of the Agreement and supporting documentation with the ACHP is required in order to complete the requirements of Section 106 of the National Historic Preservation Act.

Thank you for providing us with your notification of adverse effect. If you have any questions or require our further assistance, please contact Mr. Christopher Daniel at (202) 517-0223 or by e-mail at cdaniel@achp.gov and reference the ACHP Project Number above.

Sincerely,

Christopher Daniel

ADVISORY COUNCIL ON HISTORIC PRESERVATION

401 F Street NW, Suite 308 • Washington, DC 20001-2637
Phone: 202-517-0200 • Fax: 202-517-6381 • achp@achp.gov • www.achp.gov

Program Analyst
Office of Federal Agency Programs
Federal Property Management Section

**PROGRAMMATIC AGREEMENT
AMONG
THE UNITED STATES ARMY CORPS OF ENGINEERS,
ST. LOUIS DISTRICT,
THE MISSOURI STATE HISTORIC PRESERVATION OFFICE,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION,
AND THE OSAGE NATION,
REGARDING
INDIANA BAT HABITAT RESTORATION PROJECT,
MARK TWAIN LAKE, MONROE AND RALLS COUNTIES, MISSOURI**

WHEREAS, Mark Twain Lake was authorized by the Flood Control Act of 1938 and modified by the Flood Control Act of 1962 based on the Chief of Engineer's recommendations presented in House Document No. 507, Eighty-seventh Congress, 2nd Session. The authorized purpose of the lake project include flood control in the lower Salt and Mississippi Rivers, hydroelectric power generation, water supply, fish and wildlife conservation, recreation, and incidental benefits to navigation; and,

WHEREAS, the U.S. Army Corps of Engineers, St. Louis District's (USACE) Mark Twain Lake Master Plan provides guidelines for the day-to-day management of the lake's operations, which is periodically updated to reflect the need for management and land use changes; and,

WHEREAS, the Forest Cover Act of 1960 (Public Law 86-717) is a statutory mandate directing the USACE reservoir areas be managed to encourage, promote, and assure fully adequate and dependable future resources of readily available timber, through sustained yields programs, reforestation, and accepted conservation practices and to increase the value of such areas for conservation, recreation, and other beneficial uses; and,

WHEREAS, the Endangered Species Act of 1973, as amended, emphasized that it is the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered species and threatened species; and,

WHEREAS, USACE is proposing an Indiana Bat (*Myotis sodalists*) habitat restoration project at eight compartments at Mark Twain Lake in Monroe and Ralls counties, Missouri (Project) (Attachment A). The project proposes to implement grassland and forest management improvements to provide semi-open areas for bat foraging as well as suitable summer roosting habitat. The exact management will vary per compartment, dictated by various issues that need to be addressed at that specific compartment; and,

WHEREAS, the USACE, as the lead Federal agency, is required to comply with Section 106 of the National Historic Preservation Act (NHPA), as amended (54 U.S.C. § 306108) and its implementing regulations, "Protection of Historic Properties," codified in 36 CFR §

800; and,

WHEREAS, the USACE has determined that the proposed Project constitutes an undertaking, as defined in 36 CFR § 800.16(y), which may have the potential to affect historic properties included in or eligible for inclusion in the National Register of Historic Places (NRHP), and, therefore, will consult with the Advisory Council on Historic Preservation (ACHP), the Missouri State Historic Preservation Office (MoSHPO), and Indian Tribes pursuant to 36 CFR § 800.14(b) of the regulations implementing Section 106 and Section 110(f) of the NHPA (54 U.S.C. § 306108); and,

WHEREAS, the USACE has determined due to the nature of the Project being a multi-year project that could take up to ten (10) years to complete, that a Programmatic Agreement (PA) is needed to clarify review procedures, improve consistency, consultation, and accountability in fulfilling its responsibilities to comply with Section 106 of the NHPA pursuant to 36 CFR § 800.14(b)(2) for the Project; and,

WHEREAS, the Project undertakings are subject to development and analysis which is detailed in Project Implementation Reports (PIRs), Feasibility Reports, or other decision or implementation documents which discuss program undertaking alternatives and typically identify a Tentatively Selected Plan in the draft decision document, followed by a Recommended Plan in the final decision document, that becomes the proposed project after decision document approval; and,

WHEREAS, the Project undertakings are subject to environmental review under the National Environmental Policy Act (NEPA) and other environmental laws; and,

WHEREAS, the USACE shall defer the identification of the Area of Potential Effect (APE), as defined in Attachment B, and completion of the Section 106 process to include final identification and evaluation of historic properties, assessment of project effects to historic properties, and resolution of adverse effects, if any, until after completing the final USACE decision document and requirements of NEPA for the Project undertaking but before the implementation of the Project undertaking begins; and,

WHEREAS, the USACE shall seek ways to avoid, minimize, and mitigate any adverse effects to historic properties, listed on or eligible for inclusion in the NRHP; and,

WHEREAS, the USACE has consulted with the MoSHPO on the development of this PA, and the MoSHPO is a Signatory to this PA; and,

WHEREAS, the USACE recognizes the Federal government's special relationship with federally recognized Indian Tribes and is responsible for government-to-government consultation pursuant to the NHPA, 36 CFR § 800.2(c)(2)(ii); and,

WHEREAS, in accordance with 36 CFR § 800.2(c)(2)(ii), 800.3(f)(2), and 800.14(b)(2), the USACE, in a letter dated 15 January 2025, initiated consultation with twenty (20) federally recognized Tribes of the Undertaking, and of the potential for

effects that the Undertaking may have upon historic properties which may be of particular interest to them, and has invited the following Tribes to participate in a Programmatic Agreement with the District: Caddo Nation of Oklahoma, Citizen Potawatomi Nation Oklahoma, Delaware Nation Oklahoma, Eastern Shawnee Tribe of Oklahoma, Forest County Potawatomi Community Wisconsin, Hannahville Indian Community Michigan, Ho-Chunk Nation of Wisconsin, Iowa Tribe of Kansas and Nebraska, Iowa Tribe of Oklahoma, Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas, Kickapoo Tribe of Oklahoma, Miami Tribe of Oklahoma, Nottawaseppi Huron Band of the Potawatomi Michigan, The Osage Nation, Peoria Tribe of Indians of Oklahoma, Prairie Band Potawatomi Nation, Sac and Fox Nation of Missouri in Kansas and Nebraska, Sac and Fox Nation Oklahoma, Sac and Fox Tribe of the Mississippi in Iowa, and United Keetowah Band of Cherokee of Oklahoma; and,

WHEREAS, three (3) Tribes responded in the affirmative: Iowa Tribe of Kansas and Nebraska, The Osage Nation, and the Sac and Fox Tribe of the Mississippi in Iowa and Nebraska. The USACE has invited these two Tribes, collectively referred to as “Consulting Tribes,” to sign the PA as either Invited Signatories or Concurring Parties; and,

WHEREAS, in accordance with 36 CFR § 800.6(c)(2) and 800.6(c)(3), and based on each Consulting Tribe’s response, the USACE has invited Iowa Tribe of Kansas and Nebraska, The Osage Nation, and Sac and Fox Tribe of the Mississippi in Iowa to be Invited Signatories, as defined in Attachment B of this PA, and The Osage Nation has elected to sign the PA, each as an Invited Signatory and collectively included in “Consulting Tribes”; and,

WHEREAS, in accordance with 36 CFR § 800.6(c)(3), the Iowa Tribe of Kansas and Nebraska and Sac and Fox Tribe of the Mississippi in Iowa have been invited to participate in the development of this PA and have elected to sign the PA as a Concurring Party, as defined in Attachment B of this PA, and collectively included in “Consulting Tribes”; and,

WHEREAS, the USACE has not fully determined the scope of activity and Area of Potential Effect (APE), as defined in Attachment B of this PA, for the Undertaking but will consult with the Signatories and Invited Signatories in a timely manner prior to implementation in order to determine the APE for all of the actions subject to the terms of this PA, and shall propose and document modifications to the APE throughout the duration of this PA in accordance with the stipulations of this PA; and,

WHEREAS, the USACE benefits from consultation with Consulting Tribes in the identification and management of properties of religious and cultural significance, and the USACE shall ensure that its NHPA Section 106 procedures recognize the interests of Consulting Tribes in historic properties potentially affected by USACE decisions and afford Consulting Tribes participation in the process leading up to a District decision, in accordance with 36 CFR § 800; and,

WHEREAS, the USACE shall seek and consider the views of the public and shall provide information to the public about the Undertaking and its effects on historic properties following agency procedures pursuant to 36 CFR § 800.2(d); and in a manner that observes confidentiality requirements pursuant to Section 304 of the Act and applicable state laws; and,

WHEREAS, the definitions set forth in 36 CFR § 800.16 are incorporated herein by reference and apply throughout this PA; and,

WHEREAS, the parties to this PA have agreed to certain programmatic mitigation measures but in so doing also recognize that not all effects can be mitigated programmatically and therefore have agreed to re-enter consultation in order to devise appropriate remedial measures when the need arises; and,

WHEREAS, in accordance with 36 CFR § 800.6(a)(1), the USACE has notified the MoSHPO on 15 January 2025, and the ACHP on 6 August 2025, of this PA. The MoSHPO has chosen to enter into consultation, and on 18 August 2025 the ACHP has chosen not to enter into consultation, pursuant to 36 CFR § 800.6(a)(1)(iii); and,

NOW, THEREFORE, the USACE, MoSHPO (Signatories), and The Osage Nation, (Invited Signatories) agree to the implementation of this PA in accordance with the following stipulations will allow the USACE to meet its responsibilities under Section 106 of the NHPA for the Undertaking.

STIPULATIONS

I. SCOPE AND APPLICABILITY

- A.** This PA shall apply to all undertakings under the Indiana Bat Habitat Restoration project that have the potential to cause effects to historic properties, if any, and require Section 106 review after execution of this PA; and are not otherwise covered by a separate memorandum of agreement (hereinafter the “Project undertakings”).
- B.** The USACE will utilize this PA to fulfill its Section 106 responsibilities and those of any potential Project partner agencies, who have designated the USACE as the lead federal agency pursuant to 36 CFR § 800.2(a)(2) for Project undertakings. Project partner agencies, as applicable, may decide and notify the USACE for a specific Project undertaking that they will perform their own Section 106 compliance and the USACE will not be the lead federal agency for the Project undertaking. When the USACE is not designated as the lead federal agency and no other agency is designated lead federal agency, all federal agencies, including the USACE, remain individually responsible for their compliance with Section 106, but this PA will apply to USACE Project undertakings. This provision does not prevent the USACE from recognizing another federal agency as lead federal agency for specific Project undertakings, as appropriate. If USACE recognizes

another federal agency as lead federal agency for a specific Project undertaking that would otherwise be subject to this PA, this PA shall not apply.

- C. All Project undertakings to which this PA is applicable shall be reviewed in accordance with the stipulations in this PA. The USACE, after consulting with MoSHPO and Consulting Tribes, may combine some or all of the steps during consultation in accordance with 36 CFR § 800.3(g).
- D. Consultation among MoSHPO and Consulting Tribes (collectively, “Consulting Parties”) when appropriate to this PA shall continue throughout the implementation of individual Project undertakings subject to this PA. The USACE shall identify and consult with the Consulting Parties for each Project undertaking consisting of:
 - 1. The MoSHPO, who represents the preservation interests of the State; and,
 - 2. The Consulting Tribes that attach religious or cultural significance to historic properties within the Area of Potential Effects, per consultation with Consulting Tribes, that may be affected by the individual Project undertaking, as determined through consultation with the Consulting Tribes; and,
- E. The USACE acknowledges that contacts may change over time. Contact information for the Consulting Parties is provided in Attachment C. The Consulting Parties agree to provide updated information in accordance with Stipulation V.A.
- F. The USACE acknowledges that Tribal Nations’ areas of interest may change over time. If there is a change in areas of interest, the Consulting Tribes agree to provide the updated information to the USACE.
- G. The USACE shall seek ways to identify and preserve historic properties, and to avoid, minimize, or mitigate any adverse effects on historic properties. The USACE shall also endeavor to protect burials, cemeteries, or sites likely to contain human remains/artifacts and objects associated with interments or religious activities, and provide this information and/or reports to the Consulting Parties through the implementation of historic property surveys, and the treatment of historic properties.
- H. For each Project undertaking, the USACE shall achieve compliance with all relevant terms of this PA prior to initiating physical construction of the Project undertaking.

II. PERFORMANCE STANDARDS AND PROFESSIONAL QUALIFICATIONS STANDARDS

- A. Pursuant to 36 CFR § 800.2(a), the Agency Official is the St. Louis District Commander with approval authority for a specific Project undertaking, who can commit the agency to take appropriate action for the Project undertaking to comply with Section 106 under this PA. The Agency Official may delegate authority to other USACE personnel who shall act on their behalf.
- B. The USACE shall ensure all technical work, as defined in Attachment B, required under this PA is carried out in accordance with the professional standards and guidelines outlined in the Secretary of the Interior’s (SOI) *Standards for Archaeology and Historic Preservation* (48 FR 44716) and the SOI’s *Standards for the Treatment of Historic Properties* (36 CFR Part 68), as applicable (individually

or collectively, SOI Standards). The USACE will also consider other appropriate and applicable state laws, guidelines, or best practices for historic preservation activities within which state work is required.

1. Documentation in support of the USACE historic property eligibility determinations and findings of effect shall meet the documentation requirements specified in 36 CFR § 800.11 and the SOI Standards. The most recent version of MoSHPO's *Guidelines for Phase I Surveys and Reports* shall also be followed.
- C. The USACE shall ensure that technical work conducted pursuant to this PA is carried out by or under the supervision of persons meeting qualifications set forth in the SOI's *Professional Qualification Standards*, as amended, for the pertinent discipline (see 48 F.R. 44738-44739) or the United States Office of Personnel Management (OPM) qualifications for cultural resources professionals such as Archaeologist GS-0193 series, Anthropologist GS-0190 series, or Historian GS-0170 series.
- D. The USACE shall maintain professional qualified staff meeting SOI *Professional Qualification Standards*, OPM qualifications for cultural resources professionals, and/or Section 112 of the NHPA (hereafter referred to as "qualified staff").
 1. The USACE qualified staff assigned to review USACE Project undertakings pursuant to this PA shall be a GS-9 or higher and meet the SOI *Professional Qualification Standards* or the OPM qualifications for cultural resources professionals such as Archaeologist GS-0193 series, Anthropologist GS-0190 series, or Historian GS-0170 series.
 2. Qualified staff at or below the GS-7 level are considered to be performing duties in a developmental or technician capacity.
 3. USACE qualified staff at GS-9 or higher shall oversee and review any work conducted by GS-7 or lower graded staff when the USACE implements any portion of the PA.

III. PROJECT UNDERTAKING REVIEW PROCESS

A. USACE INTERNAL REVIEW PROCESS

1. At the earliest stages of developing a Project undertaking, the USACE shall assign a qualified staff member to ensure cultural resources and historic properties are identified and considered in the USACE planning process.
2. In general, the area of interest for the Indiana Bat Habitat Project includes lands within the eight compartments of Mark Twain Lake in Monroe and Ralls counties, Missouri (Attachment A).
3. The USACE shall further refine the general area of interest for a specific project, defining the Project undertaking subject to Section 106 review under this PA, defining and documenting an Area of Potential Effects, carrying out initial efforts to identify historic properties as stated under Stipulation III.A.4, and initiating an assessment of the Project undertaking's potential effects to historic properties.
4. Initial background research has been completed by reviewing Mark Twain Lake's files of known cultural resources within each compartment. Before the selection of a Recommended Plan for a specific Project undertaking, the

USACE shall further complete background research of each compartment to include reviewing available investigations and consulting with the MoSHPO's historic inventory database for previously identified historic, architectural, and archaeological properties and previous survey reports, and with Consulting Tribes for significant tribal resources, per 36 CFR § 800.4(a)(4).

5. At any given time during the development of the specific Project undertaking, the USACE may seek input from the Consulting Parties as appropriate.

B. DEFINE AND DOCUMENT THE AREA OF POTENTIAL EFFECTS

1. In consultation with Consulting Parties, the USACE shall identify and document the Area of Potential Effects (APE) appropriate to the scope and scale of the specific Project undertaking as identified through Stipulation III.A and include the following:
 - i. The vertical and horizontal extents (i.e., height and depth), if available, of all construction activities required to complete the Project undertaking, including but not limited to staging areas, haul roads, skid roads, and a reasonable buffer informed by consultation.
 - ii. Areas outside of the construction areas of the Project undertaking where the Project undertaking's potential direct, indirect, or cumulative effects to historic properties may be reasonably anticipated.
2. The USACE is responsible for defining and documenting a final APE. If, following consultation with Consulting Parties, there is a substantive change to scope and scale of the Project undertaking, the USACE will notify Consulting Parties and the process under Stipulation III.B.1 will be reinitiated.

C. HISTORIC PROPERTY IDENTIFICATION

1. The USACE shall complete and document historic property identification efforts and issue formal NRHP-eligibility determinations for all properties within the APE for the proposed Project undertaking as follows.
2. The USACE shall complete a literature search of the APE.
 - i. In addition to the information outlined in Stipulation III.A.4, the literature search shall include historic contexts, and other pertinent documents for information on previously developed historic contexts, recorded historic properties, and previously surveyed areas.
 - ii. The USACE shall use the literature search to determine adequacy of existing documentation and to inform the scope of any additional research or surveys, including the need for additional historic context development and/or reevaluation of any previously identified historic properties or properties previously determined to be eligible for listing on the NRHP.
3. In accordance with appropriate state survey guidelines, implementation of historic property surveys and testing, the USACE shall record all properties meeting minimum criteria for recordation, such as buildings, structures, shipwrecks, objects, linear resources, landscapes, districts, Traditional Cultural Properties/Places, and archaeological/historical and burial sites. Recordation of structures, buildings, aquatic resources such as shipwrecks, objects, districts, and sites shall be prepared using MoSHPO recordation forms, as appropriate.

4. The results of identification efforts, including any supporting documentation, shall be prepared in accordance with Stipulation II (Performance Standards and Qualifications).
5. The USACE shall make one of the following findings as a result of its historic property identification efforts:
 - i. “No Historic Properties Affected.” If the USACE finds through the identification efforts mentioned in Stipulation III.C.2-3 that either there are no historic properties identified within the APE or there are historic properties within the APE and the Project undertaking will have no effect upon them as defined in 36 CFR § 800.16(i) then the USACE shall make a “No Historic Properties Affected” finding and provide this finding, along with supporting documentation, in accordance with 36 CFR § 800.11(d), to the Applicable Consulting Parties for review and comment.
 - (1) For Project undertakings with a finding of “No Historic Properties Affected” the USACE shall provide the Applicable Consulting Parties information including the following:
 - (a) A full description of the Project undertaking, to include depth and amount of ground disturbance, as well as above-ground effects, anticipated;
 - (b) A professional map of the APE that includes a legend, north arrow, scales, and labels, and narrative description of the APE for the Project undertaking;
 - (c) A description of the steps taken, and justification for the level of effort, to identify historic properties within the APE;
 - (d) Results of historic property identification efforts completed by the USACE, including an appropriate level of documentation, to include reports, forms, evaluations, eligibility determinations, or other documents supporting NRHP eligibility determinations;
 - (e) Any photos, additional maps, images, or plans, as appropriate; and
 - (f) A stated finding of “No Historic Properties Affected” for the Project undertaking and request for comment on said finding from the MoSHPO and Consulting Tribes.
 - (2) The Consulting Tribes are under no obligation to provide comments on the finding. However, if they wish the USACE to consider their comments regarding the “No Historic Properties Affected” finding, they shall submit comments in writing within forty-five (45) calendar days of receipt of the fully documented finding, unless a request for extension was submitted. This timeline is in effect for this agreement document only, and it should not be assumed subsequent agreement documents will have a comment period outside of what is outlined in 36 CFR 800.5(c). The USACE will contact Consulting Tribes seven (7) calendar days before the end of the forty-five (45) calendar day comment period if they have not submitted comments, as long as this does

not become too burdensome on USACE. If contacting Consulting Tribes seven (7) calendar days before the end of the comment period becomes too burdensome, the USACE will consult with Consulting Tribes to amend the PA. USACE agreeing to contact Consulting Tribes seven (7) calendar days before the end of the comment period is in effect for this agreement document only, and it should not be assumed subsequent agreement documents will have this stipulation. If the Consulting Tribes fail to respond within forty-five (45) calendar days of receipt of a request for review of finding or determination, the USACE will either proceed to the next step in the process based on the finding or determination or consult with the Council in lieu of the Consulting Tribes. If Consulting Tribes re-enter the section 106 process, the USACE shall continue the consultation and may choose to reconsider previous findings or determinations in light of any objections or concerns expressed, without being required to reverse decisions made based on those previous findings or determinations, but while having full latitude to do so, pursuant to 36 CFR 800.3(c)(4). The USACE shall take any comments received from the Consulting Tribes into consideration before concluding the consultation and will notify the Consulting Parties of these concerns and the USACE response to them. Any objection to the finding received will be addressed in accordance with Stipulation III.C.6.4 below.

- (3) The MoSHPO shall provide a response to a USACE finding within thirty (30) calendar days of receipt of a fully documented “No Historic Properties Affected” finding. If no comments or requests for an extension are received from the MoSHPO within the 30-day review period, the USACE will assume the MoSHPO has waived their opportunity to comment and has concurred with the finding.
- (4) If a Consulting Party objects to the finding of “No Historic Properties Affected,” to include a request for a cultural resource survey if it had not been completed before the “No Historic Properties Affected” determination had been made, within the forty-five (45) calendar day review period, the USACE shall consult with the objecting party, and include other Consulting Parties as appropriate, for no more than a total of thirty (30) calendar days, unless another time period is agreed to among Consulting Parties, upon receipt of the notification of objection to attempt to resolve concerns as identified by the objecting party.
 - (a) The USACE may revise its finding of “No Historic Properties Affected,” to include requiring a cultural resources survey. If the USACE revises its finding to “No Adverse Effect” for the specific Project undertaking, then the USACE shall continue consultation pursuant to Stipulation III.D.

- (b) If at the end of the thirty (30) calendar days, the objecting party(ies) concurs with the finding of “No Historic Properties Affected”, the USACE shall document this concurrence, and USACE has no further obligations for the specific Project undertaking under this Stipulation.
- (c) If at the end of the thirty (30) calendar days, or agreed to specified time, the party(ies) objects to the finding of “No Historic Properties Affected” and the USACE has not altered its effects determination, the USACE shall notify the ACHP in accordance with Stipulation X.
- (5) If a Consulting Party(ies) disagrees regarding NRHP eligibility of a property identified within the APE for a Project undertaking, the USACE shall notify all Consulting Parties. The USACE shall consult with the Consulting Party(ies) for no more than thirty (30) calendar days upon receipt of the notification to resolve the disagreement. The USACE shall provide copies of the notification to other Consulting Parties within five (5) days of receipt. Upon request and at its discretion, the USACE may extend the consultation period to resolve the disagreement.
 - (a) If the dispute cannot be resolved, or if the ACHP or Secretary of the Interior so requests, the USACE shall obtain a determination of eligibility from the Keeper of the NRHP. The Keeper’s determination will be final in accordance with 36 CFR § 63.4.
- (6) If the USACE does not carry out the Project undertaking as documented in the “No Historic Properties Affected” finding, then the USACE shall continue consultation in accordance with Stipulation III.C.
- ii. If the USACE finds that there are historic properties identified within the APE which may be affected by the Project undertaking, then the USACE shall proceed to Stipulation III.D.

D. ASSESSMENT OF POTENTIAL ADVERSE EFFECTS TO HISTORIC PROPERTIES

- 1. Avoidance of adverse effects to historic properties is the preferred treatment approach. The USACE shall consider redesign of components of the Project undertakings to avoid potential adverse effects to historic properties. However, there may be instances where it is not feasible for the USACE to redesign Project undertakings to avoid adverse effects to historic properties.
- 2. The USACE shall assess potential adverse effects caused by the proposed Project undertaking on all identified historic properties within the APE. This assessment shall include consideration of all direct, indirect, and cumulative effects caused by the Project undertaking, and shall use the criteria of adverse effects (36 CFR § 800.5(a)(1)). The USACE shall make one of the following determinations:
 - i. “No Adverse Effect to Historic Properties.” If the USACE determines that historic properties present in the APE will be affected by the Project undertaking but the characteristics of the historic properties that qualify the properties for inclusion are not diminished or altered, then

- the USACE shall make a “No Adverse Effect to Historic Properties” finding and provide this finding, along with supporting documentation, in accordance with 36 CFR § 800.11(e), to the Consulting Parties for review and comment in accordance with Stipulation III.D.3.
- ii. “Adverse Effect to Historic Properties.” If the USACE determines that historic properties present in the APE will be affected by the Project undertaking and the characteristics of the historic properties that qualify them for inclusion will be diminished or altered, then the USACE shall make an “Adverse Effect to Historic Properties” finding and provide this finding, along with supporting documentation, in accordance with 36 CFR § 800.11(e), to the Consulting Parties for review and comment in accordance with Stipulation III.D.4.
3. No Adverse Effect to Historic Properties
- i. For Project undertakings with a finding of “No Adverse Effect to Historic Properties” the USACE shall provide the Applicable Consulting Parties with the following:
 - (1) A full description of the Project undertaking, to include depth and amount of ground disturbance, as well as above-ground effects, anticipated;
 - (2) A professional map of the APE that includes a legend, north arrow, scales, and labels, and narrative description of the APE for the Project undertaking;
 - (3) A description of the steps taken, and justification for the level of effort, to identify historic properties within the APE;
 - (4) Results of historic property identification efforts completed by the USACE, including an appropriate level of documentation to include reports, forms, evaluations, eligibility determinations, or other documents supporting NRHP eligibility determinations;
 - (5) A description of the affected historic properties including information on the characteristics that qualify them for the NRHP;
 - (6) A description of the Project undertaking’s potential effects on the identified historic properties and explanation of why the criteria of adverse effect were found applicable or inapplicable;
 - (7) Any photos, additional maps, images, or plans, as appropriate; and
 - (8) A stated finding of “No Adverse Effect to Historic Properties” for the Project undertaking and request for comment for said finding from the Consulting Parties.
 - ii. The Consulting Tribes are under no obligation to provide comments on the finding of “No Adverse Effect to Historic Properties.” However, if they wish the USACE to consider their comments regarding the finding of effect, the DEQ or Consulting Tribes shall submit comments in writing within forty-five (45) calendar days of receipt. This timeline is in effect for this agreement document only, and it should not be assumed subsequent agreement documents will have a comment period outside of what is outlined in 36 CFR 800.5(c). The USACE will contact Consulting Tribes seven (7) calendar days before the end of the

forty-five (45) calendar day comment period if they have not submitted comments, as long as this does not become too burdensome on USACE. If contacting Consulting Tribes seven (7) calendar days before the end of the comment period becomes too burdensome, the USACE will consult with Consulting Tribes to amend the PA. USACE agreeing to contact Consulting Tribes seven (7) calendar days before the end of the comment period is in effect for this agreement document only, and it should not be assumed subsequent agreement documents will have this stipulation. If the Consulting Tribes fail to respond within forty-five (45) calendar days of receipt of a request for review of finding or determination, the USACE will either proceed to the next step in the process based on the finding or determination or consult with the Council in lieu of the Consulting Tribes. If Consulting Tribes re-enter the section 106 process, the USACE shall continue the consultation and may choose to reconsider previous findings or determinations in light of any objections or concerns expressed, without being required to reverse decisions made based on those previous findings or determinations, but while having full latitude to do so, pursuant to 36 CFR 800.3(c)(4). The USACE shall take any comments received into consideration before concluding the consultation and will notify the Consulting Parties of these concerns and the USACE response to them. Objections shall be addressed in accordance with Stipulation III.D.3.v. below.

- iii. The MoSHPO shall provide a response to a USACE finding within thirty (30) calendar days of fully documented “No Adverse Effect to Historic Properties” finding. If no comments or a request for an extension are received within the 30-day review period, the USACE will assume MoSHPO has waived their ability to comment and has concurred.
- iv. If the MoSHPO concurs with the “No Adverse Effect to Historic Properties” finding for a specific Project undertaking, the USACE shall first determine if any Consulting Party has objected to the finding, and if there are no objections, the USACE has no further obligations under this Stipulation.
- v. If a Consulting Party(ies) objects to the finding of “No Adverse Effect to Historic Properties,” the USACE shall consult with the objecting Consulting Party(ies), and include other Consulting Parties as appropriate, for no more than a total of thirty (30) calendar days, upon receipt of the notification of non-concurrence to attempt to resolve concerns as identified by the objecting Consulting Party.
 - (1) The USACE may revise its finding of “No Adverse Effect to Historic Properties.” If the USACE revises its finding to “No Historic Properties Affected,” then the USACE shall continue consultation pursuant to Stipulation III.C.5.i. If the USACE revises its finding to “Adverse Effect,” then the USACE shall continue consultation pursuant to Stipulation III.D.4.

- (2) If at the end of the thirty (30) calendar days, the objecting Consulting Party concurs with the finding of “No Adverse Effect to Historic Properties,” the USACE shall document this concurrence, and the USACE has no further obligations under this Stipulation for the specific Project undertaking.
 - (3) If at the end of the thirty (30) calendar days, the objecting Consulting Party(ies) still objects to the finding of “No Adverse Effect to Historic Properties”, and the USACE has not altered its effects determination, the USACE shall notify the ACHP in accordance with Stipulation X.
 - vi. If the USACE does not carry out the Project undertaking as documented in the “No Adverse Effect” finding, then the USACE shall continue consultation in accordance with Stipulation III.C.
 - 4. Adverse Effect to Historic Properties
 - i. For a specific Project undertaking with a finding of “Adverse Effect to Historic Properties,” the USACE shall provide the Consulting Parties with the following:
 - (1) A full description of the Project undertaking, to include depth and amount of ground disturbance, as well as above-ground effects, anticipated;
 - (2) A professional map of the APE that includes a legend, north arrow, scales, and labels, and narrative description of the Project undertaking;
 - (3) A description of the steps taken, and justification for the level of effort, to identify historic properties within the APE;
 - (4) Results of historic property identification efforts completed by the USACE, including an appropriate level to include reports, forms, evaluations, eligibility determinations, or other documents of documentation supporting NRHP eligibility determinations;
 - (5) A description of the affected historic properties including information on the characteristics that qualify them for the NRHP;
 - (6) A description of the Project undertaking’s potential effects on the historic properties and an explanation of why the criteria of adverse effect were found applicable or inapplicable;
 - (7) Any photos, additional maps, images, or plans, as appropriate;
 - (8) A stated finding of “Adverse Effect to Historic Properties” and request for comment for said finding from the Consulting Parties.
 - ii. The USACE shall consult with the Consulting Parties to resolve the “Adverse Effect to Historic Properties” pursuant to Stipulation III.E.
- E. RESOLUTION OF ADVERSE EFFECTS**
- 1. The USACE shall notify Consulting Tribes, ACHP, and the public, upon receiving MoSHPO concurrence on a finding of “Adverse Effect to Historic Properties” for a Project undertaking.
 - i. Consulting Parties are under no obligation to provide comments on the finding of adverse effect. However, if they wish the USACE to consider their comments regarding the finding of adverse effect, Applicable

Consulting Parties shall submit comments in writing within thirty (30) calendar days of receipt. The USACE shall take any comments received into consideration before concluding the consultation and will notify the Consulting Parties of any concerns and the USACE response to those concerns.

2. The USACE shall consult with the Consulting Parties to determine appropriate avoidance, minimization and/or mitigation measures to resolve the adverse effect. The USACE shall offer to facilitate a consultation meeting, to include Consulting Parties, within thirty (30) calendar days after notification of an adverse effect finding, to discuss Project undertaking alternatives to avoid, minimize, or mitigate the adverse effects, and may schedule additional meetings at its discretion.
3. If through consultation with Consulting Parties, the USACE modifies the Project undertaking to avoid adverse effects to historic properties within the APE, the USACE shall document the alternatives utilized to eliminate the potential adverse effects of the proposed Project undertaking resulting in a revised finding of “No Adverse Effect to Historic Properties,” which must receive concurrence from the Consulting Parties pursuant to Stipulation III.D.3. Once concurrence is achieved, the USACE has no further obligations under this Stipulation for the specific Project undertaking.
4. If through consultation with the Consulting Parties, the USACE reaches agreement to appropriately resolve the adverse effects through minimization and/or mitigation measures then the measures agreed to by the USACE and the Consulting Parties shall be specified in a Memorandum of Agreement (MOA) developed and executed for the Project undertaking in accordance with 36 CFR § 800.6(b)(1) and 800.6(c) and filed with the ACHP upon execution.
 - i. If any agreed-upon minimization and/or mitigation measure included in the final MOA involves archaeological data recovery or historic property documentation, then ground-disturbing activities or activities resulting in adverse effects to historic properties associated with the Project undertaking may not begin until after the adequate completion of the fieldwork for the data recovery or historic property documentation and the USACE has provided written notification in this regard.
5. If through consultation with the Applicable Consulting Parties, the USACE cannot reach agreement to appropriately resolve adverse effects through minimization and/or mitigation measures, the USACE will notify the ACHP and seek a formal resolution in accordance with 36 CFR § 800.6(b)(2). The ACHP may participate in the resolution of adverse effects for individual Project undertakings by written request from USACE or a Consulting Party.

IV. SUBSEQUENT AGREEMENTS

Memoranda of Agreements developed to resolve adverse effects for specific Project undertakings shall be negotiated between the USACE, Consulting Parties, and ACHP, pursuant to 36 CFR § 800.6(c), and shall be independent of this PA.

V. REVIEW AND MONITORING OF PA IMPLEMENTATION

- A.** The purpose of the PA review and monitoring is to ensure the USACE identification and protection of historic properties in carrying out Project undertakings. This is accomplished through the review of Project undertakings that were completed during a reporting period and review of implementation of the PA. Electronic mail (email) will serve as the official correspondence method for all communications regarding this PA and its provisions. See Attachment C for a list of contacts and email addresses. Attachment C may be updated as needed without an amendment to this PA. It is the responsibility of each Consulting Party to inform the USACE of any change in name, email address, or phone number of any point-of-contact listed in this PA. Following any updates to Attachment C, the USACE shall provide this information to all Consulting Parties. In order to foster cooperative relations as the terms of this PA are carried out, the USACE shall:
 - 1.** Beginning on the one-year anniversary of the execution of this PA, and on an annual basis thereafter, compile and distribute a letter report to Consulting Parties on the implementation of the terms of this PA.

VI. CURATION

- A.** All records and materials resulting from the actions required by this PA shall be curated to the extent provided by law in accordance with 36 CFR Part 79, Curation of Federally Owned or Administered Archaeological Collections, except those materials identified as Native American human remains and items associated with Native American human remains and items associated with Native American burials which would be subject to Stipulation IX.
- B.** Subject to Stipulation VI and consistent with the USACE's property interest, the USACE or its contractors, in accordance with 36 CFR Part 79, will maintain all archaeological items and material collected until any specified analyses and reviews are complete.

VII. CONFIDENTIALITY

- A.** The USACE shall seek and consider the views of the public in a manner that reflects the nature of the Project undertakings and their effects on historic properties following procedures pursuant to 36 CFR § 800.2(d) and in a manner that observes confidentiality requirements pursuant to Section 304 of the NHPA (54 U.S.C. 307103) and Section 552(b) of the Freedom of Information Act (5 U.S.C. 552) and applicable state laws.
- B.** The nature and location of archaeological sites and any other cultural resources discussed in this PA shall be considered confidential as provided for in 36 CFR § 800.11(c). The USACE shall use best efforts to protect sensitive information from disclosure as requested by Consulting Parties to the extent permitted by federal and applicable state laws identified in VII.A above.

VIII. POST-REVIEW DISCOVERIES

- A.** The USACE shall ensure that previously unidentified historic properties, or unanticipated effects to previously identified historic properties, discovered during the construction activities for Project undertakings are subject to the requirements of 36 CFR § 800.13. If previously unidentified historic properties or unanticipated adverse effects to known historic properties were to occur during construction activities USACE shall implement the provisions outlined below that are intended to ensure that Project undertakings are in compliance with applicable federal and state laws and regulations. These provisions will be included in all construction, operations, and maintenance plans.
 - 1.** The contractor will be instructed to cease all ground-disturbing activities in the area of the historic property, as well as within a 100-foot radius around but within the project footprint, to avoid and/or minimize harm to the property.
 - 2.** The contractor will be instructed to notify the USACE immediately and no more than forty-eight (48) hours of the discovery and immediately implement interim measures, as appropriate, to protect the discovery from damage, looting, and vandalism, such as protective fencing and covering of the discovery with appropriate materials.
 - 3.** The USACE will inspect the work site to determine the extent of the discovery and ensure work activities have halted within the 100-foot radius.
 - 4.** The USACE will clearly mark the area of discovery and implement additional measures such as security and/or increase the buffer radius, as appropriate, to protect the discovery from theft and vandalism.
 - 5.** The USACE shall provide an initial assessment of the resource's condition and eligibility to the MoSHPO and Consulting Tribes, if applicable, of the discovery within seven (7) calendar days.
- B.** If USACE, after consultation with Consulting Parties, determines the discovery is not a historic property as it is either isolated, does not retain integrity sufficient for listing on the NRHP, or if the historic property will not be further disturbed by construction activities, construction may resume within the 100-foot radius.
- C.** If USACE determines that the discovery is a historic property that is, or may be, eligible for listing on the NRHP, the USACE shall consult with MoSHPO and Consulting Tribes, if applicable, regarding appropriate measures for site treatment pursuant to 36 CFR 800.6(a). The Consulting Parties have ten (10) business days to provide their comments on the proposed measures which may include:
 - 1.** Adjustment of buffer zones;
 - 2.** Formal evaluation of the historic property;
 - 3.** Exploration of potential alternatives to avoid the historic property;
 - 4.** If the historic property will be adversely affected by project activities, preparation and implementation of a mitigation plan by USACE to resolve adverse effects in consultation with Consulting Parties.
- D.** The notified Consulting Parties have ten (10) days following notification to provide comment regarding NRHP eligibility determination of the discovery.
- E.** USACE shall prepare a report of findings describing the background history leading to and immediately following the reporting and resolution of an unanticipated

discovery to Consulting Parties within thirty (30) days of the resolution for each unanticipated discovery.

- F. USACE shall communicate the procedures to be observed to its contractors and personnel.
- G. USACE shall provide a Notice to Proceed to the contractor to work in the area. Notices to Proceed may be issued by USACE for individual construction segments, defined by USACE in its construction specifications, after the identification and evaluation of historic properties and resolution of adverse effects has been completed.

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

- A. Under this PA, no investigative surveys or construction activities will be planned to knowingly disturb human remains, funerary objects, sacred objects, or objects of cultural patrimony. If any potential unmarked human burials or skeletal remains are encountered during construction activities, all ground disturbing activities will cease. Should any potential findings be made, field personnel will follow instructions provided by USACE for each project to initiate identification, evaluation, and consultation efforts as outlined below.
- B. All human remains, regardless of ancestry, will be treated with dignity and respect. The USACE will ensure the relevant protocols of the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 et seq), the Archaeological Resources Protection Act of 1979 (43 CFR 7), if applicable, and/or of the Missouri Unmarked Burial Law (MO Rev Stat § 194.406) are followed.
- C. If human remains, funerary objects, sacred objects, or objects of cultural patrimony encountered during field investigations, laboratory work, or during construction activities, USACE will ensure the following takes place:
 - 1. All work shall cease within 328 feet (100 meters) of the remains. Immediate steps will be taken by the contractor to secure the discovery, by flagging the area as an exclusion zone without making discovery locations too conspicuous when marking them. If human remains are identified or are suspected to be present, they will be respectfully covered up with a natural fiber cloth followed by a water impermeable sheet.
 - 2. State and/or local law enforcement will be immediately notified (within 24 hours).
 - 3. The contractor will notify the USACE immediately and no longer than twenty-four (24) hours of discovery (see points of contact in Appendix C).
 - 4. The USACE point of contact (POC) will notify the MoSHPO and Consulting Tribes (see Appendix C) of the discovery within twenty-four (24) hours.
 - 5. At no time shall human remains be allowed to be viewed or photographed by the public or project contractors, or excavated, collected, or removed

(except by County coroner and/or law enforcement) without approval from MoSHPO and USACE; and, in the event that human remains are determined to be Native American, in consultation with Consulting Tribes, USACE will request the coroner and/or law enforcement to destroy all photographs immediately following identification. No further research or analyses shall be performed on the remains, including if the remains are required to be removed by a physical anthropologist prior to eventual reburial.

6. Contractors, or their agents, representatives, and subcontractors, shall not contact or interact with members of the print, broadcast, digital, or other media or post, upload, or otherwise communicate via digital or social media matters or details concerning human graves or locations containing, or that are likely to contain, human graves and/or remains absent prior coordination and in consultation and concurrence with the MoSHPO and Consulting Tribes. Access to these areas by unapproved visitors and media will not be permitted.
7. Further steps and/or additional guidelines for the treatment of Native American human remains and associated grave materials will be established in consultation with Consulting Tribes. USACE will meet applicable requirements of the Native American Graves Protection and Repatriation Act, in accordance with 43 CFR Part 10, and all other federal, state, and local laws pertaining to burial sites and the handling of archaeological sites in the state of Missouri, the terms of this PA notwithstanding. It is the preference of the Consulting Tribes that burials remain in place and undisturbed. Neither Contractor nor USACE employees will conduct excavation, handling, or removal of any Native American human remains without consultation and concurrence from the Consulting Tribes.
8. Measures to protect the human remains and any associated artifact(s) will remain in effect until an appropriate treatment plan for the discovery has been completed for the remains and associated artifacts. The USACE will consider redesign of undertakings to avoid effects to human remains and any associated artifacts(s). The contractor will not resume work in the 328-foot (100 meter) vicinity of the find until the USACE has granted clearance to do so.

X. DISPUTE RESOLUTION

- A. Should a Consulting Party to this PA object in writing regarding implementation of this PA, the USACE shall consult with the objecting party for no more than thirty (30) calendar days. The USACE shall provide copies of the written objection to other Consulting Parties within five (5) business days of receipt of the written objection. Upon request, the USACE shall make every effort to extend the consultation period, subject to mission requirements.

1. The USACE shall take into account the reasons for the objection and evaluate the solutions suggested by the objecting party.
2. If, after the thirty (30)-calendar-day review period, the USACE determines that the objection cannot be resolved, the USACE shall forward all documentation relevant to the dispute, including the USACE proposed resolution, to the ACHP.
 - i. The ACHP shall provide the USACE with its advice on the resolution of the objection within thirty (30) calendar days of receiving adequate documentation. Prior to reaching a final decision on the dispute, the USACE shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP and other Consulting Parties. The USACE shall provide Consulting Parties with a copy of this written response. The USACE will then proceed according to its final decision.
 - ii. If the ACHP does not provide its advice regarding the dispute within the thirty (30) calendar-day time period, the USACE may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the USACE shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the Consulting Parties to the PA. The USACE shall provide Consulting Parties with a copy of this written response. The USACE will then proceed according to its final decision and notify Consulting Parties.
- B. The USACE responsibilities to carry out all other actions subject to the terms of this PA that are not the subject of the dispute remain unchanged.
- C. Should any member of the public raise a timely and substantive objection pertaining to the manner in which the terms of this PA are carried out, at any time during its implementation, the USACE shall take the objection into account by consulting with the objector. When the USACE responds to an objection, it shall notify the Applicable Consulting Parties of the objection and the manner in which it was resolved. The USACE may request the assistance of the Consulting Parties to resolve an objection.

XI. SEVERABILITY

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

XII. ANTI-DEFICIENCY PROVISION

- A. All parties to this PA acknowledge the USACE fiduciary responsibilities pursuant to the Anti-Deficiency Act (31 USC 1341). All obligations on the part of the USACE

under this PA shall be subject to the appropriations, allocation, and availability of sufficient funds available to the USACE for such purposes.

- B.** The legal responsibility of the USACE to comply with Section 106 of the NHPA is not affected by the availability of federal funding provided through appropriation.

XIII. AMENDMENTS

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

XIV. TERMINATION OR WITHDRAWAL

- A.** If the USACE or the ACHP determines that the terms of this PA will not or cannot be carried out, that party shall immediately consult with the other Signatories and Invited Signatories to attempt to develop an amendment per Stipulation XIII, above. If within ninety (90) calendar days (or another time period agreed to by all Signatories and Invited Signatories) an amendment cannot be reached, the USACE or the ACHP may terminate the PA upon written notification to the other Signatories and Invited Signatories.
 - 1.** Once the PA is terminated, the USACE must review all undertakings identified post termination in accordance with 36 CFR § 800.3 through 800.7 or an applicable alternative under 36 CFR § 800.14. The USACE will include this in a final annual report per Stipulation V.
- B.** MoSHPO may terminate this PA after providing the USACE written notice ninety (90) calendar days prior to termination.
 - 1.** The USACE shall consult with MoSHPO to identify any mutually acceptable measures that would avoid the party's termination.
 - 2.** If mutually acceptable measures are identified that would require amendment to the PA, the USACE shall follow the amendment process outlined in Stipulation XIII.
 - 3.** If within ninety (90) calendar days (or another time period agreed to by all Signatories and Invited Signatories) mutually acceptable measures are not identified or an amendment cannot be reached, and the MoSHPO terminates, the PA will no longer apply and the USACE will review all Project undertakings previously subject to this PA in accordance with Stipulation XIV.A.1.
- C.** Any Invited Signatory Tribe may withdraw as an Invited Signatory or terminate the PA after providing the USACE written notice ninety (90) calendar days prior to withdrawal or termination.
 - 1.** The USACE shall consult with the withdrawing or terminating Invited Signatory Tribe to identify any mutually acceptable measures that would avoid the party's withdrawal or termination.
 - 2.** If mutually acceptable measures are identified that would require amendment to the PA, the USACE shall follow the amendment process outlined in Stipulation XIII.

3. If within ninety (90) calendar days (or another time period agreed to by all Signatories and Invited Signatories) mutually acceptable measures are not identified or an amendment cannot be reached and an Invited Signatory Tribe withdraws, the USACE will continue to consult with the former Invited Signatory Tribe as a Consulting Tribe under the terms of this PA, and the PA will continue in full force and effect. If within ninety (90) calendar days (or another time period agreed to by all Signatories and Invited Signatories) mutually acceptable measures are not identified or an amendment cannot be reached and an Invited Signatory Tribe terminates the PA, USACE will review all Project undertakings previously subject to this PA in accordance with Stipulation XIV.A.1.

XV. DURATION

This PA shall remain in effect for ten (10) years, until October 2035, and can be extended through amendment in accordance with Stipulation XIII. Six (6) months prior to the ending of this PA, USACE shall host a meeting with Consulting Parties to discuss the extension of the PA.

XVI. IMPLEMENTATION

- A. This PA may be executed in counterparts, with a separate page for each signature.
- B. This PA shall become effective on the date of signature, whichever is latest, by the USACE, MoSHPO, or the ACHP.
- C. The USACE shall ensure each Consulting Party is provided with a complete copy of the final PA and that the final PA and any amendments are filed with the ACHP.

XVII. EXECUTION

Execution of this PA by the USACE, MoSHPO, ACHP, the Iowa Tribe of Kansas and Nebraska, The Osage Nation, and the Sac and Fox Tribe of the Mississippi in Iowa and implementation of its terms is evidence that the USACE has taken into account the effects of its undertaking on historic properties and has afforded the ACHP opportunity to comment pursuant to Section 106 of NHPA. Following the execution of this PA, the USACE will provide a copy to Signatories, Invited Signatories, and the ACHP for their files.

**PROGRAMMATIC AGREEMENT
AMONG
THE UNITED STATES ARMY CORPS OF ENGINEERS,
ST. LOUIS DISTRICT,
THE MISSOURI STATE HISTORIC PRESERVATION OFFICE,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION,
THE OSAGE NATION, THE IOWA TRIBE OF KANSAS AND NEBRASKA,
AND SAC AND FOX TRIBE OF THE MISSISSIPPI IN IOWA
REGARDING
INDIANA BAT HABITAT RESTORATION PROJECT,
MARK TWAIN LAKE, MONROE AND RALLS COUNTIES, MISSOURI**

SIGNATORY

UNITED STATE ARMY CORP OF ENGINEERS, ST. LOUIS DISTRICT

_____. **DATE:** _____.

Colonel Andy J. Pannier, St. Louis District Commander

**PROGRAMMATIC AGREEMENT
AMONG
THE UNITED STATES ARMY CORPS OF ENGINEERS,
ST. LOUIS DISTRICT,
THE MISSOURI STATE HISTORIC PRESERVATION OFFICER,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION,
THE OSAGE NATION, THE IOWA TRIBE OF KANSAS AND NEBRASKA,
AND SAC AND FOX TRIBE OF THE MISSISSIPPI IN IOWA
REGARDING
INDIANA BAT HABITAT RESTORATION PROJECT,
MARK TWAIN LAKE, MONROE AND RALLS COUNTIES, MISSOURI**

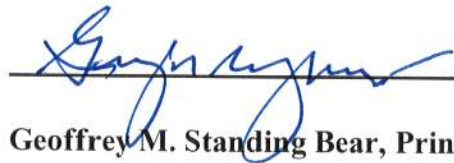
**SIGNATORY
MISSOURI STATE HISTORIC PRESERVATION OFFICER**

 . DATE: 2/25/26.

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

**PROGRAMMATIC AGREEMENT
AMONG
THE UNITED STATES ARMY CORPS OF ENGINEERS,
ST. LOUIS DISTRICT,
THE MISSOURI STATE HISTORIC PRESERVATION OFFICE,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION,
THE OSAGE NATION, THE IOWA TRIBE OF KANSAS AND NEBRASKA,
AND SAC AND FOX TRIBE OF THE MISSISSIPPI IN IOWA
REGARDING
INDIANA BAT HABITAT RESTORATION PROJECT,
MARK TWAIN LAKE, MONROE AND RALLS COUNTIES, MISSOURI**

**INVITED SIGNATORY
THE OSAGE NATION**

_____. DATE: 11-4-25.
Geoffrey M. Standing Bear, Principal Chief

**PROGRAMMATIC AGREEMENT
AMONG
THE UNITED STATES ARMY CORPS OF ENGINEERS,
ST. LOUIS DISTRICT,
THE MISSOURI STATE HISTORIC PRESERVATION OFFICE,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION,
THE OSAGE NATION, THE IOWA TRIBE OF KANSAS AND NEBRASKA,
AND SAC AND FOX TRIBE OF THE MISSISSIPPI IN IOWA
REGARDING
INDIANA BAT HABITAT RESTORATION PROJECT,
MARK TWAIN LAKE, MONROE AND RALLS COUNTIES, MISSOURI**

**CONCURRING PARTY
IOWA TRIBE OF KANSAS AND NEBRASKA**

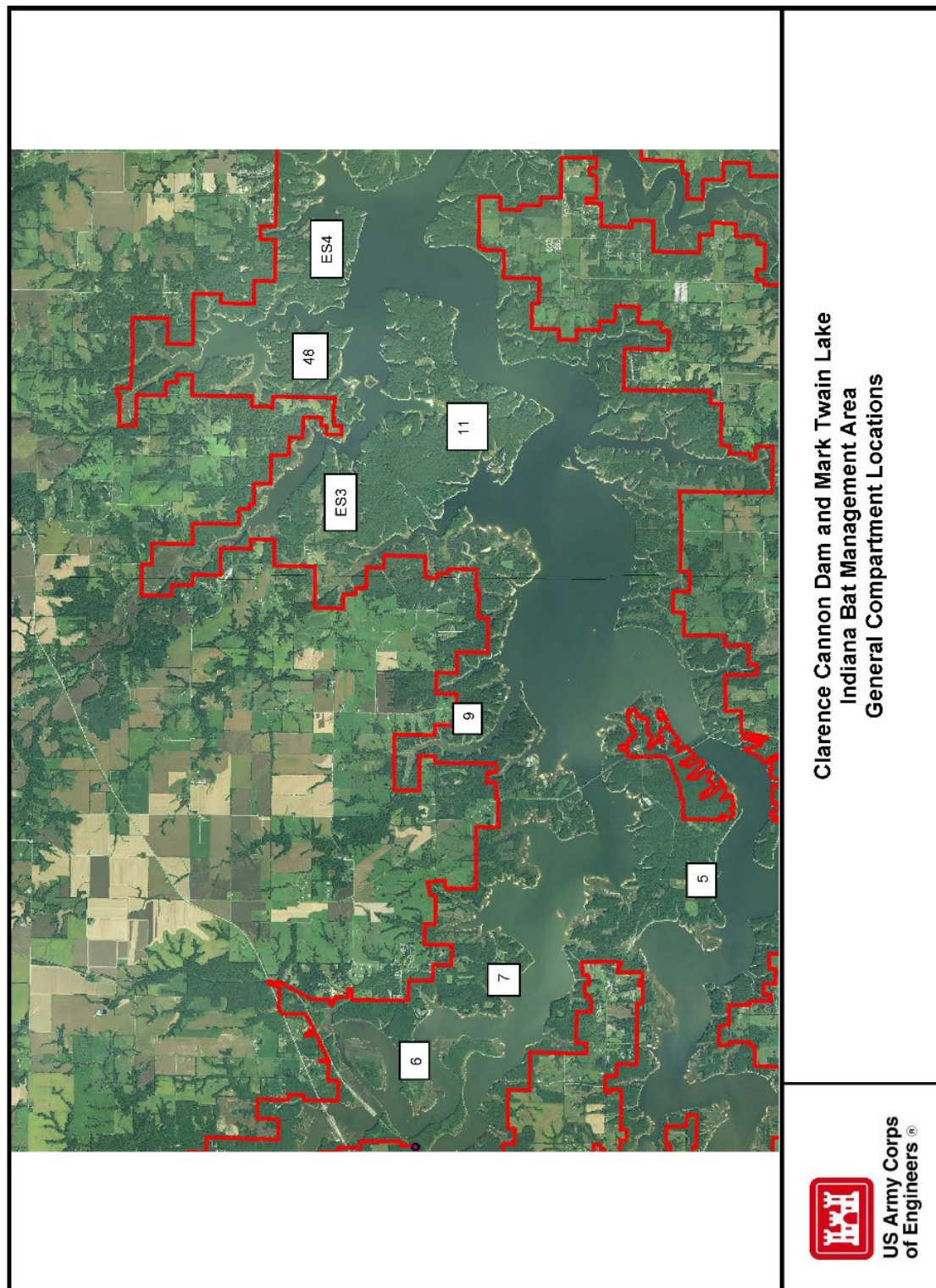
Alan Kelley . DATE: 9-27-2025
Alan Kelley, Tribal Historic Preservation Officer

**PROGRAMMATIC AGREEMENT
AMONG
THE UNITED STATES ARMY CORPS OF ENGINEERS,
ST. LOUIS DISTRICT,
THE MISSOURI STATE HISTORIC PRESERVATION OFFICE,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION,
THE OSAGE NATION, THE IOWA TRIBE OF KANSAS AND NEBRASKA,
AND SAC AND FOX TRIBE OF THE MISSISSIPPI IN IOWA
REGARDING
INDIANA BAT HABITAT RESTORATION PROJECT,
MARK TWAIN LAKE, MONROE AND RALLS COUNTIES, MISSOURI**

**CONCURRING PARTY
SAC AND FOX TRIBE OF THE MISSISSIPPI IN IOWA**

_____. DATE: _____.

**ATTACHMENT A – MARK TWAIN LAKE INDIANA BAT HABITAT RESTORATION
GENERAL PROJECT AREA OF INTEREST AND COMPARTMENTS**



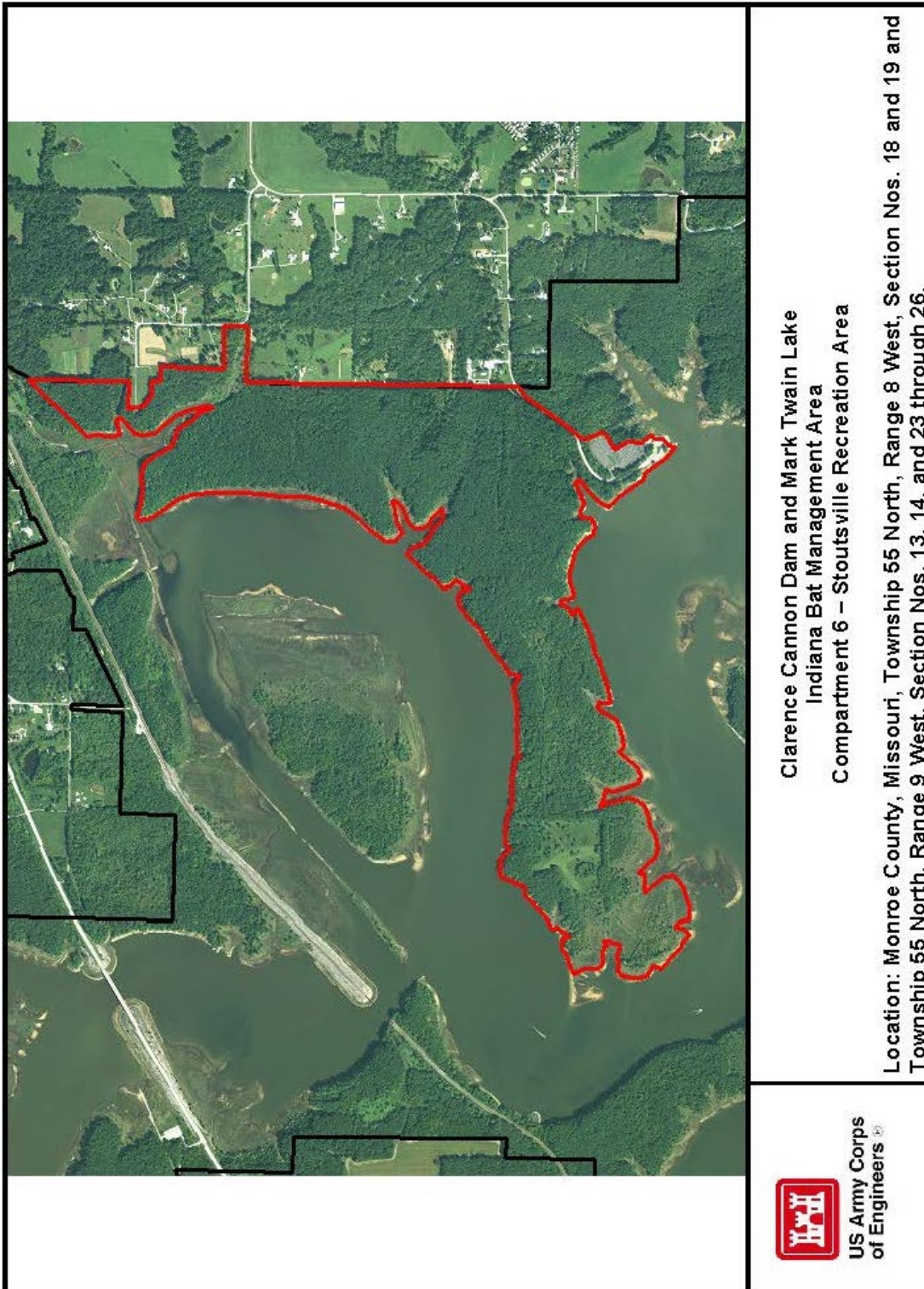


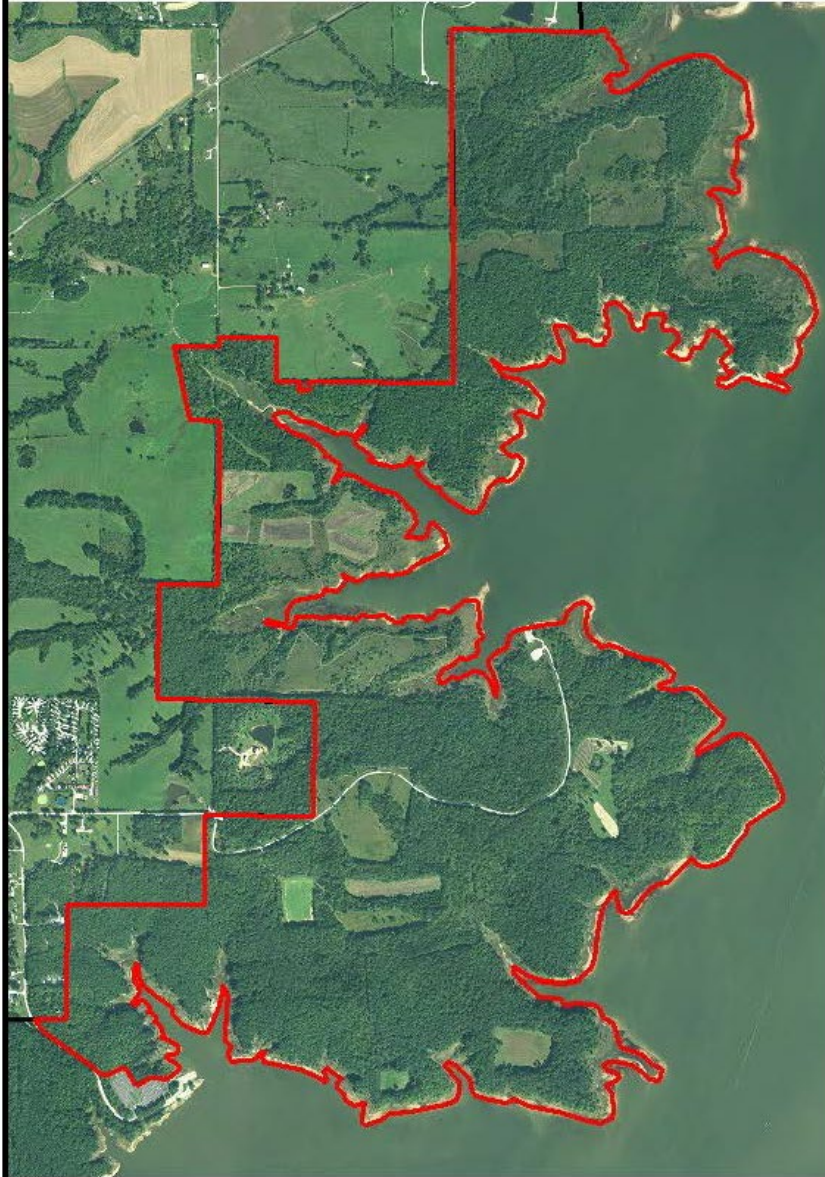
Clarence Cannon Dam and Mark Twain Lake
Indiana Bat Management Area
Compartment 5, Route U Area

Location: Monroe County, Missouri, Township 54 North, Range 8 West, Section Nos. 5, 6, 7, and 8.



US Army Corps
of Engineers

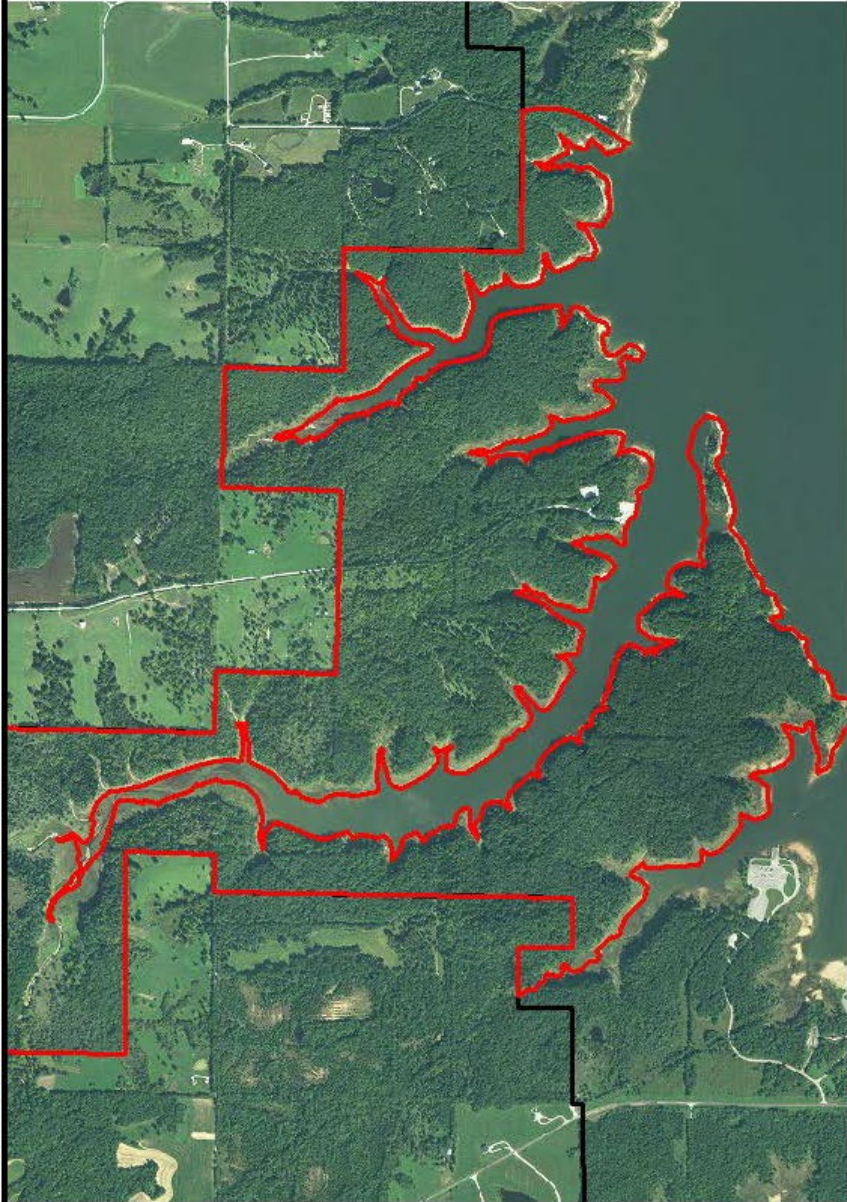




**Clarence Cannon Dam and Mark Twain Lake
Indiana Bat Management Area
Compartment 7 – North Fork Recreation Area**

Location: Monroe County, Missouri, Township 55 North, Range 8 West, Section Nos. 29, 30, 31 and 32; Township 55 North, Range 9 West, Section No. 25.



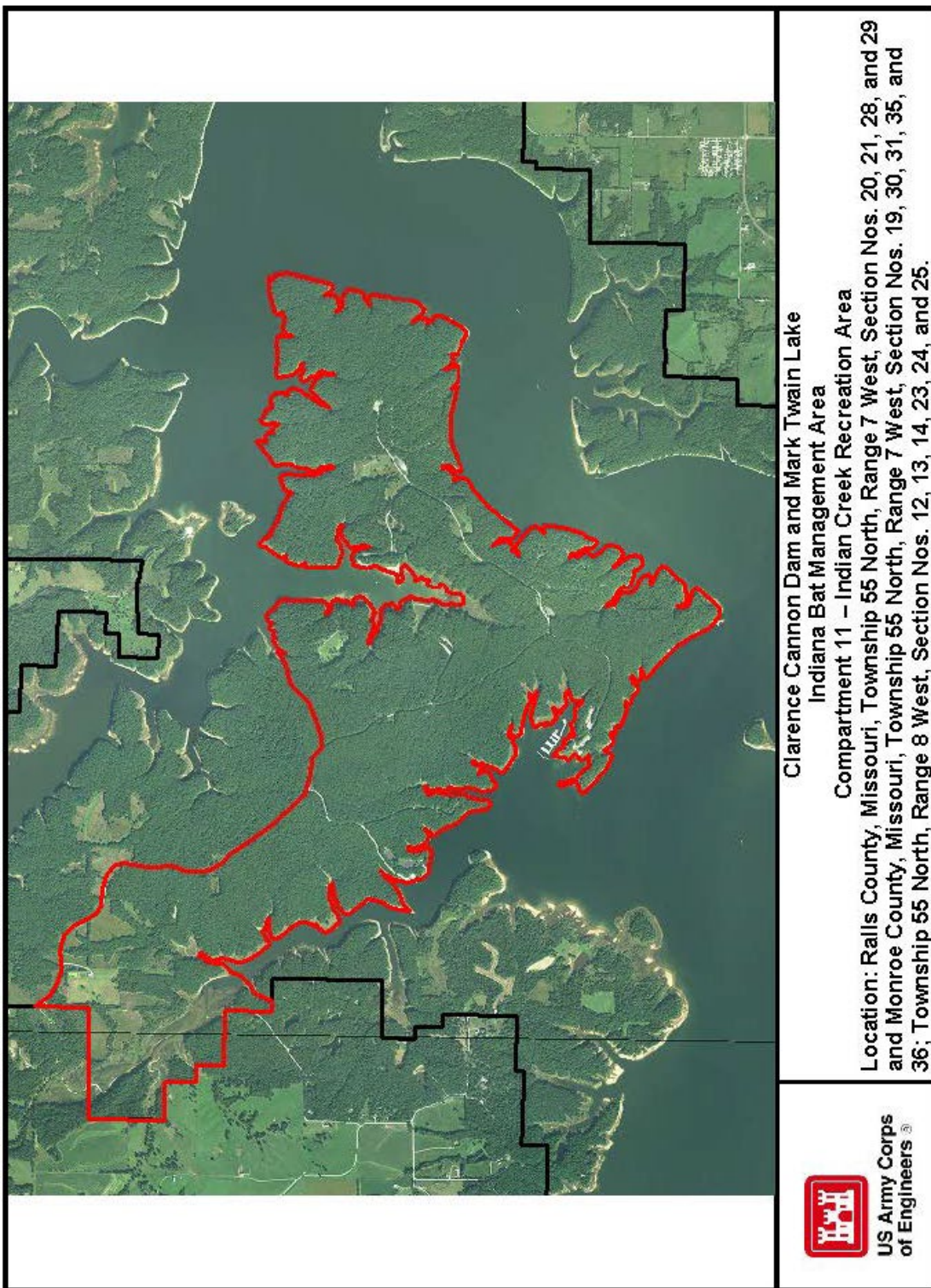


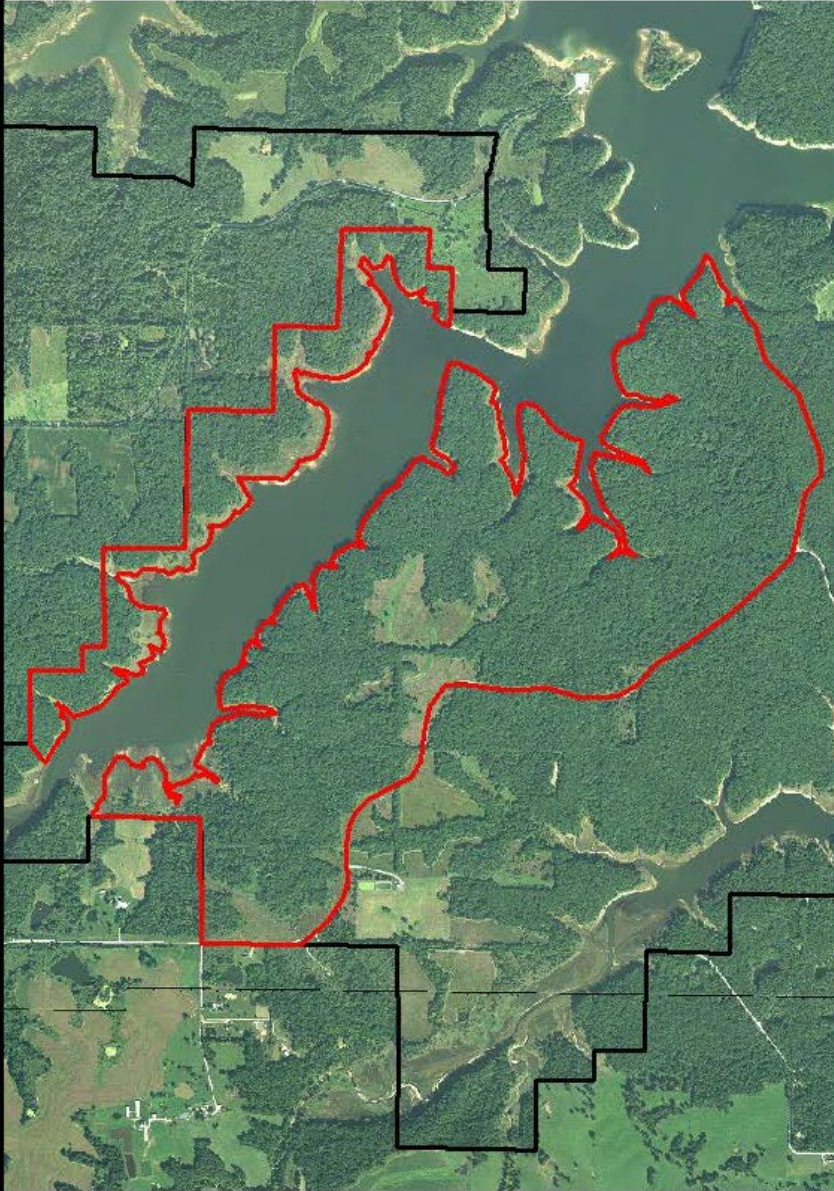
Clarence Cannon Dam and Mark Twain Lake
Indiana Bat Management Area
Compartment 9 – Shell Branch Area

Location: Monroe County, Missouri, Township 55 North, Range 8 West, Section Nos. 21, 22, 26, 27, 28, 33, and 35.



US Army Corps
of Engineers ®

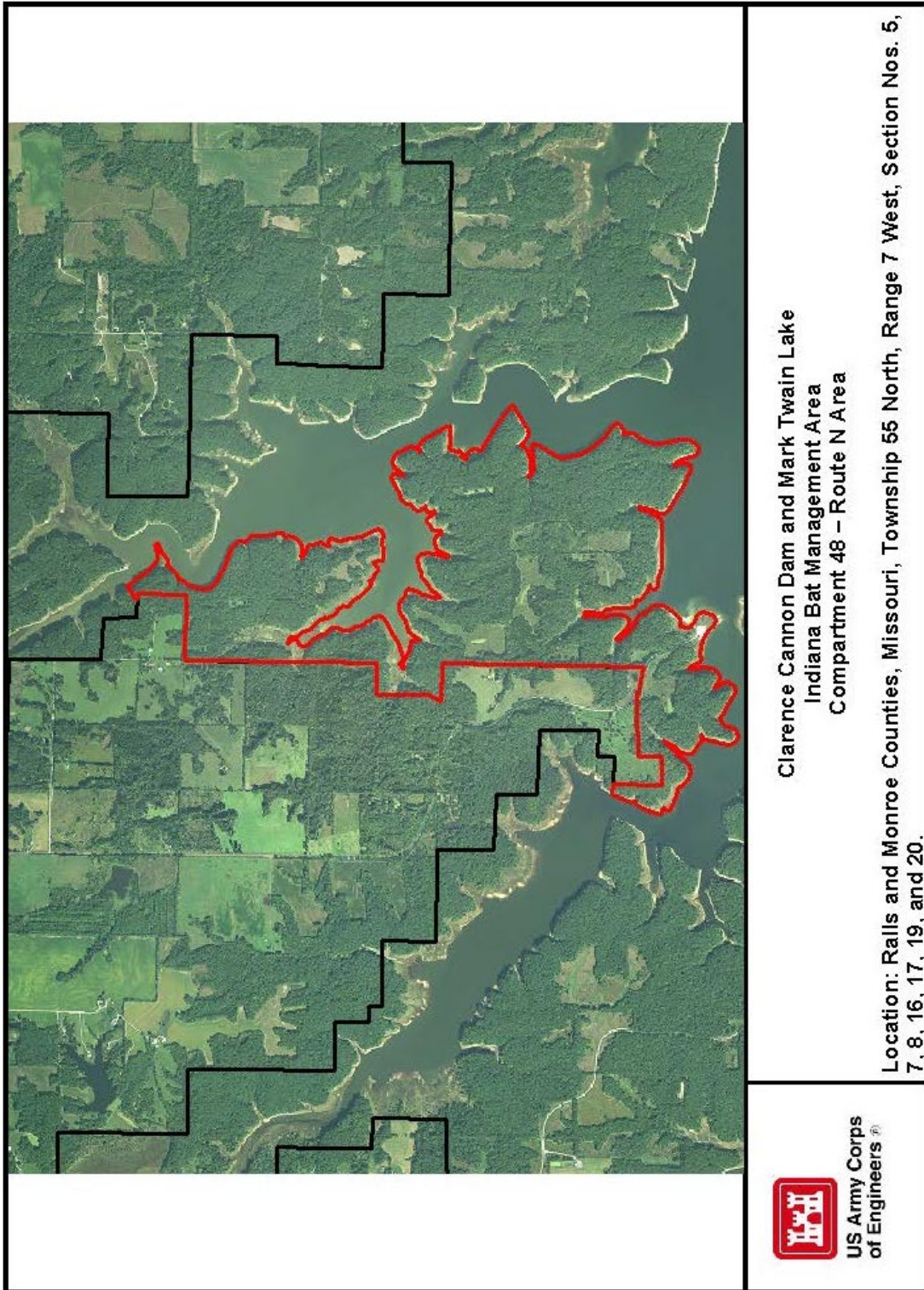


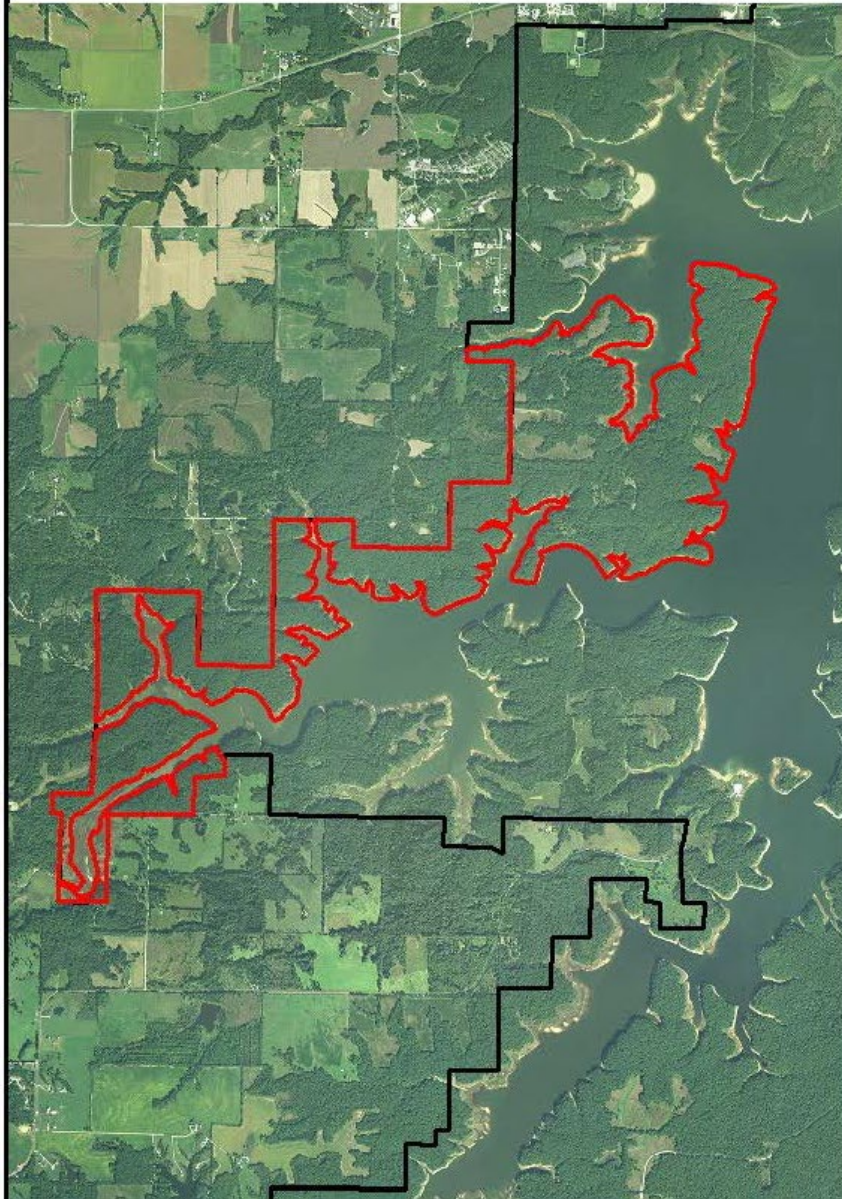


Clarence Cannon Dam and Mark Twain Lake
 Indiana Bat Management Area
 Compartment ES3 – Indian Creek Recreation Area

Location: Monroe County, Missouri, Township 55 North, Range 7 West, Section Nos. 18 and 19.







Clarence Cannon Dam and Mark Twain Lake
Indiana Bat Management Area
Compartment ES-4 – Joanna Ridge

Location: Ralls and Monroe Counties, Missouri, Township 55 North, Range 7 West, Section Nos. 5, 6, 8, 9, 15, 16, and 22.



US Army Corps
of Engineers®

ATTACHMENT B – DEFINITIONS

Area of Potential Effects (APE)	Under 36 CFR § 800.16(d) the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.
Signatory	In accordance with 36 CFR § 800.6(c)(1), a Signatory has the authority to execute, amend, or terminate the Programmatic Agreement.
Invited Signatory	In accordance with 36 CFR § 800.6(c)(2), Invited Signatories who sign the Programmatic Agreement are signatories with the authority to amend and terminate the Programmatic Agreement.
Concurring Party	In accordance with 36 CFR § 800.6(c)(3), a Concurring Party is a Consulting Party invited to concur in the Programmatic Agreement but does not have the authority to amend or terminate the Programmatic Agreement.
Technical Work	In this PA means all efforts to identify and delineate, evaluate, historic architectural, and archaeological properties, and to assess potential adverse effects, and perform subsequent treatment of historic properties, such as avoidance, minimization, data recovery excavation, monitoring, or recordation of potential historic properties that is required under this PA.

ATTACHMENT C – CONSULTING PARTY DISTRIBUTION LIST (July 2025)

Advisory Council on Historic Preservation
Mr. Christopher Daniel, Program Analyst
401 F Street NW, Suite 308
Washington, D.C. 20001-2637

U.S. Army Corps of Engineers, St. Louis District
Ms. Meredith Hawkins Trautt, Archaeologist and Tribal Liaison
1222 Spruce Street
St. Louis, MO 63103
Phone: (314) 925-5031
Email: Meredith.M.Trautt@usace.army.mil

Missouri State Historic Preservation Office
Ms. Amy Rubingh, Archaeologist/Records Management
P.O. Box 176
Jefferson City, MO 65102
Phone: (573) 751-4589
Email: Amy.Rubingh@dnr.mo.gov

Iowa Tribe of Kansas and Nebraska
Mr. Alan Kelley, Deputy Tribal Historic Preservation Officer
3345 Thrasher Road
White Cloud, KS 66094
Phone: (785) 351-0080
Email: akelley@iowas.org

The Osage Nation
Dr. Andrea A. Hunter, Tribal Historic Preservation Officer
Osage Nation Historic Preservation Office
627 Grandview Avenue
Pawhuska, OK 74056
Phone: (918) 287-5328
Email: ahunter@osagenation-nsn.gov

The Osage Nation
Ms. Sarah O'Donnell, NAGPRA Coordinator
Osage Nation Historic Preservation Office
627 Grandview Avenue
Pawhuska, OK 74056
Phone: (918) 287-5522
Email: sodonnell@osagenation-nsn.gov

The Osage Nation
Ms. Caitlin Nichols, Archaeologist

Osage Nation Historic Preservation Office
627 Grandview Avenue
Pawhuska, OK 74056
Phone: (918) 287-5427
Email: caitlin.nichols@osagenation-nsn.gov

Sac & Fox Tribe of the Mississippi in Iowa
Mr. Jonathan Buffalo, Director Historic Preservation
349 Meskwaki Road
Tama, IA 52339
Phone: (641) 484-3185
Email: director.historic@meskwaki-nsn.gov

Sac & Fox Tribe of the Mississippi in Iowa
Ms. Tieranny Keahna, Tribal Historic Preservation Officer
349 Meskwaki Road
Tama, IA 52339
Phone: (641) 484-3185
Email: tieranny.keahna@meskwaki-nsn.gov