ENVIRONMENTAL ASSESSMENT

Protecting the Mississippi–Missouri Confluence

Routing Alternatives for the Eastern Missouri Grid Transformation Project

Prepared by

**A Coalition of Conservation Organizations,
Landowners, Hunters, Anglers,
Scientists, Engineers, and Citizens
of the Mississippi–Missouri Confluence**

Prepared for:

Ameren Missouri, State and Federal Resource Agencies,
Local Governments, Conservation Organizations,
and Interested Stakeholders

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CHAPTER 1

INTRODUCTION

Guiding Principle

Infrastructure and environmental stewardship are not competing objectives. The most enduring public projects are those that achieve both by selecting routes that meet engineering needs while avoiding unnecessary impacts to irreplaceable natural resources.

1.1 Purpose of this Assessment

The **Mississippi–Missouri Confluence** represents one of North America's most ecologically significant floodplain landscapes. Its interconnected system of rivers, forests, wetlands, agricultural lands, prairies, conservation areas, and privately stewarded wildlife properties supports a remarkable diversity of plant and animal communities while providing flood storage, groundwater recharge, water quality improvement, recreation, and outdoor heritage for the citizens of Missouri and the nation.

This report has been prepared by a coalition of conservation organizations, landowners, hunters, anglers, scientists, engineers, and concerned citizens to evaluate the environmental, engineering, and public-interest considerations associated with the proposed **Eastern Missouri Grid Transformation Project**. The coalition recognizes the importance of maintaining a modern and reliable electric transmission system and does not oppose necessary infrastructure improvements. Rather, this assessment focuses on whether proposed transmission facilities can be routed in a manner that better protects one of the Midwest's most valuable floodplain ecosystems while still achieving the project's engineering objectives.

The purpose of this assessment is therefore not to determine whether new transmission infrastructure is needed. That determination rests with the appropriate regulatory authorities. Instead, this report evaluates whether alternative routing strategies may reduce environmental impacts, improve long-term engineering resilience, and better protect the substantial public and private conservation investments that have shaped the Mississippi–Missouri Confluence over many decades.

1.2 The Mississippi–Missouri Confluence

The confluence of the Mississippi and Missouri Rivers forms one of the largest remaining floodplain landscapes in the central United States. Seasonal flooding, sediment deposition, and natural hydrologic processes have created an extensive mosaic of bottomland hardwood forests, agricultural fields, managed wetlands, sloughs, oxbows, native grasslands, and riparian corridors.

This landscape serves as an essential migratory pathway for waterfowl and countless other bird species traveling along the Mississippi Flyway. Bald eagles, shorebirds, songbirds, waterfowl, wading birds, deer, turkey, beaver, and numerous aquatic species depend upon these habitats

throughout the year. The ecological value of the region extends well beyond individual properties, as wildlife populations rely upon the continuity of the larger landscape rather than isolated parcels of land.

The Confluence also provides important services to surrounding communities. During periods of high water, the floodplain stores and conveys floodwaters that might otherwise increase flood risks elsewhere. Floodplain soils filter water, replenish groundwater, support productive agriculture, and sustain ecosystems that contribute to regional biodiversity and resilience.

Because these functions depend upon the integrity of the floodplain as a connected system, land-use decisions within the Confluence should be evaluated not only for their localized effects but also for their contribution to cumulative changes across the broader landscape.

1.3 A Landscape of Conservation Investment

The environmental significance of the Confluence is reflected in decades of coordinated conservation efforts by public agencies, nonprofit organizations, and private landowners. State and federal agencies have invested substantial resources in wildlife management areas, parks, floodplain restoration, and habitat conservation. Organizations such as Great Rivers Habitat Alliance, Ducks Unlimited, Audubon, Great Rivers Greenway, the Missouri Department of Conservation, and numerous local partners have worked together with private landowners to protect and restore habitat throughout the region.

Equally important are the privately stewarded conservation properties that form much of the landscape between public conservation lands. Many of these properties have been actively managed for generations to improve habitat for migratory birds, native wildlife, and floodplain ecosystems. Through habitat restoration, water management, reforestation, invasive species control, and long-term stewardship, these lands now function as an interconnected conservation network that complements adjacent public investments.

The resulting landscape is not an undeveloped expanse awaiting future use. It is a mature conservation system created through decades of financial investment, volunteer effort, scientific management, and responsible private stewardship. In many cases, documented property transactions demonstrate that large, contiguous conservation properties command substantial market value, reflecting both their ecological importance and their rarity within the region.

1.4 The Need for Careful Route Selection

Transmission infrastructure is a vital component of modern society, but route selection can significantly influence both environmental impacts and long-term engineering performance. In floodplain environments, route selection must consider not only the immediate footprint of transmission structures but also the cumulative effects of construction access, soil disturbance, hydrologic alteration, vegetation clearing, long-term maintenance, and habitat fragmentation.

The maps, engineering information, wildlife observations, and flood documentation presented throughout this assessment indicate that portions of the proposed corridors intersect areas that experience recurrent flooding and contain important wildlife habitat. The photographs included in later chapters document extensive flood conditions on the Horseshoe Lake conservation property, illustrating the dynamic nature of the floodplain and the engineering challenges associated with construction and maintenance in such environments.

These observations support careful evaluation of routing alternatives that utilize existing transportation or utility corridors where practicable, thereby reducing fragmentation of intact conservation landscapes while limiting additional disturbance within the active floodplain.

1.5 Scope of this Report

This assessment examines the proposed project from multiple perspectives, including:

- Regional ecology and conservation significance.
- Floodplain hydrology and engineering considerations.
- Wildlife habitat and migratory bird resources.
- Bald eagle nesting areas and other sensitive ecological features.
- Clean Water Act Section 404 and related environmental permitting considerations.
- Public and private conservation investments.
- Property stewardship and recreational resources.
- Comparative evaluation of routing alternatives.
- Recommendations for avoiding or minimizing environmental impacts.

The report incorporates field observations, maps, aerial imagery, flood photographs, wildlife documentation, and other project-specific information provided by landowners and conservation partners. These materials are intended to assist decision-makers in evaluating practicable alternatives that meet project objectives while reducing environmental impacts and preserving the ecological integrity of the Mississippi–Missouri Confluence.

Key Findings

- The Mississippi–Missouri Confluence is one of the Midwest's most significant floodplain ecosystems and supports extensive ecological, hydrologic, and recreational resources.
- The report does not oppose reliable electric transmission infrastructure; it evaluates whether routing alternatives can better avoid sensitive floodplain and conservation areas.
- Decades of public and private investment have created an interconnected conservation landscape whose value extends well beyond individual properties.

- Project-specific maps, wildlife observations, and flood documentation indicate that portions of the proposed corridors warrant careful environmental and engineering review.
- Existing transportation and utility corridors should be fully evaluated as potential means of reducing impacts to intact conservation landscapes before new corridors are established through the active floodplain.

CHAPTER 2

THE MISSISSIPPI–MISSOURI CONFLUENCE:

A LANDSCAPE OF NATIONAL ECOLOGICAL SIGNIFICANCE

Guiding Principle

The ecological importance of a landscape is measured not only by the species it supports today, but by its ability to sustain natural systems for generations to come. Decisions affecting such landscapes should reflect their long-term public value as well as their immediate utility.

2.1 Introduction

The confluence of the Mississippi and Missouri Rivers is among the most distinctive floodplain landscapes in North America. Created over thousands of years through the interaction of two of the continent's largest rivers, the region encompasses an extensive network of floodplain forests, agricultural lands, seasonal wetlands, native grasslands, sloughs, oxbows, and riparian corridors that together form one of the Midwest's most productive ecological systems.

Unlike isolated conservation areas, the Confluence functions as a continuous landscape. Its ecological value derives not only from individual properties, but from the connectivity among public conservation lands, privately stewarded conservation properties, working agricultural lands, and natural floodplain habitats. This interconnected system supports wildlife movement, floodwater storage, groundwater recharge, nutrient cycling, and recreational opportunities on a regional scale.

The proposed Eastern Missouri Grid Transformation Project traverses portions of this larger landscape. As a result, project planning should evaluate not only localized impacts but also how routing decisions may influence the ecological integrity of the broader floodplain system.

2.2 A Critical Link in the Mississippi Flyway

The Mississippi Flyway is one of North America's four principal migratory bird flyways. Stretching from Canada's northern breeding grounds to wintering areas along the Gulf Coast and beyond, it supports the seasonal movement of millions of birds each year.

The Mississippi–Missouri Confluence occupies one of the most important locations within this migration corridor. Its combination of open water, managed wetlands, flooded agricultural fields, bottomland forests, and native grasslands provides essential resting, feeding, and wintering habitat during migration.

Species routinely using this landscape include:

- Ducks
- Geese
- Swans
- Shorebirds
- Wading birds
- Bald eagles
- Hawks and other raptors
- Songbirds
- Numerous resident wildlife species

The ecological value of these habitats extends beyond individual migration seasons. The continuity of habitat across the landscape allows wildlife populations to adapt to changing water levels, weather conditions, and seasonal food availability. Fragmentation of these habitats can reduce that flexibility and diminish the long-term resilience of the ecosystem.

2.3 An Actively Functioning Floodplain

The Confluence remains an actively functioning floodplain. Seasonal inundation is a defining characteristic of the landscape and supports many of the ecological processes that make the region so productive.

Floodwaters replenish wetlands, transport nutrients, recharge groundwater, support bottomland forests, and create the diverse habitat conditions upon which many wildlife species depend.

The flood photographs included in this assessment document these natural processes on the Horseshoe Lake Hunting & Fishing Club property. Rather than depicting isolated flooding events, they illustrate the dynamic hydrology characteristic of an active floodplain landscape. Roads become inundated, access is temporarily limited, agricultural fields store floodwaters, and wildlife habitat expands in response to seasonal flooding.

These observations are important not only from an ecological perspective but also from an engineering standpoint. They demonstrate the need to carefully consider long-term floodplain conditions when evaluating alternative transmission routes.

Figure 2-1. Regional Floodplain of the Mississippi–Missouri Confluence

(Insert regional floodplain map.)

Figure 2-2. Documented Flood Conditions on the Horseshoe Lake Hunting & Fishing Club Property

(Insert aerial flood photograph.)

2.4 A Landscape Shaped by Conservation

The modern character of the Confluence is not accidental. It reflects generations of stewardship by conservation organizations, public agencies, private landowners, and local communities.

Across the region, extensive efforts have been undertaken to restore wetlands, manage water levels, improve wildlife habitat, protect bottomland forests, establish conservation easements, enhance recreational opportunities, and preserve the ecological functions of the floodplain.

Organizations contributing to these efforts include, among others:

- Great Rivers Habitat Alliance
- Ducks Unlimited
- Missouri Department of Conservation
- Great Rivers Greenway
- Audubon
- Local conservation districts
- Numerous private conservation landowners

Together, these investments have created an interconnected conservation landscape extending across both public and private ownership.

2.5 The Role of Private Conservation Lands

Public conservation areas represent only one component of the Confluence.

Equally important are the privately managed conservation properties that connect public lands into a functioning ecological network. Many of these properties have remained under continuous stewardship for generations and are actively managed to improve wildlife habitat, restore wetlands, maintain bottomland forests, and support sustainable outdoor recreation.

The Horseshoe Lake Hunting & Fishing Club is one example of this broader conservation network. Like many neighboring properties, it has invested substantially in habitat management, floodplain stewardship, and wildlife conservation over many decades. These efforts complement adjacent public conservation initiatives and contribute to the ecological integrity of the entire landscape.

The significance of these properties extends beyond recreation. They provide habitat continuity, support migratory wildlife, store floodwaters, and represent substantial long-term conservation investments by private citizens.

2.6 A Landscape of Significant Public and Private Investment

The Confluence represents one of the largest coordinated conservation investments in eastern Missouri.

Federal, state, regional, nonprofit, and private organizations have collectively invested millions of dollars in habitat restoration, public parks, wetlands, floodplain management, conservation education, and wildlife protection. These investments have produced measurable ecological, recreational, and economic benefits for the region.

Likewise, private conservation properties have become increasingly valuable as large, contiguous floodplain landscapes have become more limited. Documented transactions indicate that certain conservation properties within the Confluence have commanded prices exceeding **$30,000 per acre**, reflecting both the scarcity of these landscapes and the decades of stewardship that have enhanced their ecological value.

These investments underscore an important principle: the Confluence is not vacant land awaiting development. It is a landscape that has already benefited from extensive public and private commitments to conservation.

2.7 Why Routing Decisions Matter

The question before decision-makers is not whether modern electric infrastructure is necessary.

The question is whether new transmission corridors can be planned in ways that reduce impacts to one of North America's most significant floodplain ecosystems while still meeting project objectives.

Routing decisions made today will influence habitat connectivity, floodplain management, engineering requirements, maintenance costs, and conservation outcomes for decades.

Careful evaluation of practicable alternatives—including the use of existing transportation and utility corridors where appropriate—provides an opportunity to balance infrastructure reliability with long-term environmental stewardship.

Key Findings

- The Mississippi–Missouri Confluence is one of the Midwest's most significant floodplain landscapes.
- The region functions as a connected ecological system rather than a collection of isolated properties.
- Seasonal flooding is an essential ecological process and is documented by site-specific photographs included in this assessment.
- Public agencies, nonprofit organizations, and private landowners have invested substantially in conserving the region's natural resources.
- Routing decisions should recognize both the ecological significance of the Confluence and the long-term public and private investments that have shaped it.
- Alternative routing strategies that reduce impacts to intact conservation landscapes should be carefully evaluated during project planning.

CHAPTER 3

EXISTING ENVIRONMENTAL CONDITIONS AND NATURAL RESOURCES

Guiding Principle

Sound environmental decision-making begins with a thorough understanding of existing conditions. The ecological value of the Mississippi–Missouri Confluence arises from the interaction of its floodplain, forests, wetlands, agricultural lands, and wildlife habitats, which together form a resilient and interconnected landscape.

3.1 Introduction

The environmental resources of the Mississippi–Missouri Confluence represent one of the most diverse floodplain ecosystems in the Midwest. The project area encompasses a mosaic of bottomland hardwood forests, managed wetlands, seasonal floodwaters, agricultural fields, native grasslands, riparian corridors, sloughs, oxbow lakes, and privately managed conservation properties.

These habitats function collectively rather than independently. Seasonal flooding, wildlife movement, vegetation communities, and water management practices connect individual properties into a larger ecological system that extends well beyond property boundaries.

Understanding these existing environmental conditions is essential for evaluating routing alternatives and identifying opportunities to avoid or minimize impacts.

3.2 Floodplain Hydrology

The proposed project area lies within an actively functioning floodplain influenced by the Mississippi and Missouri Rivers.

Unlike developed upland environments, floodplain ecosystems depend upon periodic inundation. Floodwaters transport sediment and nutrients, recharge groundwater, sustain wetlands, maintain bottomland forests, and create the dynamic habitat conditions necessary for many wildlife species.

Photographic evidence collected within the Horseshoe Lake Hunting & Fishing Club demonstrates recurring flood conditions, including:

- inundated roads;
- flooded agricultural fields;
- seasonal expansion of wetland habitat;
- water surrounding buildings and infrastructure;
- temporary loss of vehicle access; and
- boat-only access during high-water events.

These conditions illustrate that flooding is not an isolated occurrence but an integral ecological process that shapes the landscape.

The expanded photographic documentation contained in Appendix A further illustrates flood conditions across multiple locations within the study area, including flooded forests, managed wetlands, agricultural fields, transportation corridors, and the Horseshoe Lake Hunting & Fishing Club facilities. Collectively, these photographs demonstrate both the frequency and geographic extent of floodplain inundation, reinforcing the conclusion that seasonal flooding is a defining characteristic of the project area rather than an isolated event.

From an engineering perspective, recurring inundation also presents considerations related to construction access, foundation design, maintenance, erosion, and long-term operational reliability.

3.3 Wetlands

Wetlands are among the defining features of the Confluence.

The project area contains managed wetlands, emergent marshes, seasonally flooded agricultural lands, shallow-water habitat, and forested wetlands that provide important ecological functions.

These wetlands:

- store floodwaters;
- reduce downstream flooding;
- improve water quality through sediment and nutrient retention;
- recharge groundwater;
- provide spawning and nursery habitat for fish;
- support amphibians and reptiles;
- sustain migratory birds and waterfowl;
- provide habitat for numerous invertebrate species.

Several managed wetland complexes within the study area remain inundated for extended periods during much of the year.

Maps included in this assessment illustrate the relationship between these wetlands and portions of the proposed transmission corridors.

3.4 Bottomland Hardwood Forests

The remaining bottomland hardwood forests of eastern Missouri represent increasingly scarce ecological resources.

These forests provide:

- nesting habitat;
- denning habitat;
- travel corridors;
- mast production for wildlife;
- erosion control;
- carbon storage;
- water quality protection.

Tree species commonly observed include:

- pin oak;
- swamp white oak;
- silver maple;
- cottonwood;
- sycamore;
- green ash;
- hackberry;
- pecan.

Because these forests occur within an interconnected floodplain landscape, maintaining continuity is important for wildlife movement and ecosystem resilience.

3.5 Agricultural Lands as Wildlife Habitat

Although actively farmed, many agricultural lands within the Confluence provide significant wildlife habitat.

Seasonally flooded crop fields offer important foraging areas for migratory waterfowl and shorebirds.

Following harvest, waste grain provides an important food source during migration and winter.

Agricultural fields also contribute to:

- deer habitat;
- turkey habitat;
- raptor foraging;
- pollinator resources;
- floodwater storage.

Many agricultural operations are integrated with wildlife management practices that complement adjacent conservation lands.

3.6 Wildlife Resources

The diversity of habitats within the Confluence supports an exceptional variety of wildlife.

Observed species documented within the study area include:

Waterfowl

- Mallards
- Wood Ducks
- Northern Pintails
- Gadwalls
- Green-winged Teal
- Canada Geese
- Snow Geese
- White-fronted Geese

Raptors

- Bald Eagles
- Red-tailed Hawks
- Red-shouldered Hawks
- Barred Owls
- Great Horned Owls

Upland Birds

- Wild Turkey
- Mourning Dove
- Northern Bobwhite (where suitable habitat remains)

Mammals

- White-tailed Deer
- Beaver
- Muskrat
- River Otter
- Coyote
- Fox
- Raccoon
- Squirrel

Numerous reptiles, amphibians, fish, insects, and pollinator species also utilize the project area.

3.7 Bald Eagles

Particular attention should be given to bald eagles.

Field observations by local landowners have identified multiple documented bald eagle nest locations within the broader project area. In addition, repeated observations of adult bald eagles transporting nesting material into heavily wooded portions of the floodplain suggest the presence of at least one additional suspected nesting area where direct visual confirmation has been limited by dense forest canopy. Both the documented nest locations and the suspected nesting area are presented in Appendix A.

Because bald eagles are protected under federal law, comprehensive field surveys should be completed before final route selection where appropriate. These surveys can help inform project planning, identify opportunities to avoid or minimize disturbance during construction and operation and verify the status of suspected nesting locations identified through field observations.

For mapped locations of documented and suspected bald eagle nests, see Appendix A, Figure A-2.

3.8 Habitat Connectivity

One of the defining characteristics of the Confluence is landscape connectivity.

Wildlife does not recognize property boundaries.

Instead, animals move freely among:

- public conservation areas;

- private conservation lands;
- wetlands;
- forests;
- agricultural fields;
- riparian corridors.

Maintaining these connections helps sustain migration, breeding, foraging, and seasonal movements across the broader ecosystem.

This landscape-scale perspective is an important consideration when evaluating routing alternatives.

3.9 Conservation Stewardship

The ecological condition of the project area reflects decades of stewardship.

Private conservation organizations, hunting clubs, landowners, farmers, nonprofit organizations, and public agencies have collectively invested substantial resources in:

- wetland restoration;
- forest management;
- invasive species control;
- water management;
- levee maintenance;
- habitat enhancement;
- wildlife monitoring.

These efforts have transformed portions of the Confluence into one of Missouri's premier conservation landscapes.

3.10 Summary

The environmental resources present within the study area represent a highly functioning floodplain ecosystem shaped by natural processes and long-term stewardship.

Rather than isolated habitat features, the wetlands, forests, agricultural lands, waterways, and conservation properties operate together to support ecological functions of regional significance.

Understanding these existing conditions provides the foundation for evaluating routing alternatives, assessing engineering considerations, and identifying opportunities to reduce impacts while achieving project objectives.

Appendix A provides visual documentation supporting the environmental conditions described throughout this chapter, including regional conservation maps, documented and suspected bald eagle nesting locations, proposed transmission routing corridors, the preferred alternative corridor, and extensive floodplain photography. These exhibits complement the narrative analysis and provide additional context for evaluating routing alternatives that minimize impacts to environmentally sensitive resources.

Key Findings

- The project area encompasses a diverse and interconnected floodplain ecosystem.
- Flooding is a recurring natural process that supports ecological functions and presents important engineering considerations.
- Wetlands provide flood storage, water-quality improvement, and wildlife habitat.
- Bottomland hardwood forests contribute to biodiversity, habitat connectivity, and ecosystem resilience.
- Agricultural lands within the floodplain also support important wildlife values.
- Documented bald eagle nests and other wildlife resources warrant careful evaluation during project planning.
- Decades of public and private stewardship have enhanced the ecological integrity of the landscape.
- Environmental review should consider the cumulative role of these interconnected resources when comparing routing alternatives.

CHAPTER 4

FLOODPLAIN ENGINEERING, INFRASTRUCTURE CONSIDERATIONS, AND ROUTING ANALYSIS

Guiding Principle

Engineering excellence and environmental stewardship are not competing objectives. The most resilient infrastructure is achieved when engineering design recognizes and accommodates the natural processes of the landscape in which it is built.

4.1 Introduction

Major electric transmission infrastructure is designed to operate reliably for many decades under a wide range of environmental conditions. Route selection therefore represents one of the most important engineering decisions in any transmission project.

Within the Mississippi–Missouri Confluence, engineering considerations extend well beyond conventional topography and land ownership. The region is characterized by active floodplain processes, recurring inundation, saturated soils, wetland complexes, river migration, seasonal access limitations, and extensive conservation lands. These characteristics present both engineering challenges and environmental considerations that warrant careful evaluation during project planning.

The purpose of this chapter is not to determine the final route for the project. Rather, it identifies engineering factors that should be considered when comparing alternative corridors and selecting the route that best balances reliability, constructability, environmental protection, long-term maintenance, and public investment.

4.2 Characteristics of an Active Floodplain

Unlike upland terrain, active floodplains are dynamic systems that experience periodic change.

Floodwaters alter soil moisture, redistribute sediment, reshape drainage features, and influence vegetation communities. These natural processes are essential to the ecological health of the Confluence but also create engineering conditions that differ significantly from more stable landscapes.

Site observations and photographic documentation collected within the study area demonstrate recurring inundation affecting roads, fields, wetlands, levees, and developed areas.

Floodplain infrastructure must therefore be designed with consideration for:

- prolonged saturation of soils;
- seasonal fluctuations in groundwater levels;
- erosion and scour;
- sediment deposition;
- access limitations during flood events; and
- long-term maintenance under changing hydrologic conditions.

4.3 Foundation and Soil Considerations

Transmission structures are designed to withstand substantial vertical, lateral, and wind loads throughout their operational life.

Floodplain soils may require additional engineering evaluation because they can differ significantly from upland conditions. Depending upon site-specific investigations, considerations may include:

- soft alluvial deposits;
- variable bearing capacity;
- differential settlement;
- fluctuating groundwater conditions;
- erosion potential;
- scour around foundations.

These factors do not preclude construction, but they may influence foundation design, construction methods, and long-term maintenance requirements.

Comprehensive geotechnical investigations are therefore an important component of route evaluation.

4.4 Construction Access

Constructing major transmission facilities requires reliable access for specialized equipment, cranes, concrete delivery, foundation installation, conductor stringing, and future maintenance.

Within active floodplains, access conditions may change substantially throughout the year.

The flood photographs included in this assessment illustrate conditions in which roads become submerged, agricultural fields become inundated, and access is temporarily restricted.

Construction planning should therefore consider:

- seasonal timing;
- temporary access roads;
- wetland protection;
- soil compaction;
- restoration following construction;
- worker safety during changing hydrologic conditions.

Minimizing disturbance to existing levees, water-control structures, and habitat management infrastructure is also an important planning consideration.

4.5 Long-Term Operations and Maintenance

Transmission infrastructure requires periodic inspection, vegetation management, emergency repairs, and component replacement throughout its service life.

Floodplain environments may influence maintenance activities because recurring inundation can affect accessibility during certain periods of the year.

Long-term planning should evaluate:

- maintenance access during flood events;
- vegetation management requirements;
- inspection frequency;
- erosion monitoring;
- foundation performance;
- replacement logistics.

Considering these factors during route selection may improve long-term operational efficiency while reducing maintenance costs.

4.6 Floodplain Functions and Infrastructure Compatibility

Floodplains provide numerous public benefits beyond wildlife habitat.

These include:

- temporary floodwater storage;
- reduced downstream flood risk;
- groundwater recharge;
- sediment transport;
- nutrient cycling;
- water-quality improvement.

Infrastructure projects should, where practicable, be planned to maintain these natural floodplain functions.

Although transmission lines generally occupy a relatively narrow footprint compared with many forms of development, associated construction activities—including access roads, equipment staging, and foundation installation—may influence floodplain conditions depending on site-specific design.

Accordingly, engineering design should seek to minimize unnecessary disturbance and preserve natural hydrologic processes where practicable.

4.7 Existing Transportation and Utility Corridors

One of the principal planning considerations identified during this assessment is the potential use of existing linear infrastructure corridors.

Transportation routes, highways, railroads, and existing utility corridors have already altered the surrounding landscape to varying degrees.

Where engineering, safety, and operational requirements allow, co-locating new infrastructure within or adjacent to existing corridors may:

- reduce habitat fragmentation;
- minimize new clearing;
- consolidate infrastructure impacts;
- reduce effects on conservation lands;
- simplify long-term maintenance access.

Each alternative should be evaluated individually using engineering, environmental, and operational criteria.

4.8 Site Observations from Horseshoe Lake Hunting & Fishing Club

Field observations from the Horseshoe Lake Hunting & Fishing Club provide valuable insight into existing floodplain conditions.

Photographs collected during flood events document:

- inundated access roads;
- flooded agricultural lands;
- expanded wetland habitat;
- floodwaters surrounding buildings;
- temporary reliance on boats for transportation;
- seasonal changes in water levels.

These observations illustrate the dynamic nature of the floodplain and provide site-specific context for evaluating engineering considerations within similar portions of the project area.

The observations should be considered alongside formal engineering investigations, geotechnical studies, and hydrologic analyses conducted as part of project development.

4.9 Engineering and Environmental Integration

Modern infrastructure planning increasingly recognizes that engineering and environmental disciplines are complementary.

Early integration of environmental information into route selection can reduce permitting challenges, minimize construction impacts, improve public acceptance, and enhance long-term project resilience.

Successful transmission projects often incorporate:

- early agency coordination;
- environmental field surveys;
- geotechnical investigations;
- hydrologic analysis;
- stakeholder engagement;
- evaluation of alternative alignments.

Applying these principles within the Mississippi–Missouri Confluence provides an opportunity to identify routing solutions that satisfy both engineering objectives and environmental stewardship.

4.10 Summary

The Mississippi–Missouri Confluence presents engineering conditions that differ substantially from those encountered in more stable upland landscapes.

Recurring flooding, saturated soils, wetlands, dynamic hydrology, and conservation investments all warrant careful consideration during route selection.

These conditions do not prevent transmission infrastructure from being constructed. Rather, they underscore the importance of selecting routes that are technically sound, environmentally responsible, and resilient over the project's expected service life.

Evaluating practicable alternatives—including the use of existing transportation and utility corridors where appropriate—may reduce environmental impacts while supporting reliable electric service.

Key Findings

- The project area is characterized by active floodplain processes that influence engineering design and long-term infrastructure performance.

- Floodplain soils, hydrology, and seasonal access limitations should be evaluated through detailed engineering investigations.
- Site-specific flood photography documents recurring inundation that is relevant to route planning and maintenance considerations.
- Preserving natural floodplain functions benefits both ecological integrity and long-term infrastructure resilience.
- Existing transportation and utility corridors should be thoroughly evaluated where practicable to reduce new landscape fragmentation.
- Integrating engineering analysis with environmental planning can improve project outcomes and support informed decision-making.

CHAPTER 5

REGULATORY FRAMEWORK, ENVIRONMENTAL REVIEW, AND PUBLIC INTEREST CONSIDERATIONS

Guiding Principle

Environmental laws and permitting processes exist to ensure that infrastructure projects are planned with full consideration of their engineering, environmental, and public consequences. Effective decision-making depends upon complete information, transparent analysis, and meaningful public participation.

5.1 Introduction

The Eastern Missouri Grid Transformation Project will be subject to a variety of federal, state, and local environmental review requirements. These reviews are intended to ensure that infrastructure projects are planned, designed, and constructed in a manner that protects public safety, natural resources, and the long-term public interest while allowing essential infrastructure improvements to proceed.

The purpose of this chapter is to summarize the principal regulatory considerations that may be relevant to transmission routing within the Mississippi–Missouri Confluence. It is not intended as a legal opinion, nor does it attempt to identify every permit or approval that may ultimately apply. Rather, it provides an overview of the environmental review process and the importance of evaluating routing alternatives before final decisions are made.

5.2 The Public Interest Standard

Many environmental permitting decisions require agencies to balance multiple public interests, including:

- Reliable electric service;
- Public safety;
- Environmental protection;
- Conservation of wetlands and floodplains;
- Economic considerations;
- Long-term infrastructure reliability;

- Effects on landowners and local communities.

In floodplain landscapes such as the Mississippi–Missouri Confluence, these interests often intersect. The objective is not to elevate one interest above all others, but to identify a route that reasonably satisfies engineering needs while avoiding or minimizing unnecessary impacts where practicable.

5.3 Floodplain Management

Floodplains perform essential public functions that extend beyond the boundaries of individual properties.

These include:

- temporary storage of floodwaters;
- reduction of downstream flood risk;
- groundwater recharge;
- water-quality improvement;
- wildlife habitat;
- nutrient transport.

Projects located within floodplains are commonly evaluated to determine whether they are compatible with these functions and whether impacts can be avoided, minimized, or appropriately mitigated.

The recurring flood conditions documented within this assessment illustrate why floodplain considerations should remain an important component of project planning.

5.4 Wetlands and Aquatic Resources

Wetlands are among the nation's most valuable ecological resources.

Depending upon site-specific conditions, construction activities affecting wetlands or other waters may require review under applicable federal and state regulations.

Potential areas of evaluation may include:

- wetland delineation;
- avoidance and minimization;
- temporary construction impacts;
- permanent conversion;
- restoration measures;
- compensatory mitigation, where applicable.

Early identification of wetlands often allows project designers to refine alignments and reduce environmental impacts before construction begins.

5.5 Wildlife and Protected Species

The project area supports a diverse assemblage of wildlife, including migratory birds, waterfowl, raptors, mammals, reptiles, amphibians, and fish.

Field observations documented by landowners have identified bald eagle nesting activity within portions of the study area. Additional habitat may warrant field evaluation during project planning.

Wildlife review commonly includes consideration of:

- breeding habitat;
- nesting locations;
- migration corridors;
- seasonal timing;
- habitat connectivity;
- opportunities to avoid or minimize disturbance.

Coordination with the appropriate resource agencies can help ensure that project planning incorporates the most current biological information available.

Since preparation of the initial assessment, additional field observations by local landowners have identified multiple documented bald eagle nest locations and at least one additional suspected nesting area within the broader project area. Although the suspected nest has not yet been visually confirmed because of dense forest canopy, repeated observations of adult bald eagles transporting nesting material into the same wooded area warrant further evaluation. The locations of documented and suspected nesting activity are presented in Appendix A, Figure A-2 and should be considered during final route selection and biological field surveys.

5.6 National Environmental Policy Considerations

If a federal permit, federal funding, or another federal action is required for any portion of the project, the project may be subject to review under the National Environmental Policy Act (NEPA).

The purpose of NEPA is procedural rather than outcome-determinative. It requires federal agencies to evaluate environmental consequences, consider reasonable alternatives where applicable, disclose information to the public, and incorporate public participation into the decision-making process.

Where NEPA applies, the analysis often includes:

- the purpose and need for the project;
- the affected environment;
- potential environmental impacts;
- alternatives considered;
- opportunities to avoid or minimize impacts;
- cumulative environmental effects.

One of NEPA's principal strengths is its emphasis on informed decision-making through a transparent evaluation of environmental information.

5.7 Clean Water Act Considerations

Construction activities affecting jurisdictional waters or wetlands may require review under the Clean Water Act.

Depending on the final design and site conditions, agencies may evaluate:

- wetland impacts;
- stream crossings;
- temporary fill;
- permanent fill;
- erosion and sediment control;
- restoration plans.

Early coordination during project design frequently helps identify opportunities to reduce impacts and streamline permitting.

5.8 Public Participation

Meaningful public participation is an essential component of environmental review.

Private landowners, conservation organizations, local governments, recreational users, agricultural interests, and members of the public often possess valuable knowledge regarding:

- historic flood conditions;
- wildlife observations;
- habitat management;
- drainage patterns;
- access conditions;

- local land use.

The flood photographs, wildlife observations, and mapping presented throughout this assessment represent examples of locally developed information that may assist agencies during environmental review.

Incorporating such information into project planning can improve both environmental outcomes and public confidence in the permitting process.

5.9 Evaluation of Routing Alternatives

A recurring theme throughout this assessment is the importance of evaluating alternative routes early in project planning.

Alternative analyses generally seek to determine whether project objectives can be achieved while reducing impacts to sensitive environmental resources.

Within the Confluence, factors that may be considered include:

- existing transportation corridors;
- existing utility corridors;
- floodplain characteristics;
- wetlands;
- wildlife habitat;
- engineering feasibility;
- construction access;
- long-term maintenance;
- effects on public and private conservation investments.

No single factor should determine route selection. Rather, the evaluation should integrate engineering, environmental, operational, and community considerations to identify the most balanced solution.

5.10 Stewardship as a Public Interest

The Mississippi–Missouri Confluence reflects generations of public and private stewardship.

Federal agencies, the State of Missouri, conservation organizations, private landowners, agricultural producers, and local communities have collectively invested significant resources in preserving the ecological functions of this floodplain.

These investments demonstrate that conservation and economic activity have long coexisted within the region. Future infrastructure planning should build upon this legacy by seeking solutions that maintain ecological integrity while supporting reliable electric service.

5.11 Summary

Environmental review is most effective when it integrates sound engineering, rigorous scientific analysis, meaningful public participation, and thoughtful consideration of alternatives.

The Mississippi–Missouri Confluence presents unique environmental characteristics that warrant careful evaluation during project planning. The floodplain, wetlands, wildlife habitats, and long history of conservation investment documented throughout this assessment provide important context for routing decisions.

By considering environmental information early in the planning process and evaluating practicable alternatives, project proponents and reviewing agencies can better achieve the shared goals of infrastructure reliability, environmental stewardship, and long-term public benefit.

The regional conservation maps presented in Appendix A illustrate the interconnected nature of public conservation lands, privately managed hunting clubs, wetlands, and bottomland forests throughout the Mississippi–Missouri Confluence. These exhibits reinforce the importance of evaluating transmission corridors at the landscape scale rather than as isolated crossings of individual properties.

Key Findings

- Environmental review provides a structured process for evaluating engineering, environmental, and community considerations.
- Floodplain functions, wetlands, wildlife resources, and conservation investments should be incorporated into routing decisions.
- Comprehensive field surveys and agency coordination can improve project planning and reduce environmental impacts.
- Public participation contributes valuable local knowledge that may not be available through technical studies alone.
- Evaluation of practicable alternatives is an important component of informed decision-making.
- Responsible infrastructure planning is strengthened when engineering, science, and conservation objectives are considered together.

CHAPTER 6

ROUTING ALTERNATIVES AND LANDSCAPE-LEVEL PLANNING

Guiding Principle

The selection of a transmission corridor is one of the most consequential decisions in the life of an infrastructure project. Careful evaluation of routing alternatives can reduce environmental impacts, improve long-term operational efficiency, and strengthen public confidence in the planning process.

6.1 Introduction

The location of a transmission line influences its environmental footprint for generations. While engineering feasibility, system reliability, and cost are central considerations, modern infrastructure planning also recognizes the importance of avoiding or minimizing impacts to sensitive natural resources where practicable.

Within the Mississippi–Missouri Confluence, routing decisions have implications that extend beyond individual parcels of land. The landscape functions as an interconnected ecological system supporting floodplain processes, wildlife movement, conservation investments, agricultural production, and outdoor recreation. Consequently, evaluating routing alternatives requires consideration of both site-specific conditions and landscape-scale effects.

This chapter examines the planning principles that should guide route selection and discusses how alternative alignments may better balance infrastructure needs with environmental stewardship.

6.2 The Importance of Early Route Selection

The greatest opportunity to reduce environmental impacts often occurs before final engineering design begins.

Once a corridor has been selected, opportunities to avoid sensitive resources become more limited. Early identification of wetlands, flood-prone areas, wildlife habitat, conservation lands, and existing infrastructure corridors allows planners to refine alignments before significant engineering commitments have been made.

An effective routing analysis should integrate:

- engineering feasibility;

- environmental constraints;
- construction considerations;
- long-term maintenance;
- land use compatibility;
- agency input; and
- stakeholder engagement.

Considering these factors together supports a more informed and resilient decision.

6.3 Existing Linear Infrastructure Corridors

Across the United States, electric transmission projects frequently follow or parallel existing transportation and utility corridors where appropriate.

Existing highways, railroads, and utility easements have already introduced linear infrastructure into the landscape. Where engineering and operational requirements permit, co-location can offer several advantages:

- reducing new habitat fragmentation;
- minimizing clearing of forests and wetlands;
- simplifying access for construction and maintenance;
- limiting effects on previously undisturbed landscapes; and
- concentrating infrastructure within existing transportation or utility corridors.

The maps included in this assessment illustrate several existing transportation corridors that should be carefully evaluated during route selection.

6.4 Landscape Fragmentation

The ecological effects of infrastructure are influenced not only by the physical footprint of structures but also by how new corridors divide the surrounding landscape.

Large, contiguous conservation areas often function more effectively than fragmented habitat patches. Fragmentation may alter wildlife movement, change vegetation patterns, increase edge effects, and complicate habitat management.

Within the Confluence, many public conservation areas and privately managed conservation lands are connected by wetlands, forests, agricultural fields, and riparian corridors. Maintaining these connections is an important planning consideration.

Evaluating alternative routes with an emphasis on minimizing unnecessary fragmentation can help preserve the long-term ecological integrity of the landscape.

6.5 Floodplain Compatibility

Floodplain conditions should remain a central consideration throughout the routing process.

As documented in previous chapters, portions of the proposed project area experience recurring inundation. Flood photographs collected from the Horseshoe Lake Hunting & Fishing Club illustrate how water levels can affect roads, buildings, wetlands, and agricultural lands during seasonal flooding.

Alternative routes that reduce exposure to these dynamic floodplain conditions may offer advantages related to:

- construction logistics;
- maintenance access;
- long-term operational reliability;
- environmental protection; and
- preservation of natural floodplain functions.

These considerations should be evaluated alongside traditional engineering criteria.

Appendix A contains extensive photographic documentation of flood conditions throughout the project area, including flooded forests, wetlands, agricultural fields, transportation corridors, and structures within the Horseshoe Lake Hunting & Fishing Club. These photographs demonstrate that prolonged inundation is characteristic of the project area and provide visual confirmation of the engineering and maintenance challenges associated with infrastructure located within the active floodplain.

6.6 Conservation Investments

The Mississippi–Missouri Confluence reflects decades of coordinated conservation investment by federal agencies, the State of Missouri, nonprofit organizations, and private landowners.

Habitat restoration, wetland management, forest conservation, water-control infrastructure, and wildlife management have collectively created one of Missouri's most valuable conservation landscapes.

Routing decisions should recognize these long-term investments and seek, where practicable, to avoid unnecessary impacts to lands that have been actively managed for ecological purposes.

This consideration applies equally to publicly owned conservation areas and privately managed conservation properties that contribute to regional habitat connectivity.

6.7 Wildlife Movement and Habitat Connectivity

Wildlife populations depend upon connected landscapes.

Species documented within the study area—including migratory waterfowl, bald eagles, deer, turkey, and numerous other birds and mammals—regularly move among wetlands, forests, agricultural lands, and river corridors.

Route planning should therefore evaluate not only direct effects within the immediate right-of-way but also broader landscape relationships, including:

- movement corridors;
- breeding habitat;
- seasonal foraging areas;
- wetland complexes;
- forest continuity.

Maintaining ecological connectivity contributes to the long-term resilience of wildlife populations throughout the Confluence.

6.8 Property Stewardship

Many properties within the study area have been under continuous stewardship for generations.

Private landowners, hunting clubs, conservation organizations, and agricultural producers have invested substantial financial resources and volunteer effort in habitat restoration, water management, invasive species control, levee maintenance, and wildlife conservation.

These stewardship activities have enhanced ecological conditions across the broader landscape.

The Horseshoe Lake Hunting & Fishing Club is representative of these long-term investments. Together with neighboring conservation properties, it contributes to a continuous network of habitat extending across much of the Confluence.

Considering these stewardship investments during route selection recognizes both their ecological value and their contribution to the public interest.

6.9 Opportunities for Collaborative Planning

Successful infrastructure projects increasingly rely upon collaborative planning.

Constructive engagement among utilities, landowners, conservation organizations, regulatory agencies, and local governments can identify opportunities to refine alignments, reduce conflicts, and improve project outcomes.

The environmental information presented throughout this assessment—including flood photography, wildlife observations, and mapping—illustrates how local knowledge can complement technical engineering studies.

Continued collaboration during project development may identify routing solutions that satisfy engineering objectives while minimizing environmental impacts.

6.10 Summary

Selecting the location of a transmission corridor is both an engineering decision and a landscape planning decision.

Within the Mississippi–Missouri Confluence, route selection should consider the interaction among floodplain processes, wetlands, wildlife habitat, conservation investments, agricultural land use, and long-term infrastructure requirements.

A comprehensive evaluation of practicable alternatives—including existing transportation and utility corridors where appropriate—provides the opportunity to reduce environmental impacts while maintaining reliable electric service.

The goal is not simply to determine where a transmission line can be constructed, but where it can be constructed in a manner that best serves the long-term public interest.

Future routing decisions should also consider official FEMA flood hazard mapping, hydrologic analyses, and documented field conditions together when evaluating the long-term performance of transmission infrastructure within the Mississippi–Missouri Confluence. Appendix A provides field documentation that complements these engineering evaluations.

Key Findings

- Early evaluation of routing alternatives provides the greatest opportunity to reduce environmental impacts.
- Existing transportation and utility corridors may offer opportunities to minimize new landscape fragmentation where practicable.
- Floodplain compatibility should be incorporated into route selection alongside engineering and operational considerations.
- Public and private conservation investments represent significant landscape values that warrant consideration during planning.
- Wildlife movement and habitat connectivity are important landscape-scale factors in evaluating alternative alignments.
- Collaboration among utilities, agencies, landowners, and conservation organizations can improve project planning and strengthen public confidence.

CHAPTER 7

POTENTIAL ENVIRONMENTAL EFFECTS OF TRANSMISSION LINE DEVELOPMENT

Guiding Principle

Infrastructure projects inevitably alter the landscapes through which they pass. The objective of environmental planning is not to eliminate all impacts, but to identify, avoid, minimize, and mitigate them wherever practicable through careful route selection and responsible project design.

7.1 Introduction

Electric transmission systems are essential components of modern infrastructure and play a critical role in supporting economic development, public safety, and energy reliability. Like all major infrastructure projects, however, transmission line construction and operation have the potential to affect natural resources depending upon project location, design, construction methods, and long-term maintenance practices.

Within the Mississippi–Missouri Confluence, the potential effects of new transmission corridors should be evaluated within the context of an actively functioning floodplain supporting wetlands, bottomland hardwood forests, agricultural lands, and interconnected wildlife habitats. Many of these resources have been enhanced through decades of public and private conservation investment.

This chapter reviews the principal environmental considerations that may be relevant to transmission line development in the study area.

7.2 Temporary Construction Disturbance

Construction activities typically include:

- surveying;
- vegetation clearing within the right-of-way;
- access road improvements;
- foundation excavation;
- concrete placement;
- structure erection;
- conductor installation;

- site restoration.

Many of these activities are temporary; however, they can temporarily disturb soils, vegetation, and wildlife if not carefully managed.

Common best management practices include:

- limiting disturbance to the minimum necessary;
- erosion and sediment controls;
- restoration of temporarily disturbed areas;
- timing restrictions during sensitive wildlife seasons;
- protection of wetlands and water-control structures.

Careful construction planning can substantially reduce temporary environmental effects.

7.3 Long-Term Vegetation Management

Following construction, transmission rights-of-way require periodic vegetation management to maintain electrical safety and system reliability.

Vegetation management may alter forest structure within the maintained corridor while allowing compatible low-growing vegetation to become established.

Within floodplain landscapes, vegetation management plans should consider:

- native plant communities;
- invasive species prevention;
- pollinator habitat;
- erosion control;
- wetland vegetation;
- compatibility with adjacent habitat management.

Integrated vegetation management practices can often support both operational safety and ecological objectives.

7.4 Wildlife Considerations

The study area supports diverse wildlife communities that utilize forests, wetlands, grasslands, agricultural lands, and river corridors throughout the year.

Potential considerations include:

- temporary displacement during construction;
- seasonal breeding activity;

- nesting habitat;
- movement between habitat areas;
- disturbance from equipment and increased human activity.

Many wildlife species adapt successfully following construction when habitat connectivity is maintained and disturbance is minimized.

Construction scheduling outside sensitive nesting periods, where appropriate, may further reduce temporary effects.

7.5 Migratory Birds

The Mississippi Flyway is internationally recognized for supporting millions of migratory birds annually.

Transmission lines located within important migration corridors may present considerations related to:

- bird movement;
- visibility of conductors;
- seasonal migration;
- habitat use.

Modern transmission projects frequently incorporate design measures intended to reduce potential bird interactions, including bird flight diverters or other visibility-enhancing devices where appropriate.

Site-specific evaluation of migration patterns can help determine whether additional protective measures are warranted.

7.6 Bald Eagles

The coalition has documented bald eagle nests within the broader study area.

Bald eagles have demonstrated remarkable recovery across North America; however, they remain protected under federal law, and nesting sites continue to warrant careful consideration during project planning.

Project planning should include:

- confirmation of nest locations through field surveys;
- consultation with the U.S. Fish and Wildlife Service, where appropriate;
- consideration of seasonal construction timing;
- evaluation of opportunities to avoid unnecessary disturbance.

Early coordination allows engineering and environmental teams to identify practical avoidance measures before construction begins.

7.7 Wetlands and Water Resources

Wetlands within the Confluence perform numerous ecological functions.

Construction activities should seek to minimize:

- unnecessary wetland disturbance;
- alteration of drainage patterns;
- sediment movement;
- impacts to water-control structures;
- temporary soil compaction.

Where temporary impacts occur, restoration plans should be implemented to return disturbed areas to stable conditions.

Protection of existing water-management infrastructure is particularly important on managed conservation properties where habitat management depends upon carefully maintained hydrologic systems.

7.8 Floodplain Function

Floodplains are dynamic systems that continue functioning long after construction has been completed.

Accordingly, transmission design should consider:

- natural floodwater movement;
- sediment transport;
- erosion;
- access during flood events;
- long-term inspection requirements.

Maintaining natural floodplain processes benefits both ecological integrity and long-term infrastructure performance.

The flood photography presented throughout this assessment demonstrates the importance of evaluating these conditions using actual field observations rather than relying solely upon mapping.

7.9 Cumulative Landscape Effects

Individual transmission structures occupy relatively small footprints.

However, environmental review should also consider cumulative effects across the broader landscape.

Questions that merit evaluation include:

- Does the proposed corridor increase landscape fragmentation?
- Does it divide existing conservation properties?
- Does it reduce habitat connectivity?
- Does it affect long-term management of wetlands or forests?
- Can similar project objectives be achieved through alternative alignments?

Evaluating cumulative effects provides a broader understanding of how routing decisions may influence ecological systems over time.

7.10 Opportunities for Impact Avoidance and Minimization

One of the strengths of modern environmental planning is its emphasis on avoidance before mitigation.

Potential opportunities include:

- utilizing existing transportation corridors where practicable;
- avoiding intact wetland complexes where feasible;
- minimizing forest clearing;
- reducing construction during sensitive wildlife seasons;
- protecting existing levees and water-control infrastructure;
- restoring temporarily disturbed areas;
- coordinating with conservation land managers.

Many of these measures can be incorporated during design without compromising project reliability.

7.11 Summary

Transmission infrastructure and environmental conservation need not be viewed as competing objectives.

When projects are planned using sound engineering, comprehensive environmental information, and meaningful stakeholder engagement, opportunities frequently exist to reduce impacts while maintaining reliable electric service.

Within the Mississippi–Missouri Confluence, careful attention to wetlands, floodplain processes, wildlife habitat, conservation investments, and landscape connectivity can improve project outcomes and preserve one of Missouri's most significant ecological resources.

Key Findings

- Construction effects are often temporary and can be substantially reduced through appropriate planning and best management practices.
- Long-term vegetation management should support both transmission reliability and ecological health.
- Migratory birds and documented bald eagle nesting areas warrant careful evaluation during project planning.
- Wetlands, water-control structures, and floodplain functions should be protected where practicable.
- Environmental review should consider cumulative landscape effects in addition to site-specific impacts.
- Early avoidance and minimization measures are generally more effective than relying solely on post-construction mitigation.

CHAPTER 8

ECONOMIC, RECREATIONAL, AND CONSERVATION VALUES OF THE MISSISSIPPI–MISSOURI CONFLUENCE

Guiding Principle

Healthy natural systems provide measurable economic, recreational, and community benefits. Investments in conservation landscapes contribute not only to biodiversity but also to flood resilience, outdoor recreation, agricultural productivity, and the regional economy.

8.1 Introduction

The Mississippi–Missouri Confluence is often recognized for its ecological importance, yet its value extends far beyond wildlife habitat. The region is a working landscape that supports agriculture, outdoor recreation, conservation, education, tourism, and local businesses while providing ecosystem services that benefit communities throughout eastern Missouri.

The proposed transmission project is located within a landscape where these values intersect. Understanding these multiple benefits is an important part of evaluating routing alternatives and considering the long-term public interest.

8.2 A Legacy of Conservation

For more than a century, the Confluence has been shaped by conservation leadership from both public and private sectors.

Federal and state agencies, nonprofit organizations, conservation districts, and private landowners have invested substantial financial and human resources in:

- wetland restoration;
- bottomland forest conservation;
- floodplain management;
- wildlife habitat enhancement;
- water-control infrastructure;
- conservation education;
- public recreation.

These efforts have transformed the region into one of Missouri's premier conservation landscapes.

Many of today's healthy habitats are the result of decades of sustained stewardship rather than natural succession alone.

8.3 Private Stewardship

An important characteristic of the Confluence is the role of private conservation lands.

Hunting and fishing clubs, agricultural landowners, conservation easement holders, and family-owned properties collectively manage thousands of acres of wildlife habitat.

Typical stewardship activities include:

- wetland management;
- native grass restoration;

- invasive species control;
- forest management;
- levee maintenance;
- water-level management;
- habitat improvement.

These privately funded conservation efforts complement adjacent public conservation areas and contribute significantly to landscape-scale ecological connectivity.

The Horseshoe Lake Hunting & Fishing Club is representative of this long tradition of stewardship. Through ongoing habitat management and floodplain conservation, the property contributes to a broader network of lands supporting migratory birds, waterfowl, deer, turkey, bald eagles, and numerous other species.

8.4 Agriculture and Conservation

Agriculture remains one of the defining land uses within the Confluence.

Rather than existing in opposition, agriculture and conservation frequently operate together.

Seasonally flooded crop fields provide valuable forage for migratory waterfowl.

Field margins support pollinators and upland birds.

Agricultural producers often participate in conservation programs that improve soil health, water quality, and wildlife habitat while maintaining productive farming operations.

This integration of agriculture and conservation is one of the defining characteristics of the region.

8.5 Hunting, Fishing, and Outdoor Recreation

Outdoor recreation represents both an important cultural tradition and a significant contributor to the regional economy.

Activities supported by the Confluence include:

- waterfowl hunting;
- deer hunting;
- turkey hunting;
- fishing;
- birdwatching;
- wildlife photography;

- boating;
- kayaking;
- hiking;
- environmental education.

The region's hunting clubs—including Horseshoe Lake Hunting & Fishing Club and neighboring conservation properties—have preserved habitat while sustaining outdoor traditions that span multiple generations.

These recreational opportunities support local businesses including:

- sporting goods retailers;
- outfitters;
- lodging establishments;
- restaurants;
- fuel suppliers;
- equipment dealers.

Healthy natural landscapes therefore generate both ecological and economic benefits.

8.6 Ecosystem Services

The natural systems of the Confluence provide important public benefits that are often described as **ecosystem services**.

These include:

Flood Risk Reduction

Floodplains temporarily store large volumes of floodwater, helping reduce downstream flood peaks.

Water Quality Improvement

Wetlands filter sediments, nutrients, and pollutants before they reach major rivers.

Groundwater Recharge

Floodplain soils help replenish groundwater resources.

Carbon Storage

Bottomland hardwood forests and wetlands store significant amounts of carbon within vegetation and soils.

Wildlife Habitat

The region supports resident and migratory species throughout the year.

Recreation

Healthy ecosystems support outdoor recreation, tourism, and conservation education.

These services have measurable public value even though they are not always reflected directly in market prices.

8.7 Economic Value of Conservation Investments

The Confluence reflects substantial long-term public and private investment.

Examples include:

- land acquisition;
- habitat restoration;
- wetland construction;
- water-control infrastructure;
- levee improvements;
- conservation easements;
- educational facilities;
- public parks;
- wildlife management.

Private conservation properties have likewise benefited from decades of investment in habitat enhancement and stewardship.

Documented transactions indicate that certain conservation properties within the Confluence have commanded exceptionally high market values, reflecting the scarcity and ecological significance of large, contiguous floodplain landscapes.

Protecting these investments serves both conservation and economic objectives.

8.8 Community Identity

The Confluence is more than an ecological landscape.

It is part of the identity of surrounding communities.

Generations of families have hunted, fished, farmed, managed wetlands, restored habitat, and celebrated outdoor traditions throughout this region.

Conservation organizations, sporting clubs, schools, universities, and volunteers have worked together to maintain the landscape as both a natural resource and a cultural resource.

Infrastructure planning should recognize these community values alongside engineering and environmental considerations.

8.9 Compatibility Through Thoughtful Planning

Modern infrastructure and conservation are not mutually exclusive.

When projects are planned collaboratively and routed carefully, opportunities frequently exist to:

- reduce environmental impacts;
- protect long-term conservation investments;
- maintain recreational opportunities;
- preserve agricultural productivity;
- improve project resilience.

Evaluating alternative routes early in project development helps identify these opportunities before detailed engineering design is finalized.

8.10 Summary

The Mississippi–Missouri Confluence provides a wide range of ecological, recreational, agricultural, educational, and economic benefits.

Its value lies not only in individual habitats but also in the long history of stewardship that has created an interconnected conservation landscape.

Future infrastructure projects should build upon this legacy by recognizing conservation investments, supporting responsible land management, and selecting routes that minimize unnecessary impacts while achieving essential public infrastructure objectives.

Key Findings

- The Confluence supports agriculture, conservation, recreation, education, and local economies.
- Public and private conservation investments have created one of Missouri's most valuable floodplain landscapes.
- Hunting clubs, farmers, and conservation organizations play complementary roles in habitat stewardship.
- Ecosystem services—including flood storage, water-quality improvement, carbon storage, and wildlife habitat—provide substantial public benefits.

- Outdoor recreation contributes to the cultural identity and economy of the region.
- Careful route selection can help preserve these values while supporting modern electric infrastructure.

CHAPTER 9

SYNTHESIS OF FINDINGS AND RECOMMENDED PLANNING APPROACH

Guiding Principle

The strongest infrastructure decisions are those that integrate sound engineering, environmental science, responsible stewardship, and meaningful public participation. Long-term success is measured not only by reliable operation but also by the ability of a project to coexist with the natural and human landscapes through which it passes.

9.1 Introduction

The preceding chapters have examined the ecological significance of the Mississippi–Missouri Confluence, documented existing environmental conditions, reviewed engineering considerations, summarized the applicable regulatory framework, evaluated routing alternatives, and assessed the potential environmental effects associated with transmission line development.

Taken together, these chapters demonstrate that the Confluence is not simply another location through which infrastructure may pass. It is a highly functioning floodplain ecosystem that supports wildlife, agriculture, recreation, conservation, flood protection, and local communities while providing essential ecological services that extend far beyond the project area.

The purpose of this chapter is to synthesize these findings and identify planning principles that can guide the continued development of the Eastern Missouri Grid Transformation Project.

9.2 What the Assessment Demonstrates

The information assembled throughout this report supports several overarching observations.

First, the project area lies within one of the Midwest's most significant floodplain landscapes. Seasonal flooding, extensive wetlands, bottomland hardwood forests, managed wildlife habitat, and interconnected conservation lands distinguish the Confluence from many other potential transmission settings.

Second, the ecological condition of this landscape is the product of generations of stewardship by public agencies, nonprofit conservation organizations, agricultural producers, hunting clubs, and private landowners. The current landscape reflects decades of investment rather than passive preservation.

Third, the floodplain remains an active natural system. The flood photographs included in this assessment document recurring inundation that influences habitat conditions, construction access, engineering considerations, and long-term maintenance.

Finally, the study area contains documented wildlife resources—including bald eagle nesting locations—and supports an internationally important migratory bird corridor. These characteristics underscore the importance of careful environmental planning.

9.3 Integrating Engineering and Environmental Planning

Transmission planning is most effective when engineering and environmental disciplines work together from the earliest stages of project development.

Engineering analyses evaluate system reliability, constructability, structural design, and operational performance.

Environmental analyses evaluate floodplains, wetlands, wildlife habitat, hydrology, land use, and conservation resources.

Neither discipline alone provides a complete basis for route selection.

An integrated planning process allows project designers to identify opportunities to refine alignments before substantial engineering commitments have been made. This approach frequently reduces permitting challenges, lowers long-term maintenance risks, improves stakeholder confidence, and results in more resilient infrastructure.

9.4 The Importance of Landscape-Scale Planning

One of the central themes of this assessment is that environmental review should extend beyond individual parcels of land.

The Mississippi–Missouri Confluence functions as a connected landscape.

Wildlife moves freely among public conservation areas, privately managed wetlands, forests, agricultural fields, and river corridors. Floodwaters move across jurisdictional boundaries. Conservation investments made on one property often benefit neighboring lands.

Evaluating the project at this broader landscape scale provides a more complete understanding of how routing decisions may influence ecological connectivity and long-term stewardship.

9.5 Existing Infrastructure Corridors

The assessment repeatedly identifies the value of carefully evaluating existing transportation and utility corridors where practicable.

While each alignment presents unique engineering considerations, existing corridors often provide opportunities to:

- reduce new habitat fragmentation;
- consolidate infrastructure;
- simplify construction access;
- reduce impacts on previously undisturbed conservation lands;
- improve long-term maintenance efficiency.

The assessment does not conclude that any single corridor is appropriate in all circumstances. Rather, it recommends that these alternatives receive comprehensive engineering and environmental evaluation before final routing decisions are made.

9.6 The Value of Local Knowledge

An important finding of this assessment is the value of local experience.

Landowners, conservation managers, agricultural producers, hunting clubs, and local communities possess decades of practical knowledge regarding:

- flood behavior;
- drainage patterns;
- wildlife use;
- habitat management;
- levee systems;
- seasonal access conditions;
- water-management infrastructure.

The flood photographs, wildlife observations, and mapping presented throughout this report illustrate the importance of incorporating this knowledge into project planning.

When combined with engineering studies and biological surveys, local observations contribute to a more complete understanding of site conditions.

9.7 Long-Term Stewardship

Infrastructure projects typically remain in service for many decades.

Likewise, conservation investments within the Confluence represent commitments extending across generations.

Route selection should therefore consider not only immediate construction requirements but also long-term stewardship.

Questions worthy of consideration include:

- Will the selected route maintain ecological connectivity?
- Can future maintenance occur with minimal disruption?
- Does the alignment recognize existing conservation investments?
- Can engineering objectives be achieved while reducing environmental impacts?

Planning with a multi-generational perspective benefits both infrastructure owners and the public.

9.8 Principles for Responsible Route Selection

Based on the findings presented throughout this assessment, the coalition recommends that route evaluation be guided by the following principles:

1. **Support reliable electric infrastructure and modernization of the transmission system.**
2. **Recognize the Mississippi–Missouri Confluence as a landscape of exceptional ecological and public value.**
3. **Evaluate practicable alternatives using consistent engineering and environmental criteria.**
4. **Minimize unnecessary fragmentation of floodplain conservation landscapes.**
5. **Consider existing transportation and utility corridors where practicable.**
6. **Incorporate comprehensive field surveys into route planning.**
7. **Engage landowners, conservation organizations, and regulatory agencies throughout the planning process.**
8. **Preserve long-term opportunities for wildlife management, floodplain restoration, and conservation stewardship.**

9.9 Preferred Alternative Corridor

Based upon the environmental information compiled during preparation of this assessment, the coalition has identified a preferred alternative corridor that generally follows existing transportation and utility corridors while reducing impacts to environmentally sensitive floodplain resources east of Highway 79.

The preferred alternative is intended to:

- reduce fragmentation of wetlands and bottomland hardwood forests;
- avoid or minimize impacts to documented and suspected bald eagle nesting areas where practicable;
- reduce long-term engineering challenges associated with recurring flood conditions;
- minimize impacts to privately managed conservation lands; and
- utilize existing disturbed corridors where feasible.

The preferred alternative corridor is illustrated in **Appendix A, Figure A-4** and demonstrates that environmental protection and transmission reliability can be advanced simultaneously through careful route selection.

9.10 Looking Forward

The Eastern Missouri Grid Transformation Project presents an opportunity to demonstrate how modern infrastructure can be integrated into one of Missouri's most valuable conservation landscapes.

Advances in environmental planning, engineering design, geospatial analysis, and collaborative decision-making provide tools that were unavailable only a generation ago.

Applying these tools thoughtfully can improve environmental outcomes while maintaining the reliability and resilience of the electric transmission system.

The goal should not be to choose between infrastructure and conservation.

The goal should be to achieve both.

9.10 Summary

This assessment concludes that the Mississippi–Missouri Confluence is a landscape deserving careful consideration during transmission planning.

The environmental resources documented throughout this report—including wetlands, floodplains, forests, wildlife habitat, conservation lands, and recreational resources—represent long-term public and private investments that contribute significantly to Missouri's environmental, economic, and cultural heritage.

Through careful planning, comprehensive evaluation of alternatives, meaningful stakeholder engagement, and continued collaboration, it is possible to advance necessary electric infrastructure while protecting the ecological integrity of this extraordinary landscape.

The expanded exhibits contained in Appendix A—including regional conservation maps, flood photography, wildlife mapping, proposed routing corridors, and the preferred alternative corridor—provide additional visual support for the comparative evaluation presented in this chapter.

Key Findings

- The Confluence functions as a connected ecological system rather than a collection of isolated properties.
- The report's findings support integrating engineering, environmental science, and stakeholder engagement throughout project planning.
- Existing transportation and utility corridors merit careful evaluation where practicable.
- Local knowledge—including documented flood conditions and wildlife observations—provides valuable information for route selection.
- Long-term stewardship should be considered alongside immediate engineering and construction objectives.
- Reliable electric infrastructure and responsible conservation are compatible goals when supported by thoughtful planning.

CHAPTER 10

CONCLUSIONS, RECOMMENDATIONS, AND A PATH FORWARD

Guiding Principle

The most enduring infrastructure projects are those that respect both the needs of society and the landscapes in which they are built. By integrating sound engineering, environmental science, and collaborative planning, it is possible to strengthen the electric grid while preserving the natural systems that sustain communities, wildlife, and future generations.

10.1 Introduction

This Environmental Assessment has examined the relationship between the proposed Eastern Missouri Grid Transformation Project and the unique environmental resources of the Mississippi–Missouri Confluence.

The assessment has evaluated the ecological significance of the region, documented existing environmental conditions, reviewed engineering and regulatory considerations, examined routing alternatives, and considered the potential effects of transmission infrastructure within an active floodplain.

Throughout the report, one consistent conclusion has emerged:

Reliable electric infrastructure and responsible environmental stewardship are compatible public objectives.

The question is not whether the electric grid should be modernized. The question is how that modernization can best be accomplished while respecting one of Missouri's most significant natural landscapes.

10.2 Principal Conclusions

The information presented throughout this assessment supports the following principal conclusions.

Conclusion 1

The Mississippi–Missouri Confluence is a landscape of exceptional ecological importance.

The Confluence represents one of the Midwest's most valuable floodplain ecosystems. Its wetlands, forests, agricultural lands, and river corridors support wildlife, improve water quality, reduce flood risk, and sustain recreational opportunities that extend well beyond the project area.

Conclusion 2

The landscape reflects generations of stewardship.

The environmental quality of the Confluence has been achieved through decades of investment by federal and state agencies, conservation organizations, private landowners, agricultural producers, and local communities.

These investments have created a connected conservation landscape that should be recognized during infrastructure planning.

Conclusion 3

Floodplain conditions warrant careful engineering evaluation.

The flood photography and field observations presented throughout this assessment document recurring inundation across portions of the study area.

These conditions illustrate the importance of incorporating floodplain hydrology, soil conditions, access limitations, and long-term maintenance considerations into route selection.

Conclusion 4

Wildlife resources deserve careful consideration.

The study area supports diverse wildlife populations, including migratory birds, waterfowl, deer, turkey, and documented bald eagle nesting areas.

Comprehensive biological surveys and coordination with the appropriate resource agencies should continue throughout project planning.

Conclusion 5

Alternative routing deserves thorough evaluation.

One of the central findings of this assessment is the importance of evaluating practicable routing alternatives before final engineering decisions are made.

Existing transportation corridors, existing utility corridors, and other previously disturbed landscapes should be carefully evaluated where appropriate to determine whether project objectives can be achieved while reducing impacts to sensitive environmental resources.

The expanded visual documentation contained in Appendix A reinforces the findings of this assessment by illustrating the ecological connectivity, floodplain characteristics, wildlife resources, and engineering constraints discussed throughout the report. Together, these exhibits demonstrate the environmental significance of the Mississippi–Missouri Confluence and support careful consideration of routing alternatives that reduce impacts to sensitive resources.

10.3 Recommendations

Based upon the findings presented throughout this assessment, the coalition respectfully offers the following recommendations.

Recommendation 1

Continue modernizing Missouri's electric transmission system in support of long-term energy reliability.

Recommendation 2

Recognize the Mississippi–Missouri Confluence as one of the region's most significant ecological and conservation landscapes during project planning.

Recommendation 3

Conduct comprehensive field investigations prior to final route selection, including:

- wetland delineations;
- biological surveys;
- bald eagle surveys, where appropriate;
- floodplain evaluations;
- geotechnical investigations.

Recommendation 4

Evaluate all practicable routing alternatives using consistent engineering, environmental, operational, and community criteria.

Recommendation 5

Where practicable, consider existing transportation corridors, utility corridors, and other previously disturbed areas to reduce unnecessary fragmentation of intact conservation landscapes.

Recommendation 6

Continue meaningful consultation with:

- affected landowners;
- conservation organizations;
- local governments;
- regulatory agencies;
- agricultural producers;

- recreational stakeholders.

Recommendation 7

Develop construction and maintenance practices that minimize disturbance to wetlands, floodplain functions, wildlife habitat, and water-management infrastructure.

Recommendation 8

Maintain transparency throughout the planning and permitting process by providing opportunities for continued public participation and timely access to relevant project information.

Recommendation 9

Incorporate the preferred alternative corridor illustrated in Appendix A into the final engineering evaluation and compare its environmental, engineering, and operational performance against other proposed routing alternatives during the final route selection process.

10.4 A Shared Opportunity

The Eastern Missouri Grid Transformation Project presents more than an engineering challenge.

It presents an opportunity to demonstrate that major infrastructure improvements can be planned with careful attention to environmental stewardship.

Modern engineering tools, geospatial analysis, biological science, hydrologic modeling, and collaborative planning provide unprecedented opportunities to identify routing solutions that meet multiple public objectives simultaneously.

Rather than viewing conservation and infrastructure as competing interests, this project can become an example of how thoughtful planning achieves both.

10.5 The Importance of Partnership

Long-term success depends upon continued collaboration.

Utilities, landowners, conservation organizations, regulatory agencies, local governments, engineers, scientists, and citizens each possess valuable expertise.

The most durable solutions often emerge through open dialogue, transparent decision-making, and a willingness to evaluate alternatives before final commitments are made.

The information presented throughout this assessment—including maps, flood photography, wildlife observations, and field documentation—is offered in that spirit.

10.6 Looking Toward the Future

The Mississippi–Missouri Confluence has changed over centuries through natural processes and human stewardship.

Future generations will inherit the decisions made today.

Infrastructure constructed during this decade may remain in service well into the next century.

Likewise, wetlands restored today, forests protected today, and wildlife habitat maintained today will continue providing ecological, recreational, and economic benefits for decades to come.

Responsible planning therefore requires a long-term perspective that considers not only present needs but also future opportunities.

10.7 Final Statement

The coalition submitting this Environmental Assessment supports reliable electric infrastructure and recognizes the importance of maintaining a resilient transmission system for Missouri and the broader region.

At the same time, the coalition believes that the Mississippi–Missouri Confluence represents an extraordinary conservation landscape deserving thoughtful planning and careful stewardship.

The evidence presented throughout this report demonstrates that:

- the region supports nationally significant floodplain ecosystems;
- recurring floodplain conditions influence engineering and environmental planning;
- public and private conservation investments have created an interconnected landscape of exceptional value;
- wildlife resources, including documented bald eagle nesting areas, warrant careful consideration; and
- evaluating practicable routing alternatives offers an opportunity to reduce impacts while achieving the project's engineering objectives.

The coalition respectfully encourages project proponents and reviewing agencies to continue working collaboratively toward a routing solution that reflects the highest standards of engineering, environmental stewardship, and public service.

This Environmental Assessment demonstrates that modern transmission infrastructure and environmental stewardship are compatible objectives. By utilizing existing transportation and utility corridors wherever practicable, avoiding unnecessary impacts to floodplain resources east

of Highway 79, and considering the preferred alternative corridor identified in this assessment, the Eastern Missouri Grid Transformation Project can meet its reliability objectives while preserving one of Missouri's most important ecological landscapes for future generations.

Closing Reflection

"The Mississippi–Missouri Confluence is more than the meeting of two great rivers. It is the meeting place of natural history, human stewardship, agriculture, conservation, and community. The decisions made here will shape not only the future of the electric grid, but also the future of one of America's great floodplain landscapes. With thoughtful planning and collaboration, both can thrive."

Final Recommendations Summary

1. Support modernization of Missouri's electric transmission infrastructure.
2. Recognize the Mississippi–Missouri Confluence as a landscape of exceptional ecological importance.
3. Complete comprehensive environmental and engineering field investigations before final route selection.
4. Evaluate all practicable routing alternatives using transparent, multidisciplinary criteria.
5. Where practicable, utilize or parallel existing transportation and utility corridors to reduce new landscape fragmentation.
6. Protect wetlands, floodplain functions, wildlife habitat, and documented conservation investments through careful route selection and design.
7. Maintain meaningful collaboration with landowners, conservation organizations, public agencies, and local communities throughout project development.
8. Commit to a transparent planning process that balances infrastructure reliability with long-term environmental stewardship.

Thoughtful route selection can:

- Reduce environmental impacts.
- Improve long-term infrastructure resilience.
- Minimize future maintenance challenges in active floodplains.
- Preserve decades of public and private conservation investment.
- Support agriculture, outdoor recreation, tourism, and local economies.
- Strengthen public confidence in the planning process.

Protecting these resources today will benefit Missouri's communities, wildlife, and economy for generations to come.

OUR GOAL

We support the modernization of Missouri's electric transmission system.

We also believe that the Mississippi–Missouri Confluence is an extraordinary landscape whose ecological, economic, recreational, and cultural values deserve careful consideration during project planning.

With collaborative planning, transparent decision-making, and thoughtful route selection, Missouri can achieve both reliable energy infrastructure and lasting environmental stewardship.

Appendix A

Maps and Photographic Documentation

This appendix contains the maps and photographic documentation referenced throughout the Environmental Assessment.

Figure A-1. Regional Conservation Landscape and Study Area

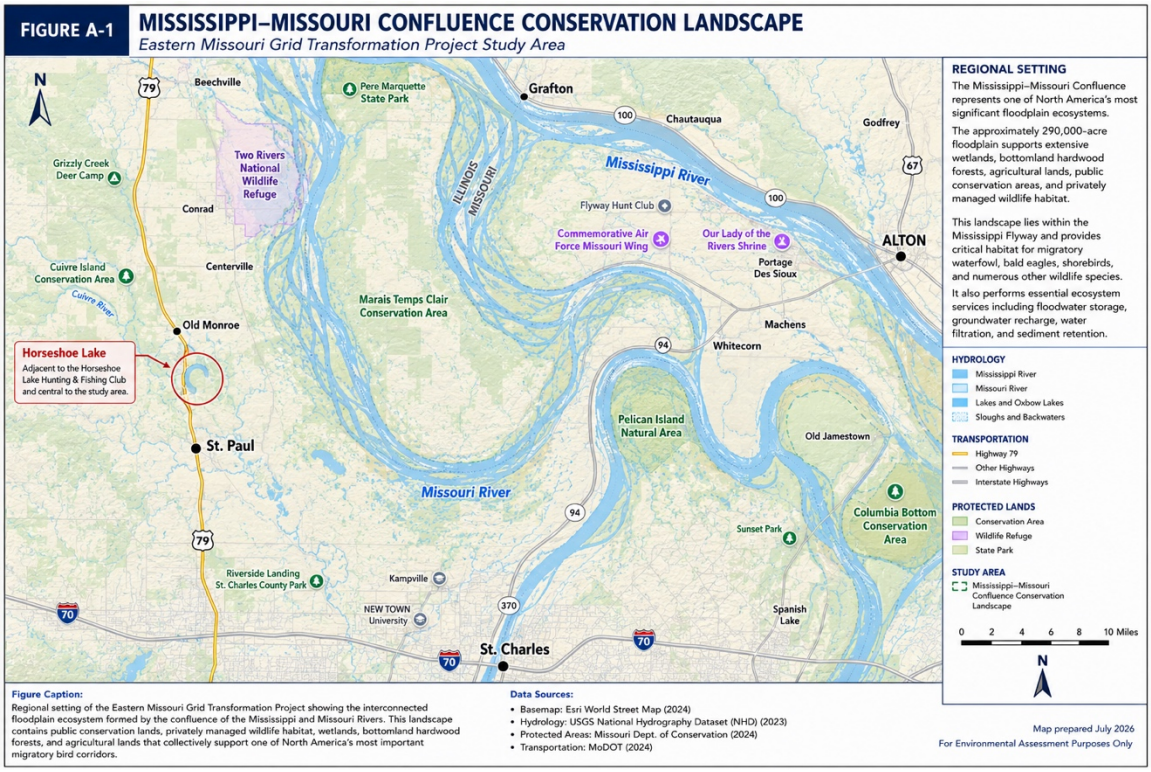

Figure A-2. Documented Bald Eagle Nest Locations

Figure A-2A. Suspected Bald Eagle Nest Location

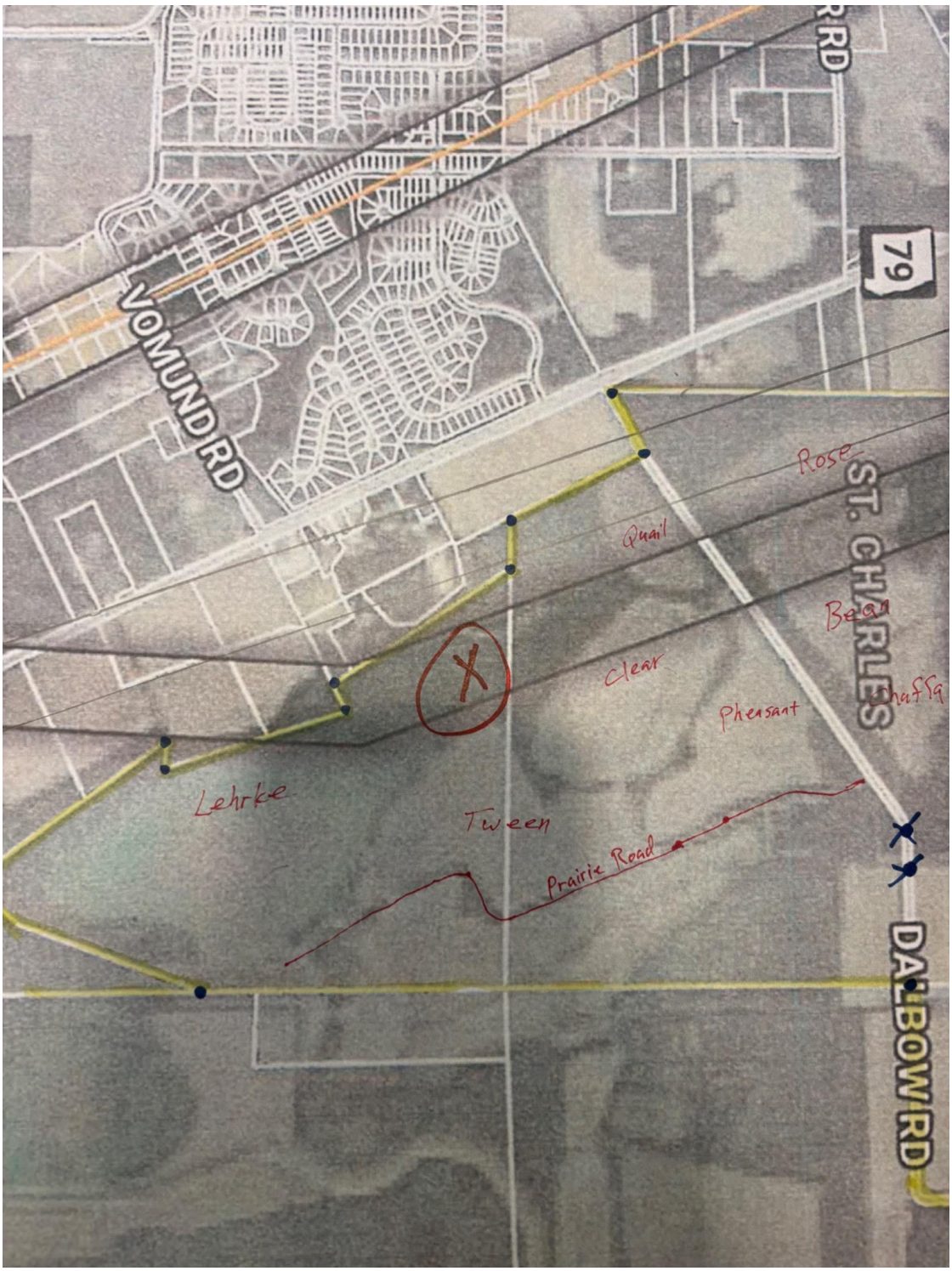

Figure A-3. Proposed Ameren Routing Corridors

Figure A-4. Coalition Preferred Alternative Corridor

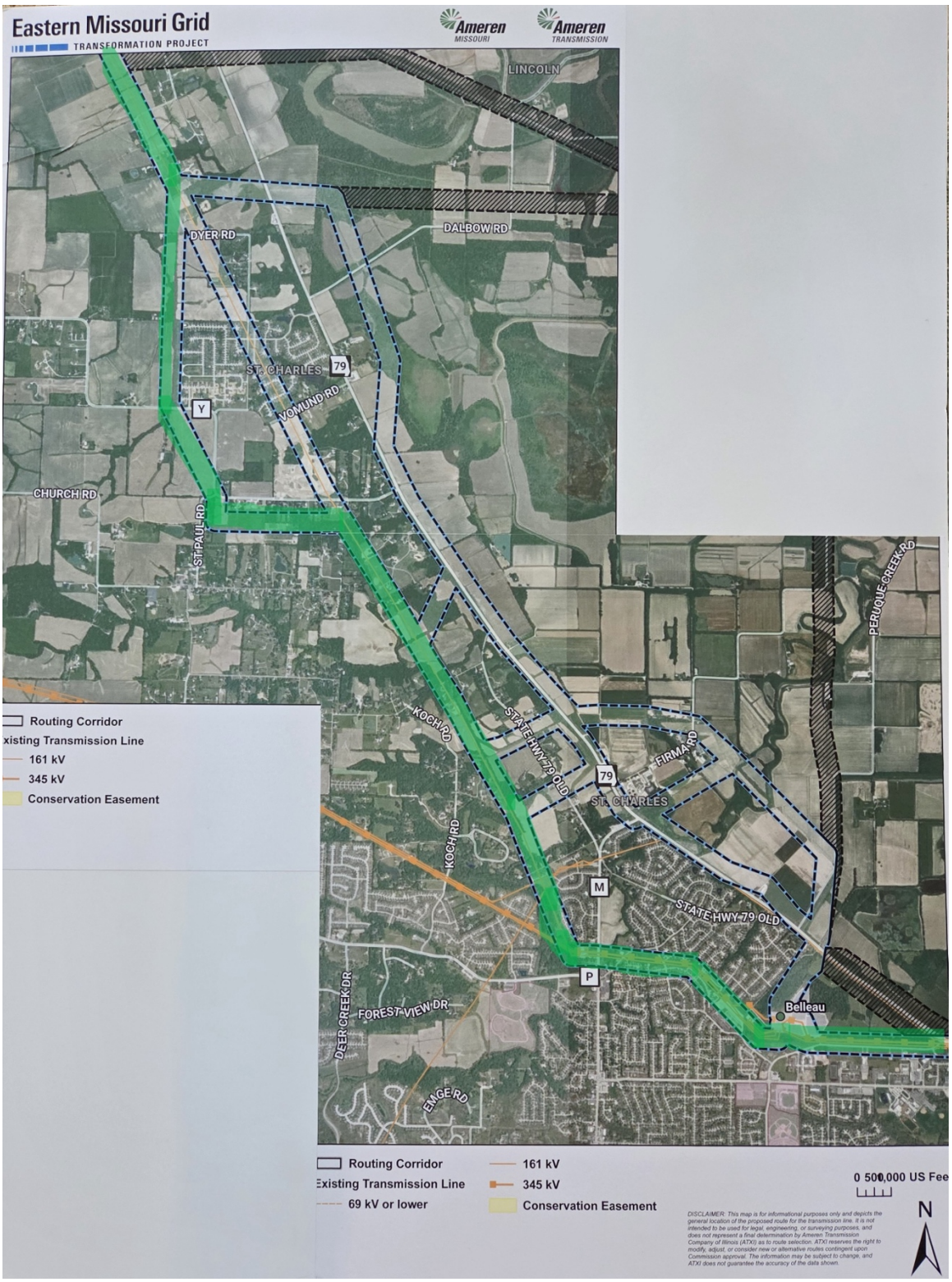

Figure A-4A. FEMA Floodplain Overlay

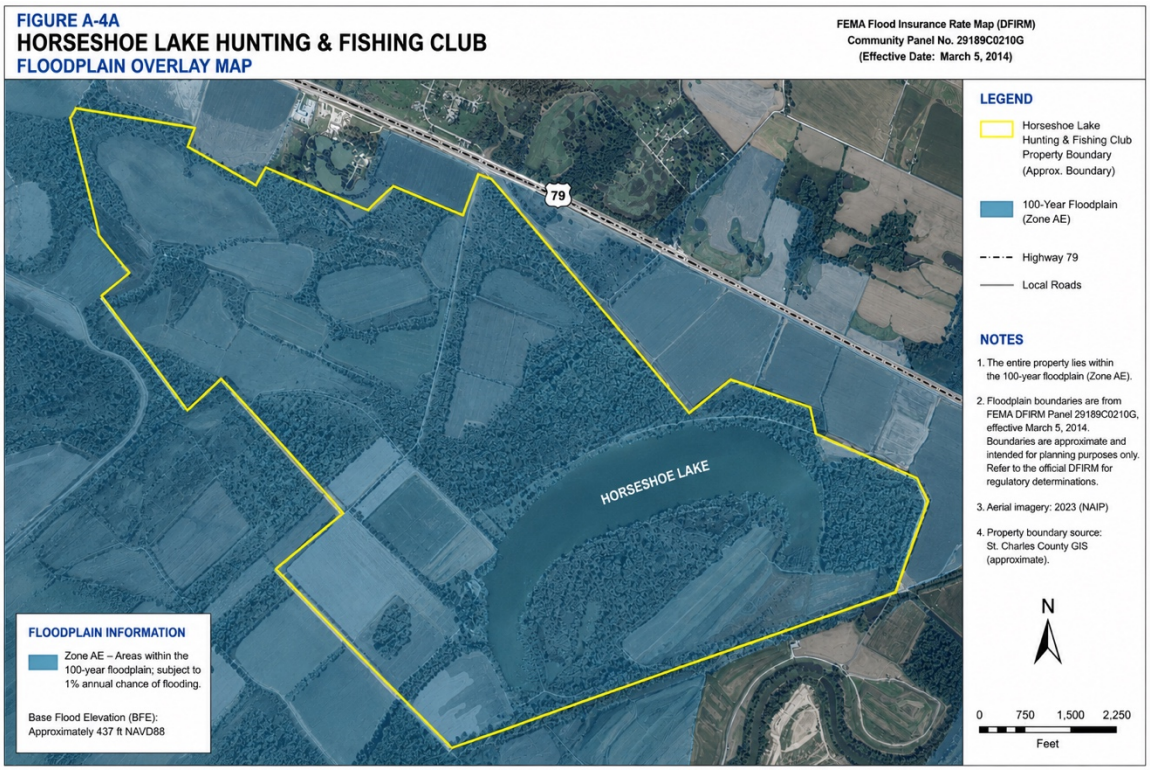

Figure A-5. Floodwaters Surrounding the Clubhouse

Figure A-6. Flooded Bottomland Hardwood Forest

Figure A-7. Managed Wetland

Figure A-8. Managed Wetland

Figure A-9. Flooded Agricultural Habitat

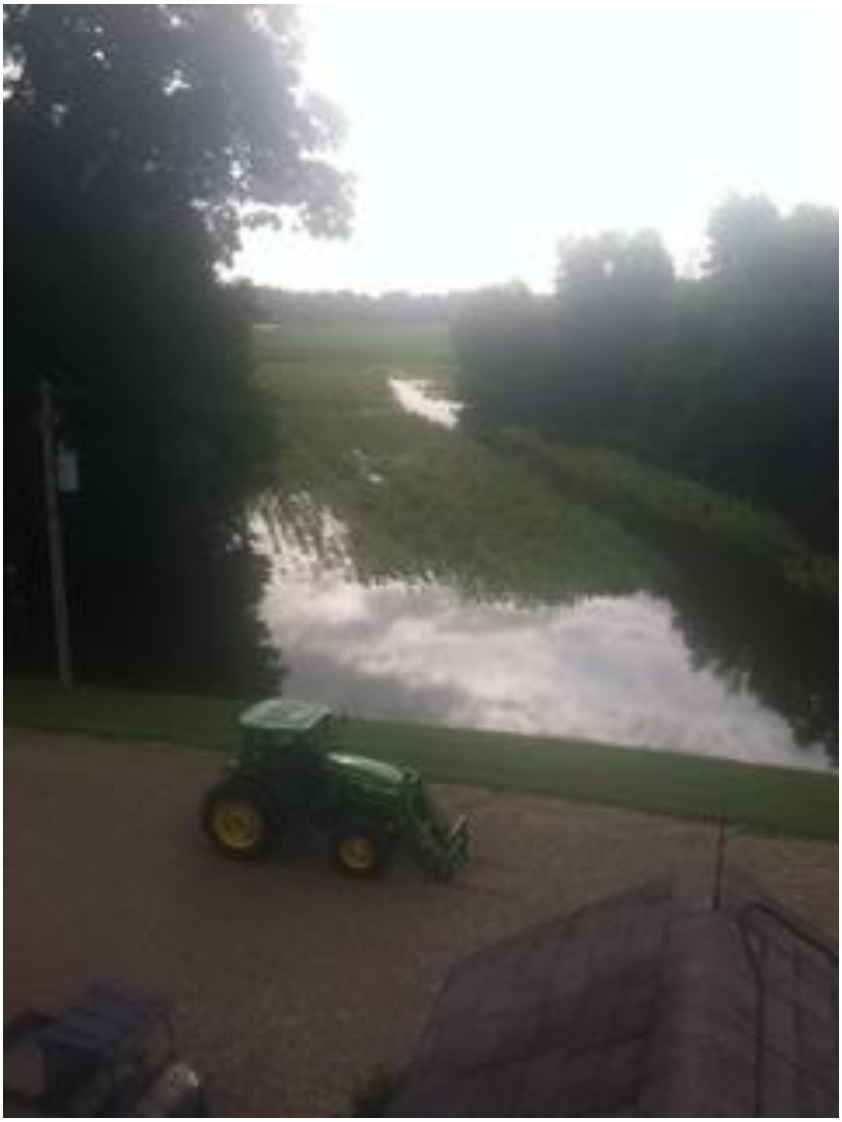

Figure A-10. Flooded Agricultural Habitat

Figure A-12. Flooded Roadway

Figure A-13. Boat Access

Figure A-14. Flooded Outbuilding

Figure A-15. Flooded Equipment Building

Figure A-16. Flooded Access Road

Figure A-17. Drainage Structure

Figure A-18. Aerial Floodplain Inundation

APPENDIX B

Wildlife Resources and Habitat Documentation

Protecting the Mississippi–Missouri Confluence

Wildlife Resources, Habitat Values, and Conservation Significance

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Purpose

This appendix documents the principal wildlife resources associated with the Mississippi–Missouri Confluence and the Horseshoe Lake Hunting & Fishing Club property. It provides a summary of habitat types, representative species, ecological functions, and conservation values that should be considered during transmission line routing and project planning.

The appendix supplements the Environmental Assessment by describing the biological resources supported by this landscape and the importance of maintaining habitat connectivity through thoughtful infrastructure planning.

B-1 Regional Ecological Significance

The Mississippi–Missouri Confluence is among the most important floodplain ecosystems in North America.

Located within the Mississippi Flyway, the region serves as a critical migration corridor connecting northern breeding grounds with wintering habitats throughout the southern United States and beyond.

The combination of wetlands, bottomland hardwood forests, agricultural lands, native grasslands, rivers, and managed waterfowl habitat supports exceptional biological diversity.

For more than a century, conservation organizations, public agencies, and private landowners have invested in preserving and restoring these resources.

B-2 Habitat Types

The study area contains a mosaic of interconnected habitat types that function collectively to support wildlife throughout the year.

Bottomland Hardwood Forests

Typical ecological functions include:

- nesting habitat
- roosting habitat
- mast production
- denning habitat
- migration stopover habitat
- floodwater storage
- nutrient cycling

Representative tree species include:

- pin oak
- swamp white oak
- silver maple
- cottonwood
- sycamore
- green ash
- pecan
- hackberry

Seasonal Wetlands

Seasonally flooded wetlands provide:

- waterfowl resting habitat
- feeding habitat
- amphibian breeding habitat
- aquatic invertebrate production
- floodwater storage
- sediment retention

Many wetlands within the project area are actively managed to improve habitat quality.

Agricultural Lands

Working agricultural lands provide:

- seasonal forage
- waste grain
- wildlife movement corridors

- edge habitat
- economic sustainability for landowners

Many species utilize agricultural lands in conjunction with adjacent wetlands and forests.

Native Grasslands

Native grasslands provide:

- nesting habitat
- brood habitat
- pollinator habitat
- wildlife travel corridors

Rivers and Backwaters

Aquatic habitats support:

- fish communities
- amphibians
- reptiles
- aquatic birds
- beaver
- river otter
- mussels
- aquatic insects

B-3 Waterfowl Resources

The Mississippi Flyway supports millions of migrating birds annually.

Representative species include:

Dabbling Ducks

- Mallard
- Northern Pintail
- Gadwall
- American Wigeon
- Green-winged Teal

- Blue-winged Teal
- Northern Shoveler
- Wood Duck

Diving Ducks

- Canvasback
- Redhead
- Lesser Scaup
- Ring-necked Duck
- Bufflehead
- Common Goldeneye

Geese

- Canada Goose
- Greater White-fronted Goose
- Snow Goose
- Ross's Goose

These species depend upon the floodplain for resting, feeding, and staging during migration.

B-4 Bald Eagles and Other Raptors

Documented bald eagle nests occur within or adjacent to the study area, and observations provided during preparation of this assessment indicate an additional probable nesting location that merits field verification before final route selection.

The mature floodplain forest provides suitable nesting and roosting habitat, while nearby wetlands and rivers support abundant prey resources.

Representative raptors include:

- Bald Eagle
- Red-tailed Hawk
- Red-shouldered Hawk
- Cooper's Hawk
- Sharp-shinned Hawk
- Barred Owl
- Great Horned Owl
- American Kestrel

Large transmission structures and associated corridors may present potential collision or disturbance concerns for some avian species. Accordingly, route selection should consider known nesting locations and important flight corridors and should incorporate appropriate avian protection measures where warranted.

B-5 Wading Birds and Shorebirds

Representative species include:

- Great Blue Heron
- Great Egret
- Snowy Egret
- Green Heron
- Black-crowned Night-Heron
- Killdeer
- Greater Yellowlegs
- Lesser Yellowlegs
- Wilson's Snipe

Seasonally flooded wetlands provide critical foraging habitat.

B-6 Songbirds

Bottomland forests support numerous migratory songbirds.

Representative species include:

- Prothonotary Warbler
- Yellow Warbler
- American Redstart
- Wood Thrush
- Eastern Wood-Pewee
- Indigo Bunting
- Baltimore Oriole
- Red-winged Blackbird

These forests contribute to regional biodiversity and support long-distance migrants during breeding and migration.

B-7 Mammals

Representative mammals include:

- White-tailed Deer
- Wild Turkey
- Beaver
- River Otter
- Raccoon
- Coyote
- Red Fox
- Gray Fox
- Bobcat
- Eastern Cottontail
- Fox Squirrel
- Gray Squirrel
- Virginia Opossum
- Nine-banded Armadillo (now established in parts of Missouri)

The area also provides habitat for smaller mammals that contribute to ecosystem function.

B-8 Reptiles and Amphibians

Representative species include:

- Northern Water Snake
- Midland Painted Turtle
- Common Snapping Turtle
- American Bullfrog
- Green Frog
- Chorus Frogs
- Leopard Frog
- Cricket Frog

Seasonal wetlands are especially important breeding habitat for amphibians.

B-9 Fish Communities

Representative species include:

- Largemouth Bass
- Bluegill
- Channel Catfish
- Flathead Catfish
- Crappie
- Carp
- Buffalo Fish
- Gar

These aquatic resources support recreational opportunities and ecological functions.

B-10 Pollinators and Beneficial Insects

Native habitats support:

- Monarch butterflies
- Native bees
- Dragonflies
- Damselflies
- Numerous beneficial insects

These species contribute to pollination and food-web stability.

B-11 Habitat Connectivity

The ecological value of the Confluence depends not only on individual habitat patches but on the connections among wetlands, forests, agricultural lands, rivers, and conservation properties.

Maintaining landscape connectivity benefits:

- migratory birds
- mammals
- reptiles
- amphibians
- pollinators

Routing decisions should seek, where practicable, to minimize fragmentation of intact habitat complexes.

B-12 Conservation Stewardship

The wildlife resources documented in this appendix reflect decades of stewardship by:

- private landowners
- hunting and fishing clubs
- agricultural producers
- conservation organizations
- state agencies
- federal agencies

Collectively, these efforts have helped preserve one of Missouri's most productive and biologically diverse floodplain landscapes.

B-13 Summary of Wildlife Findings

Based upon available information, field observations, photographs, and the habitat characteristics of the study area, the following conclusions are supported:

- The Mississippi–Missouri Confluence provides habitat for a wide diversity of wildlife throughout the year.
- The region functions as a critical component of the Mississippi Flyway and supports significant concentrations of migratory birds.
- Wetlands, bottomland hardwood forests, agricultural lands, and riparian corridors operate as an interconnected ecological system.
- Documented bald eagle nesting activity and additional observed nesting behavior indicate the importance of carefully evaluating potential effects on raptor habitat during route selection.
- Maintaining habitat connectivity and minimizing unnecessary fragmentation, where practicable, can help sustain the ecological integrity of the landscape while accommodating needed infrastructure improvements.

APPENDIX C

Technical Appendix of Supporting Authorities

Protecting the Mississippi–Missouri Confluence

Supporting Scientific, Engineering, and Regulatory Authorities

Purpose

This Technical Appendix identifies the principal scientific literature, engineering guidance, regulatory authorities, and conservation resources that support the findings and recommendations presented in this Environmental Assessment.

The references are intended to assist project planners, engineers, regulatory agencies, elected officials, conservation organizations, and interested stakeholders in evaluating routing alternatives for the Eastern Missouri Grid Transformation Project.

The sources cited represent widely recognized authorities within their respective disciplines.

I. ELECTRIC TRANSMISSION PLANNING

Edison Electric Institute (EEI)

Relevant guidance regarding:

- transmission planning
- utility corridor management
- right-of-way management
- transmission reliability

Supports:

- use of existing utility corridors where feasible
- best management practices
- integrated planning

North American Electric Reliability Corporation (NERC)

Relevant standards concerning:

- transmission reliability
- grid resilience
- long-term planning
- system integrity

Supports:

- modernization objectives
- infrastructure reliability

Federal Energy Regulatory Commission (FERC)

Relevant policy concerning:

- transmission planning
- regional coordination
- public interest
- infrastructure development

Supports:

- balanced infrastructure planning
- consideration of alternatives

II. FLOODPLAIN ENGINEERING

FEMA

National Flood Insurance Program

Engineering guidance regarding:

- floodplains
- floodways
- flood elevations
- flood storage
- flood hazards

Supports:

- floodplain avoidance
- resilient infrastructure
- engineering analysis

U.S. Army Corps of Engineers

Engineering guidance including:

- floodplain hydraulics
- river engineering

- wetlands
- levees
- scour
- channel migration

Supports:

- foundation design
- maintenance access
- floodplain compatibility

American Society of Civil Engineers (ASCE)

Relevant publications include:

- ASCE 24 (Flood Resistant Design and Construction)
- Manuals of Practice
- geotechnical guidance

Supports:

- engineering best practices
- flood-resistant infrastructure
- resilient design

III. WETLAND SCIENCE

U.S. Army Corps of Engineers Wetland Delineation Manual

Supports:

- wetland identification
- jurisdictional analysis
- mitigation sequencing

Regional Wetland Supplements

Applicable regional guidance for the Midwest.

Society of Wetland Scientists

Research concerning:

- wetland functions
- restoration
- ecosystem services

Supports:

- flood storage
- water quality
- wildlife habitat

IV. WILDLIFE CONSERVATION

U.S. Fish & Wildlife Service

Guidance regarding:

- migratory birds
- bald eagles
- habitat conservation
- transmission line planning

Supports:

- collision reduction
- nest protection
- habitat stewardship

Bald and Golden Eagle Protection Act

Supports:

- avoidance of disturbance
- consideration of nesting areas
- conservation planning

Migratory Bird Treaty Act

Supports:

- protection of migratory bird populations
- conservation planning

Avian Power Line Interaction Committee (APLIC)

Important publications:

Suggested Practices for Avian Protection on Power Lines

Reducing Avian Collisions with Power Lines

Supports:

- line marking
- route selection
- bird-safe design

V. WATER RESOURCES

Clean Water Act

Relevant provisions include:

Section 401

Section 402

Section 404

Supports:

- wetlands
- aquatic resources
- avoidance and minimization

Rivers and Harbors Act

Applicable where federal waters are involved.

National Flood Insurance Program

Supports:

- floodplain management
- resilience

VI. ENVIRONMENTAL REVIEW

National Environmental Policy Act (NEPA)

Although applicability depends upon federal involvement, NEPA provides a widely recognized planning framework emphasizing:

- alternatives analysis
- cumulative impacts
- interdisciplinary review
- informed decision-making
- public participation

Council on Environmental Quality (CEQ)

Relevant guidance concerning:

- environmental review
- alternatives
- mitigation hierarchy

VII. MISSOURI AUTHORITIES

Missouri Public Service Commission

Relevant authorities regarding:

- certificate proceedings
- public convenience
- necessity
- routing considerations

Missouri Department of Conservation

Relevant resources concerning:

- wetlands
- migratory birds
- fisheries
- wildlife habitat
- conservation planning

Missouri Department of Natural Resources

Relevant guidance regarding:

- floodplains
- water quality
- wetlands
- environmental permitting

VIII. CONSERVATION SCIENCE

Ducks Unlimited

Technical publications concerning:

- wetland restoration
- waterfowl habitat
- floodplain management

The Nature Conservancy

Landscape-scale conservation planning

Habitat connectivity

Floodplain restoration

Audubon

Bird conservation

Migratory bird science

Collision research

IX. FLOODPLAIN ECOLOGY

Representative scientific topics include:

Bottomland hardwood forests

Floodplain ecology

Hydrologic connectivity

Ecosystem services

Carbon storage

Habitat fragmentation

Landscape ecology

Connectivity science

X. ENGINEERING BEST PRACTICES

Widely accepted engineering principles encourage:

• Avoid unnecessary environmental impacts whenever practicable.

• Consider long-term maintenance during route selection.

• Incorporate floodplain engineering early in project planning.

• Evaluate geotechnical conditions before final alignment.

• Minimize fragmentation of intact landscapes.

• Utilize existing transportation and utility corridors where practicable.

• Coordinate engineering with environmental planning.

XI. PRINCIPAL ENVIRONMENTAL FINDINGS SUPPORTED BY THESE AUTHORITIES

Collectively, the authorities summarized in this appendix support several broad planning principles reflected throughout this Environmental Assessment:

- Reliable electric transmission and environmental stewardship are compatible objectives when integrated into project planning.
- Floodplains present distinctive engineering, operational, and maintenance considerations that merit careful evaluation during route selection.
- Wetlands and bottomland hardwood forests provide valuable ecosystem services, including floodwater storage, water-quality improvement, and wildlife habitat.
- Avoidance and minimization of impacts, where practicable, are generally more effective than relying solely on compensatory mitigation after impacts occur.
- Existing transportation and utility corridors may, in appropriate circumstances, reduce fragmentation of intact landscapes and should be evaluated during alternatives analysis.
- Early collaboration among utilities, regulators, landowners, conservation organizations, and local communities often leads to more informed and durable routing decisions.

XII. Selected References

A final publication should include a complete bibliography. The following organizations publish guidance and technical materials that informed this assessment:

- American Society of Civil Engineers (ASCE)
- Avian Power Line Interaction Committee (APLIC)
- Council on Environmental Quality (CEQ)
- Ducks Unlimited
- Edison Electric Institute (EEI)
- Federal Emergency Management Agency (FEMA)
- Federal Energy Regulatory Commission (FERC)
- Missouri Department of Conservation
- Missouri Department of Natural Resources
- Missouri Public Service Commission
- National Audubon Society
- North American Electric Reliability Corporation (NERC)
- Society of Wetland Scientists
- The Nature Conservancy
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service

APPENDIX D
Authorities Cited

I. Federal Statutes

Bald and Golden Eagle Protection Act, 16 U.S.C. §§ 668–668d.

Clean Water Act, 33 U.S.C. §§ 1251–1387.

Endangered Species Act of 1973, 16 U.S.C. §§ 1531–1544.

Federal Power Act, 16 U.S.C. §§ 791a–828c.

Migratory Bird Treaty Act, 16 U.S.C. §§ 703–712.

National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321–4370h.

Rivers and Harbors Act of 1899, 33 U.S.C. §§ 401–426.

II. Federal Regulations

33 C.F.R. Parts 320–332 (U.S. Army Corps of Engineers Regulatory Program).

40 C.F.R. Parts 1500–1508 (Council on Environmental Quality NEPA Regulations).

50 C.F.R. Part 22 (Eagle Permits).

50 C.F.R. Part 21 (Migratory Bird Permits).

III. Missouri Authorities

Missouri Public Service Commission statutes and applicable regulations governing certificates of convenience and necessity.

Missouri Department of Conservation.

Missouri Department of Natural Resources.

Missouri State Wildlife Action Plan.

IV. Engineering Standards

American Society of Civil Engineers.

ASCE 24-24
Flood Resistant Design and Construction.

American Society of Civil Engineers.

Manuals and Reports on Engineering Practice.

American Society of Civil Engineers.

Geotechnical Special Publications.

American Association of State Highway and Transportation Officials.

AASHTO LRFD Bridge Design Specifications.

Federal Highway Administration.

Hydraulic Engineering Circular Series.

Federal Emergency Management Agency.

Flood Insurance Study Guidelines.

National Flood Insurance Program Technical Bulletins.

U.S. Army Corps of Engineers.

Engineering Manuals relating to:

- levees
- scour
- hydraulic design
- floodplain management

V. Electric Transmission References

Avian Power Line Interaction Committee.

Reducing Avian Collisions with Power Lines.

Avian Power Line Interaction Committee.

Suggested Practices for Avian Protection on Power Lines.

Edison Electric Institute.

Transmission Line Siting Guidance.

Right-of-Way Best Practices.

North American Electric Reliability Corporation.

Transmission Reliability Standards.

Planning Standards.

Federal Energy Regulatory Commission.

Transmission Planning Orders and Guidance.

VI. Wetland References

Cowardin, L. M., Carter, V., Golet, F. C., & LaRoe, E. T.

Classification of Wetlands and Deepwater Habitats of the United States.

U.S. Fish and Wildlife Service.

Mitsch, W. J., & Gosselink, J. G.

Wetlands.

John Wiley & Sons.

Society of Wetland Scientists.

Professional guidance documents.

U.S. Army Corps of Engineers.

Wetland Delineation Manual.

Regional Supplements.

VII. Floodplain Ecology

Junk, W. J., Bayley, P. B., & Sparks, R. E.

The Flood Pulse Concept.

Ward, J. V.

Riverine Floodplain Ecology.

National Research Council.

Floodplain Management reports.

VIII. Landscape Ecology

Forman, R. T. T.

Road Ecology.

Island Press.

Forman, R. T. T.

Land Mosaics.

Cambridge University Press.

Turner, M. G.

Landscape Ecology.

IX. Conservation Biology

Soulé, M. E.

Conservation Biology.

Primack, R.

Essentials of Conservation Biology.

The Nature Conservancy.

Landscape Conservation Planning.

X. Wildlife References

U.S. Fish & Wildlife Service.

Bald Eagle Management Guidelines.

U.S. Fish & Wildlife Service.

Migratory Bird Program publications.

Missouri Department of Conservation.

Waterfowl Management publications.

Missouri Department of Conservation.

Bottomland Hardwood publications.

Ducks Unlimited.

Wetland Restoration Manuals.

National Audubon Society.

Bird Conservation publications.

XI. Hydrology

Dunne, T.

Hydrology texts.

Leopold, L. B.

A View of the River.

Leopold, Wolman & Miller.

Fluvial Processes in Geomorphology.

XII. Climate and Flooding

Intergovernmental Panel on Climate Change.

Assessment Reports.

National Oceanic and Atmospheric Administration.

Hydrologic publications.

U.S. Geological Survey.

Flood frequency publications.

River hydrology.

XIII. Ecosystem Services

Millennium Ecosystem Assessment.

National Academies.

Natural Infrastructure reports.

The Economics of Ecosystems and Biodiversity.

XIV. Case Studies

Examples to discuss include:

- Prairie State transmission planning
- Cardinal–Hickory Creek
- Grain Belt Express
- SOO Green HVDC Link
- SunZia Transmission Project
- Gateway West Project

These illustrate approaches to routing, stakeholder engagement, and environmental review. The discussion should accurately describe each project's context and avoid implying that the outcomes or regulatory requirements are directly comparable.

XV. Technical References

FEMA Technical Bulletins.

USACE Engineering Circulars.

EPA Wetland guidance.

USGS Professional Papers.

Natural Resources Conservation Service soil surveys.

National Wetlands Inventory.

National Hydrography Dataset.

XVI. Geographic Data Sources

Federal Emergency Management Agency flood mapping.

National Wetlands Inventory.

National Land Cover Database.

USGS topographic mapping.

Missouri Spatial Data Information Service.

USDA soil surveys.

Missouri Department of Conservation GIS layers.

XVII. Scientific Journals

Journal of Wildlife Management

Wetlands

Ecological Applications

Conservation Biology

Journal of Applied Ecology

Ecological Engineering

River Research and Applications

Landscape Ecology

Environmental Management

BioScience

Hydrological Processes

Journal of Environmental Management