Appendix PP
Mid-States Corridor Project
Tier 1 Biological Assessment
Southwest Indiana
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1 Introduction

The purpose of this biological assessment is to review the proposed Mid-States Corridor in sufficient detail to determine whether the proposed action may affect any of the threatened, endangered, proposed or sensitive species listed below. This biological assessment is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (16 U.S. C. 1536 (c)) and follows the standards established in Indiana Department of Transportation (INDOT) NEPA guidance.

2 Proposed Action

The Indiana Department of Transportation has conducted a major regional study of transportation needs with a 12-county Study Area in Southern Indiana. This study has identified the need for increased personal, business and logistical accessibility within this Study Area. This section briefly summarizes how these needs were identified as the basis for the proposed action. The information in this section is a high-level summary of **Chapter 1 – Purpose and Need** and **Section 2.1 – Process Overview** in the **Mid-States Tier 1 DEIS**.

2.1 Study Area and Tiering

As described in Section 3, the Mid-States Corridor project is the latest in a series of studies evaluating transportation needs in Southern Indiana. The areas which these studies evaluated are bounded by I-69 to the west and north, SR 37 to the east, and the Ohio River to the south. The Study Area for the Mid-States Corridor project was designated as including the twelve counties within these boundaries. Figure 1 shows the Study Area for the Mid-States Tier 1 EIS.

The Council on Environmental Quality (CEQ) allows major EISs to be tiered (40 CFR 1508.28: Tiering). Tiering considers broader issues such as selection of the general location and mode choice in Tier 1, with more detailed site-specific impacts considered in Tier 2. For large, complex transportation projects, tiering is beneficial for both the lead federal agency providing approval and the lead state agency planning the transportation improvement. It also is beneficial to elected officials, stakeholders, and the public by providing the opportunity for input early in the planning and project development process.

Without tiering, the EIS would need to conduct detailed field studies over much of the Study Area. The EIS also would need to develop more detailed engineering plans for all alternatives carried forward. These plans would need to provide a final alignment with an associated construction footprint. These activities would greatly increase project costs and schedule. Through tiering, the Tier 1 EIS can focus on determining the Purpose and Need and the appropriate corridor. Subsequent detailed Tier 2 NEPA studies determine the project's final alignment.

Figure 1. Mid-States Corridor Study Area

2.2 Project Need

The Indiana Department of Transportation has identified significant unmet accessibility needs within the project area. These unmet needs are for personal, business, and logistical accessibility. The major industrial area of Central Dubois County and the cities of Huntingburg and Jasper are the focus of these unmet needs. However, unmet needs exist elsewhere throughout the 12-county Study Area. These accessibility needs are associated with the three core goals of the project's Purpose and Need. Alternatives must have adequate performance on the core goals in order to receive consideration as the preferred alternative. As described in Section 5, two of the five alternatives carried forward for detailed study did not have adequate performance on the core goals. Accordingly, they did not receive further consideration as the preferred alternative.

2.2.1 Major Business Market Accessibility (Core Goal)

Goal 1 is "Increase accessibility to major business markets." Its performance measures assess the ability of alternatives to increase accessibility between 12 city origin-destination pairs. It also assesses their ability to increase labor force access to five major employment locations within the Study Area. These performance measures assess the ability of alternatives to provide increased personal and business accessibility in the Study Area.

2.2.2 More Efficient Truck/Freight Travel (Core Goal)

Goal 2 is "Provide more efficient truck/freight travel in Southern Indiana." Its performance measure assesses the ability of alternatives to reduce vehicle-hours of truck travel within the Study Area. This performance measure assesses the ability of alternatives to provide increased business accessibility in the Study Area.

2.2.3 Improved Intermodal Access (Core Goal)

Goal 7 is "Increase access to major intermodal centers from Southern Indiana." Its 12 performance measures assess the ability of alternatives to increase accessibility between two major business origins (Jasper and Crane) and six major freight intermodal facilities. These performance measures assess the ability of alternatives to provide increased logistical accessibility in the Study Area.

In addition to the three core goals, four other secondary goals were identified during the development of the Purpose and Need. Performance on these goals were evaluated, **but were not considered in identifying a preferred alternative.** Performance on these goals may be considered for decisions about project programming and scheduling. These secondary goals address congestion, safety, and economic development within the Study Area.

2.3 Project Purpose

The purpose of the project is to provide an improved highway corridor that increases major business market accessibility, provides more efficient truck/freight travel and improves intermodal access in the 12-county Mid-States Corridor Study Area.

2.4 Proposed Action Scope

For the purposes of the Mid-States Corridor Tier 1 Endangered Species Act Section 7 consultation, the scope of the proposed action includes the following:

- Alternative P Corridor including Loogootee corridor variations (see Section 5.3)
- Local Improvements for segments along US 231 (see Section 5.4)
- All preliminary AMMs outlined in the Tier 1 biological assessment
- All conservation measures outlined in the Tier 1 biological assessment: bat habitat forest loss mitigation via in-lieu fee, mitigation banking credits, project specific site development, and/or habitat preservation conservation easement.

3 Previous Studies

Six previous studies were reviewed as part of determining the project's Purpose and Need. They illustrate a continuing interest in improved major north-south connections in the Study Area. The desire for improved north-south connections has increased in the years just prior to the initiation of the Mid-States Tier 1 EIS in 2019. Key needs identified in these studies included supporting freight and logistics. **DEIS Section 1.3 – Previous Studies** and **Section 3 – Previous Studies** in **Appendix CC** provide details.

These studies included:

- **US 231 in Dubois County (2004 and 2011).** A DEIS (2004) and Supplemental DEIS (2011) documented a history of planning studies for a bypass of Jasper and Huntingburg dating back to 1993. This DEIS/SDEIS were never finalized. This project had a limited Study Area of about 50 square miles. The Study Area for the Mid-States Corridor project is approximately 100 times as large.
- **I-67 Corridor Feasibility Study (2012).** This study was conducted by Cambridge Systematics for a private entity representing regional businesses. It considered transportation needs for a corridor extending from Nashville, Tennessee to southern Michigan. The study concluded that such an improved corridor would lead to significant growth in existing businesses and attract many new businesses.
- **Blue Ribbon Panel on Transportation Infrastructure Report (2014).** This panel was commissioned by Indiana Governor Michael Pence to evaluate major highway, rail, port and air projects throughout Indiana. The Mid-States Corridor project was identified as one of four Tier 2 statewide priorities. It was assumed to connect to I-69 at Petersburg.
- **Conexus Southwest Indiana Logistic Sector Plan (2015).** Conexus is a not-for-profit organization which seeks to grow Indiana's advanced manufacturing and logistics industries. It labeled the Mid-States Corridor as a Tier 1 (top level) priority for the region. It included optional connections to I-69 at either Washington or Crane.
- **Mid-States Corridor White Paper (2017).** This report was authored by Lochmueller Group. It reviewed the previous studies described above, and recommended a Tiered EIS be used to advance the project.

- **US 231 Corridor Assessment (2018).** This report was authored by WSP for INDOT. It identified potential next steps to address needs in the US 231 corridor.

These studies show the continuing interest by Southern Indiana stakeholders and businesses for improved north-south connections within the Study Area. These studies were provided by INDOT and other entities. These studies recommended connections to I-69 at multiple locations and illustrate the continuing desire to improve north-south accessibility within the Study Area, especially for freight and logistics needs.

4 Tier 1 Biological Assessment Approach

As described in Section 2.1, the purposed of the Tier 1 process is identify a corridor through the NEPA process within which a design alignment can be determined during the Tier 2 phase. Similarly, the Tier 1 biological assessment phase is a high level comprehensive evaluation of the preferred Tier 1 corridor (Alternative P Corridor) that is of sufficient scope and coverage for the purposes of determining "jeopardy" under Section 7 of the Endangered Species Act. As part of the Tier 1 NEPA process, potential endangered species impact concerns for the Alternatives Carried Forward for Further Consideration were taken into account along with multiple other environmental, socio-economic, transportation need, and cost parameters to select a preferred alternative that meet the project purpose and need with the least environmentally damaging solution.

The approach to the Tier 1 biological assessment for Section 7 consultation was commensurate with the Tier 1 NEPA approach, in that it is focused on higher order level of evaluation to determine potential impacts to the species of concern identified through early coordination with the U.S. Fish and Wildlife Service (USFWS). Through early consultation with the USFWS, it was concluded that species specific field survey studies would not be required to evaluate the Alternative P Corridor for the purposes of a "jeopardy" analysis. As such, the Tier 1 biological assessment was based solely on a landscape scale analysis using GIS data, available literature, and personal communication with biologist familiar with and knowledgeable about the species of concern.

The GIS sources used for this analysis included, but not limited to:

- USFWS species occurrence data for bats and mussels
- Indiana Department of Natural Resources (IDNR) Natural Heritage Data Center
- National Land Cover Data (NLCD)
- National Wetland Inventory (NWI)
- National Hydrology Dataset (NHD)
- IDNR Managed Lands
- Indiana Geological Survey (IGS) sinkhole and springs

GIS data in combination with aerial photography interpretation was the foundation for the analysis of potential habitat of the species of concern. Although this approach cannot definitely determine presence or absence for each species of concern of distribution of local populations across the Mid-States Corridor project area landscape, it is regarded to provide a suitable degree of certainty for the purposes of a "jeopardy analysis".

5 Project Description

The DEIS **Chapter 2 – Alternatives** describes the step-by-step process of considering alternatives at increasing levels of detail. At each step, some alternatives were eliminated from further

consideration, while others were retained and analyzed in further detail. The following sections describe the process by which Alternative P was identified as the single preferred alternative in the DEIS. As also described below, Alternative P has been modified for the FEIS/ROD by incorporating variations at Loogootee. These variations will be carried forward into Tier 2 studies, where a single variation will be chosen.

5.1 Conceptual and Preliminary Alternatives

The initial stages of alternative development considered a broad range of highway and non-highway alternatives. Eighteen (18) conceptual alternatives were identified through review of previous studies (see Section 3) public input and agency input. See **DEIS Appendix D – Screening of Alternatives Report**, **Preliminary Alternatives Appendix** for details. No facility type was assumed for the conceptual alternatives.

During the development of conceptual alternatives, a number of non-transportation and non-highway alternatives were evaluated. Fifteen (15) non-transportation alternatives were evaluated, as well as three non-personal car alternatives. See **Screening of Alternatives Report, Non-Highway Alternatives Analysis Appendix**. None of these addressed the core goals of surface freight transportation accessibility or accessibility to intermodal centers. The scope and scale of these alternatives are too limited, not regional in nature or do not exist within the geography of the Study Area. These non-highway alternatives were removed from further consideration.

Conceptual highway alternatives were grouped into three families, designated as Northwest, North Central and Northeastern. These designations reflected their common geographic characteristics. In identifying alternatives to be carried forward, alternatives were compared only with alternatives in the same family. This assured that a geographically-diverse range of alternatives was carried forward for detailed study. This approach provided the best possible chance of finding an alternative which meets project goals while addressing environmental concerns and minimizing costs. It also allowed consideration of interests and viewpoints of all potentially affected communities in Southern Indiana.

Alternatives were compared with a qualitative assessment of comparative costs and impacts. Ten (10) conceptual alternatives were identified for further consideration as preliminary alternatives. Nine of these conceptual alternatives could potentially use one of three facility types. These are freeway (multi-lane divided, with full access control), expressway (multi-lane divided, with partial access control) and Super-2 (two-lane road with continuous center/left turn lanes). Accounting for combinations of route and facility type 28 preliminary alternatives were considered.

All preliminary alternatives extended from US 231/SR 66 near Rockport to I-69. Alternatives in the Northwest and North Central families connected directly to I-69. Alternatives in the Northeast Family connected to I-69 via SR 37. South of I-64, all alternatives use existing US 231, which is a four-lane expressway. Freeway facility types for each alternative would require upgrading this portion of US 231 to a fully access-controlled freeway. No modifications to US 231 from Rockport to I-64 would be required for expressway or Super-2 alternatives.

5.2 Screening and Alternatives Carried Forward

The 28 preliminary alternatives were evaluated for construction costs, impacts to key environmental resources and performance on key Purpose and Need measures. This evaluation is fully described in the **Screening of Alternatives Report**.

As was the case with the evaluation of conceptual alternatives, preliminary alternatives were evaluated only by comparison with other alternatives within the same family. Five alternatives were carried forward as alternatives for detailed study (Figure 2).

Alternative P was the only alignment carried forward with all three facility types. Other alternatives were carried forward with one or two facility types. Each combination of alignment and facility type was designated as an individual alternative. This resulted in 10 alternatives carried forward from the Screening of Alternatives Report. Subsequent decisions, some related to the COVID pandemic, resulted in a modified set of alternatives which were evaluated in the DEIS. These circumstances are described in Section 5.3.

5.3 Finalizing Alternatives for Detailed Study

Shortly after the Screening of Alternatives report was issued early in 2020, the COVID pandemic resulted in reductions in vehicle travel and motor fuel tax revenues. This led INDOT to reevaluate future capital spending plans. It made several key decisions to provide itself with greater flexibility.

One decision was to remove freeways as a facility type. Freeways typically cost 40 percent more than expressways and have the largest footprint with the greatest impacts. One effect of this decision is that there would be no impacts along US 231 south of I-64.

Another decision was to defer the selection of a facility type to Tier 2 studies. This also addressed agency comments about the desire to consider combinations of facility types.

Several agencies also requested that Tier 1 alternatives be evaluated for both eastern and western corridors around Jasper. This evaluation determined that an eastern corridor is preferable. Alternatives C, P, M and O were evaluated in the DEIS with an eastern corridor in Dubois County only. Alternative B cannot be paired with an eastern Dubois County corridor. Accordingly, it retained its corridor in western Dubois County.

The process of investigating combinations of existing facility upgrades as part of alternatives identified the potential for benefits of localized safety and congestion improvements. Accordingly, a series of conceptual local improvements were identified for each respective alternative (Section 5.4 Local Improvements). For its evaluation in the DEIS, the cost, benefits and impacts of each alternative included the local highway improvements associated with each alternative.

As a result of these decisions, all alternatives were evaluated in the DEIS with both Super-2 and Expressway facility types. This resulted in a range of costs, impacts and benefits for each alternative. None of the alternatives would require modifications to US 231 south of I-64. All alternatives, with the exception of Alternative B, use an eastern Dubois County corridor.

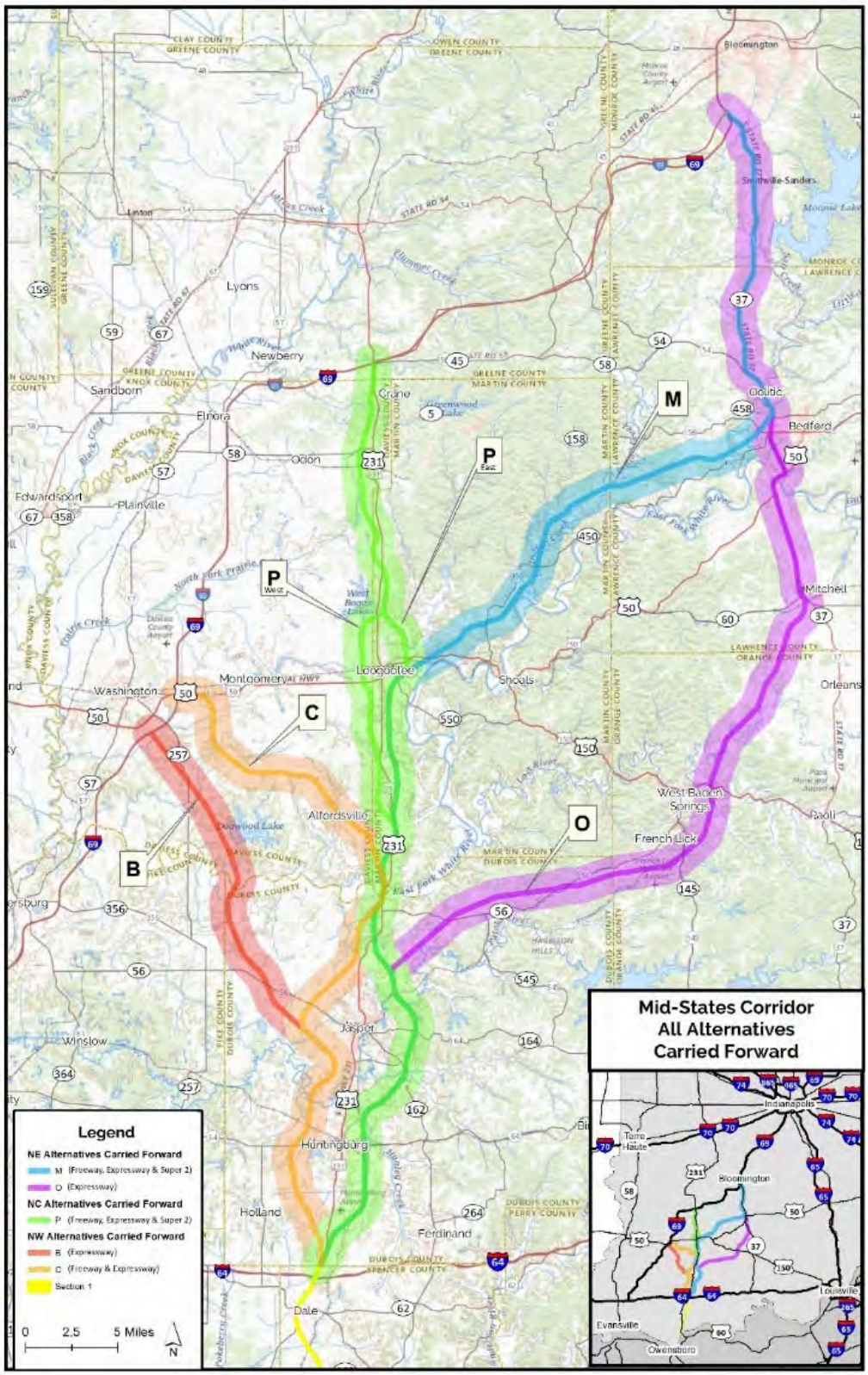


Figure 2. Alternatives Carried forward from Screening of Alternatives Report

5.4 Working Alignment Development

Working alignments were created within the corridors based on terrain, land use, and facility type for use in general impact calculations in the EIS. Buffers of set distances were placed along the alignment to assess resource impacts for all alternatives originally developed for the Mid-States Corridor project. Following screening of these alternatives, five corridors were selected for further development and the working alignments were refined. Each alternative corridor included two working alignments: expressway and super 2. Each working alignment was centered in the 2000-foot wide corridor for the purposes of determining general comparative impacts. For each working alignment, variable width footprints were developed based on the facility type (expressway generally wider than the super 2) and terrain using Lidar surface models and profiles in compliance with INDOT standards. The working alignment footprint also included potential local access crossings (interchanges, intersections, overpasses, and underpasses). For the Refined Preferred Alternative P, the expressway and super 2 working alignment footprints were further revised and included the four alignment variations at Loogootee (see Section 5.5 Preferred Alternative). The expressway working alignment width for the Referred Preferred Alternative ranges from approximately 190 feet to 650 feet, excluding potential diamond interchanges.

5.5 Preferred Alternative

The evaluation of each alternative on Purpose and Need goals determined that Alternative B and Alternative C performed too poorly to be considered as a potential preferred alternative. Among the remaining alternatives, Alternative P was identified as the preferred alternative. Following are the key factors supporting this determination.

- Overall, it has the highest performance for project goals of all alternatives.
- It overall has the lowest impacts among the three alternatives (Alternatives M, O and P).
- Alternative P has especially favorable rating on several key environmental factors.
    - It has the smallest wetland impact of all alternatives.
    - It impacts no known karst features.
    - It impacts significantly less forest than the other alternatives (Alternatives M and O) which adequately address the Purpose and Need goals.

Figure 3 shows the Refined Preferred Alternative P Corridor, including variations at Loogootee. It also shows the local improvements which are part of Alternative P. Figure 4 shows the variations at Loogootee which will be carried forward into Tier 2 studies.

5.6 Local Improvements

In addition to the Alternative P corridor and associated Loogootee route variations, there are nine different potential Local Improvement segments along US 231 Each of these Local Improvements represent separate independent projects. Therefore, any one, combination, or all nine Local Improvements might be constructed in association with Alternative P. Additionally, any one, combination, or all nine Local Improvements could also be constructed without construction of an Alternative P roadway. Each of these Local Improvement segments would be addressed through individual NEPA studies and individual Section 7 evaluation via the Programmatic BO process. However, for the purposes of the Mid-States Corridor Tier 1

biological assessment, all nine of the Local Improvements are being included as part of the "proposed action". Table 1 provides a brief description for each Local Improvement.

Table 1. Local improvement location and general proposed action

Local Improvement	Existing condition	Location	Proposed Improvement
LI-1	US 231 two-lane	1.3 mile segment south of CR 750 S Dubois County	Passing lanes and/or turn lanes
LI-2	US 231 two-lane	3.2 miles segment south of SR 162 Dubois County	Passing lanes and/or turn lanes
LI-3	US 231 two-lane with limited left/right turns	1.5 mile segment north of SR 162 Dubois County	Passing lanes and turn lanes
LI-4	US 231 various cross sections	3.2 miles segment Bartley St. to Common Dr. in Jasper	Various upgrades to increase safety and efficiency
LI-5	US 231 two-lane	2.5 miles segment from W 400 N to W 600 N Dubois County	Passing lanes and/or turn lanes
LI-6	US 231 two-lane	2.7 miles segment from CR 22 to CR 162 Martin County	Passing lanes and/or turn lanes
LI-7	US 231 two-lane	1.1 mile segment CR 158 and US 50 Martin County	Passing lanes and/or turn lanes
LI-8	US 231 two-lane	0.8 mile segment north of Loogootee Martin County	Passing lanes and/or turn lanes
LI-9	US 231 two-lane	1.9 mile segment south of I-69 Greene/Martin Counties	Passing lanes and/or turn lanes

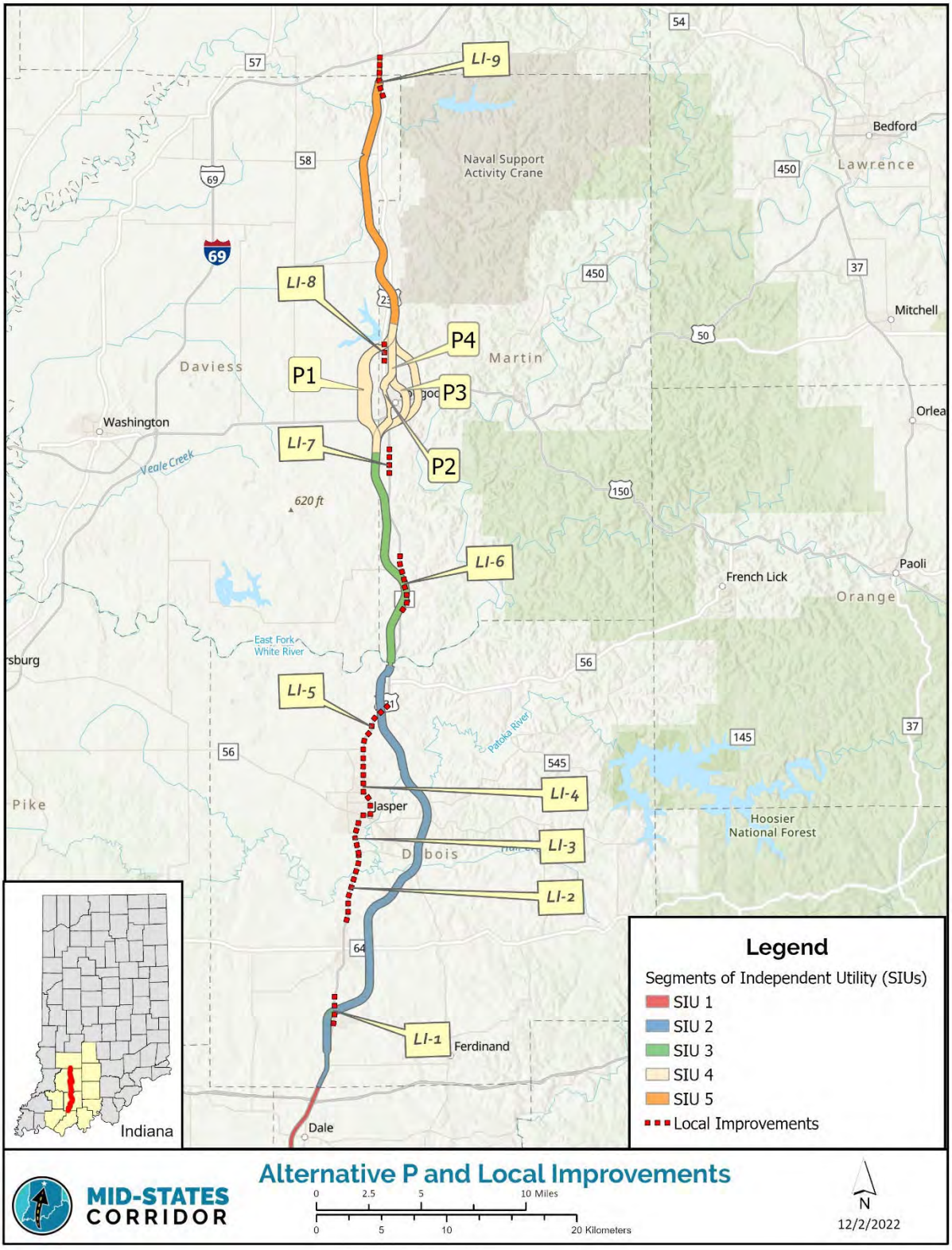


Figure 3. Alternative P Corridor Including Local Improvements

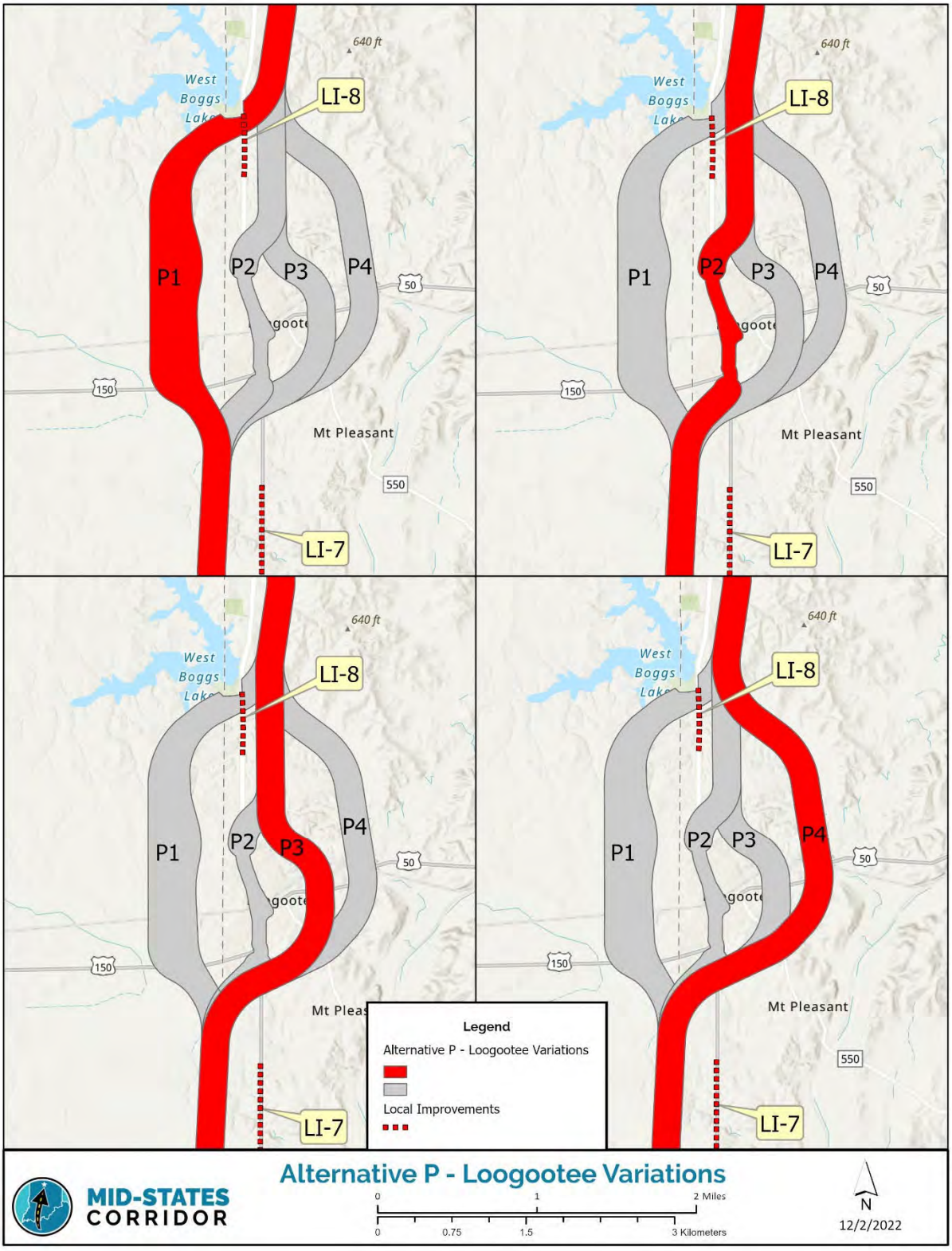


Figure 4. Alternative P Variations at Loogootee

6 Affected Environment

6.1 Physiographic Regions

Physiographic regions are areas that have similar topography and land use. Physiographic regions provide a general view of the terrain, and resources that may be affected by the proposed corridor. The preferred alternative, Alternative P, traverses portions of three physiographic regions: Boonville Hills, Wabash Lowland, and Crawford Upland (Appendix A Map 2).

The proposed corridor crosses the Boonville Hills in the southwestern portion of Dubois County. This region is slightly hillier than the adjacent Wabash Lowland, possibly because it was not glaciated. Strip mining has been extensive in this region, and there are large areas of reclaimed or modified land in the eastern portion (Gray 2000). Land use in the Boonville Hills includes farmland, forest, and mining.

The remainder of the Alternative P corridor lies along the border between the Wabash Lowland and Crawford Upland. The Alternative P corridor crosses the Wabash Lowland in portions of Pike and Daviess counties. It is flat to rolling with wide expanses of alluvial land, some of which is lacustrine in origin. The Wabash Lowland is the largest of the southern Indiana regions and was completely covered by the Illinoian Glacier.

The majority of the Alternative P corridor is located within the western limits of the Crawford Upland. The corridor crosses this region in portions of Dubois, Daviess, Martin, and Greene counties. This region is largely unglaciated and is a rugged highland with varied elevations and v-shaped valleys with narrow sharp ridges to u-shaped valleys with broader rounded ridges. Karst terrain, including sinkholes and caves, is common.

6.2 Natural Regions

Natural regions are major, generalized units of the landscape with a distinctive assemblage of natural features. It is part of a classification system that integrates several natural features, including climate, soils, glacial history, topography, exposed bedrock, pre-settlement vegetation, species composition, physiography, and flora and fauna distribution. A “section” is a subunit of a natural region where sufficient differences are evident, such that recognition is warranted (Homoya et al. 1985). Natural regions are similar to physiographic regions, but while physiographic regions may give information on predominant land use, natural regions give more information about native plant and animal species. Some natural regions have a similar corresponding boundary with physiographic regions, while some may be unique to the classification system.

The proposed corridor crosses three natural regions: Southwestern Lowlands, Southern Bottomlands, and Shawnee Hills. Within these three natural regions, the corridor crosses four sections: Driftless, Southern Bottomlands, Crawford Upland, and Glaciated. The following natural region section descriptions come from “The Natural Regions of Indiana,” (Homoya et al. 1985).

The Southwestern Lowlands Region includes the Driftless Section and the Glaciated Section. The Southwestern Lowlands Region is characterized by low relief and extensive aggraded valleys. This region, except for the southern portion, was covered by the Illinoian Glacier.

Much of the region is nearly level, undissected, and poorly drained, although in some areas the topography is hilly and well drained.

A portion of the Alternative P corridor is within the Driftless Section, primarily in Pike and Dubois counties. This section is south of the Illinoian glacial border and is characterized by low hills and broad valleys. This area has the longest growing season and highest average summer temperature in the state. Natural communities include upland forest, occupying the well-drained slopes, and southern flatwoods occupying lacustrine plains and river terraces. Flatwoods species include cherry bark oak, sweetgum, shellbark hickory, pin oak, swamp white oak, Shumard's oak, green ash, black gum, and locally, post oak. Upland forests of this section are relatively dry communities dominated by oaks and hickories. Other natural communities include marsh, swamp, sandstone cliff, and low to medium-gradient stream. Soils in this section are predominately acidic.

The Glaciated Section is also part of the Southwestern Lowlands Region. The Alternative P corridor passes through this section in Daviess County. Natural communities in this section are mostly forests, but several types of former prairie are known. The flatwoods community is common, but species composition differs from the Driftless Section. Common flatwoods species in this section include shagbark hickory, shellbark hickory, pin oak, shingle oak, hackberry, green ash, red maple, and silver maple. Black ash swamps are near their southern limit in this section. This section also appears to have the largest amount of prairie south of the Wisconsinan glacial border in Indiana; however, little is known about the composition of this prairie. Additional community types include swamp, marsh, pond, and low-gradient stream. The prairie kingsnake and the crawfish frog are characteristic animal species of this region.

The Southern Bottomlands Section is the only section within the Southern Bottomlands Natural Region. This natural region includes the alluvial bottomlands along rivers and larger streams of southwestern Indiana. The soils are mostly neutral to acid silt loams, and include series such as Nolin, Newark, Huntington, Linside, Stendal, and Bonnie. Much of the area is subject to frequent flooding. Natural communities of the region include bottomland forest, swamp, pond, slough, and former marsh and prairie. Bottomland forest, the major community type of this region, is characterized by pecan, sugarberry, swamp chestnut oak, pin oak, swamp white oak, red maple, silver maple, honey locust, catalpa, shellbark hickory, sycamore, and green ash. Swamp and slough communities are characterized by bald cypress, swamp cottonwood, water locust, pumpkin ash, and overcup oak. Other distinctive species, many of which are restricted to this region, include American featherfoil, bloodleaf, acanthus, climbing dogbane, catbird grape, woolly pipe-vine, swamp privet, American snowbell, climbing hempweed, spiderlily, mistletoe, and giant cane. Distinctive southern animals include cottonmouth, hieroglyphic turtle, diamondbacked watersnake, eastern mud turtle, northern copperbelly, swamp rabbit, mosquitofish, harlequin darter, and yellow-crowned night heron.

6.3 Geology and Karst

In south-central Indiana, karst features occur in the Mitchell Plateau and portions of the Crawford and Norman Upland physiographic regions. As discussed above, the proposed corridor lies on the border between the Wabash Lowland and Crawford Upland.

Mississippian age shale, siltstone, and carbonate strata form the base for the Crawford Upland. The western portion of this region, within which the Alternative P corridor is located,

is characterized by ridges and valleys, rather than the relatively flat plains and wide, shallow valleys of the Wabash Lowlands. While karst features including sinkholes, karst valleys, and caves are common along the eastern border of the Crawford Upland, they are not common in the western portion of the region and there are no such features currently known along the Alternative P corridor (Appendix A Map 2).

Bedrock geology of the proposed corridor area consists primarily of the Pennsylvanian age Raccoon Creek Group (Seelyville, Buffaloville, and Lower Block coals). The Raccoon Creek Group consists mostly of shale and sandstone and includes thin beds of limestone, clay, and coal. Elevations in the area of the proposed corridor range from approximately 420 feet above mean sea level (MSL) at East Fork White River to approximately 710 feet south of I-69 near the northern terminus of the corridor.

6.4 Watersheds and Rivers

The proposed corridor is located within nine separate 10-digit HUC watersheds within four 8-digit HUC subbasins (Appendix A Map 3).

Lower Ohio-Little Pigeon	Patoka	Lower East Fork White	Lower White
• Barren Fork-Little Pigeon Creek	• Hunley Creek • Straight River • Alter Creek-Patoka River	• East Fork White River • Barn Run-East Fork White River • Boggs Creek	• Prairie Creek • First Creek-White River

The Barren Fork-Little Pigeon Creek (0514020109) watershed encompasses 222 square miles of Dubois, Warrick, and Spencer counties. Pastureland and cultivated cropland comprise nearly 50 percent of the landscape, while forest cover comprises approximately 40 percent of the landscape. There is only approximately 1.6 miles of Alternative P corridor within the northern limits of this watershed.

The Hunley Creek (0512020903) watershed encompasses 82 square miles of Dubois and Spencer counties. The dominant land use within this watershed is agricultural (69 percent), while the majority of the remaining land is forest cover (21 percent). The Alternative P corridor bisects the western and lower northern portion of this watershed.

The Straight River (0512020902) watershed encompasses 68 square miles of Dubois County. Where terrain is conducive, pastureland and cultivated cropland comprise approximately 53 percent of the landscape. Forest cover is the remaining predominant land use (41 percent) within the watershed. The Alternative P corridor traverses approximately 3.8 miles of the lower portion of this watershed.

The Altar Creek-Patoka River (0512020904) watershed encompasses 155 square miles of Dubois and Orange counties. The Patoka River crosses the proposed corridor within this watershed. The Patoka River is approximately 100 miles long with an 860 square mile drainage basin. Much of this river has been dredged and straightened. The Indiana Department of Environmental Management (IDEM) has listed the Patoka River on the 2022 303 (d) List of Impaired Waterbodies. Parameters of concern for the Patoka River include impaired biotic communities, low dissolved oxygen, pathogens, and PCBs. Forest cover and agriculture are the predominant land uses (45 percent and 44 percent, respectively) within the Altar Creek-Patoka River watershed. The Alternative P corridor traverses approximately 5.2 miles of the central portion of this watershed.

The East Fork White River (0512020815) watershed encompasses 207 square miles of Pike, Dubois, Daviess, and Martin counties. The East Fork White River is the largest river that crossed by the Alternative P corridor. It is a slow stream that drains approximately 5,700 square miles. IDEM has listed the East Fork White River on the 2022 303 (d) List of Impaired Waterbodies. Parameters of concern for the East Fork White River are impaired biotic communities and PCBs. Pastureland and cultivated cropland comprise approximately 62 percent of the landscape with forest being the other predominant land use at approximately 29 percent cover. The Alternative P corridor traverses approximately 9.6 miles of the upper portion of this watershed.

The Barn Run-East Fork White River (0512020814) watershed encompasses 155 square miles of Daviess, Martin, Orange, and Lawrence counties. Forest cover is a predominant land use (64 percent) within the watershed, while pastureland and cultivated cropland comprise an additional 28 percent of the landscape. The Alternative P corridor traverses approximately 5.1 miles of the western lower portion of this watershed to the west of the East Fork White River.

The Prairie Creek (0512020207) watershed encompasses 152 square miles of Daviess and Martin counties. The predominant land use within the watershed is pastureland and cultivated crops (84 percent) with forest making up an additional 9 percent of the landscape. Alternative P corridor traverses approximately 2.7 miles of the extreme upper southeast portion and 6.7 miles of the extreme upper northeast portion of this watershed.

The Boggs Creek (0512020811) watershed encompasses 89 square miles of Daviess and Martin counties. Forest cover is a predominant land use (65 percent) within the watershed, while pastureland and cultivated cropland comprise nearly 23 percent of the landscape. The Alternative P corridor traverses approximately 5.5 miles of the southwestern lower portion of this watershed.

The First Creek-White River (0512020205) watershed encompasses 202 square miles of Daviess, Martin, and Greene counties. Agriculture is a predominant land use with pastureland and cultivated cropland comprising approximately 61 percent of the landscape, while forest comprises an additional 30 percent. The Alternative P corridor traverses approximately 4.3 miles in the south central portion of this watershed up to I-69.

No rivers listed in the National Wild and Scenic Rivers System or IDNR Natural, Scenic and Recreational Rivers are present within the Alternative P corridor. The East Fork White River is listed on the National Rivers Inventory and has been recommended by the state for inclusion in the State Natural, Scenic and Recreational Rivers System.

6.5 Regional Managed Lands

The IDNR Managed Lands GIS dataset includes a number of public properties and private conservation lands within 10 miles of the proposed corridor (Appendix A Maps 4a and 4b). Six of these properties are located within the Alternative P corridor or along US 231 Local Improvement segments: West Boggs Park, Gantz Woods Nature Preserve, Barnes-Seng Wetland Conservation Area, Jasper Parklands, Fromme Wildlife Habitat Area, and a Wetland Reserve Program (WRP) property.

West Boggs Park is a 1,600-acre public recreational land in Martin County that has received Land and Water Conservation Fund (LWCF) monies. The park is managed by the Daviess-Martin County Park Board and includes a 622-acre lake, campground, multi-use trails,

playgrounds, swimming beach, and shelter houses. A small portion (approximately 0.25 acre) of West Boggs Park property is located within the Alternative P corridor.

Gantz Woods Nature Preserve is an undeveloped 98-acre property located in northeast Daviess County within the upper portion of the First Creek watershed. The property is managed by The Nature Conservancy as part of its Forest Bank program and is closed to the public. Approximately 30 percent of this TNC property is within the Alternative P corridor.

Barnes-Seng Wetland Conservation Area is located in central Dubois County, south of Jasper east of US 231. The 146-acre tract of land within the Hunley Creek floodplain is managed by the IDNR Division of Fish and Wildlife provides hunting opportunities while preserving woodland, swamp, and marsh wetland habitat. The property is located immediately east of the US 231 Local Improvement 2 segment.

Jasper Parklands is an LWCF property managed by the IDNR - Division of Outdoor Recreation within Jasper incorporated limits. The 74-acre property features walking trails, ponds, wetlands, an indoor public event space, splash pad, outdoor exercise equipment, and multiple play areas. The property is immediately southwest of the US 231 Local Improvement 4 segment.

Fromme Wildlife Habitat Area is located in Dubois County north of Huntingburg. This small 0.6 acre plot on a residential property is managed by the IDNR – Division of Fish and Wildlife. The property is located immediately west of the US 231 Local Improvement 2 segment.

A WRP property is located to the east of Huntingburg in Dubois County within the Bruner Creek watershed. This 36-acre property is part of a voluntary Natural Resources Conservation Service program for landowners offering the opportunity to protect, restore, or enhance wetland areas on their property. Approximately 86 percent of this bottomland forested wetland is within the Alternative P corridor.

7 NEPA and Section 7 Coordination Chronology with U.S. Fish and Wildlife Service

Throughout the alternative development, alternative screening process, and development of the DEIS, the USFWS has been engaged in various general agency meetings and Section 7 consultation meetings with the project sponsors. This coordination also included the development of a Pre-Consultation Agreement between the USFWS, FHWA, and INDOT (Appendix B). The Pre-Consultation Agreement was drafted to chronicle the species of concern under the Endangered Species Act, establish the scope of impact assessment for Tier 1, level of effort and assessment expectations for Tier 2, and provide a framework for developing mitigation strategies during the Tier 2 phase. Table 2 summarizes Tier 1 milestone meetings and coordination response dates involving the USFWS.

Table 2 U.S. Fish and Wildlife Service coordination chronology for Mid-States Corridor project

Date	Summary of Activity
July 3, 2019	USFWS general project introduction meeting • Notification of tiered approach for EIS and Section 7 consultation • Preliminary discussion of listed species and candidate species • Discussion on approach to tiered Section 7 consultation
August 20, 2019	Mid-States Corridor Agency Scoping Meeting
September 10, 2019 Appendix C	USFWS response to Early Coordination and Draft Purpose and Need Statement. • As part of the Service's review of the initial alternatives proposed, the following endangered/threatened species were identified as having ranges that included the Mid-States Corridor project area:

Date	Summary of Activity
	○ Indiana bat (*Myotis sodalis*) Endangered ○ Gray bat (*Myotis grisescens*) Endangered ○ Northern long-eared bat (*Myotis septentrionalis*) Threatened ○ Least tern (*Sterna antillarum*) Endangered ○ Fanshell (*Cyprogenia stegaria*) Endangered ○ Sheepnose (*Plethobasus cyphyus*) Endangered ○ Rough pigtoe (*Pleurobema plenum*) Endangered ○ Fat pocketbook (*Potamilus capax*) Endangered ○ Rabbitsfoot (*Quadrula quadrula*) Endangered • USFWS also indicated that the following species were currently under review for listing: ○ Lake sturgeon (*Acipenser fulvescens*) ○ Northern cavefish (*Amblyopsis spelaea*) Also likely to include the newly described Hoosier cavefish (*Amblyopsis hoosieri*)
December 12, 2019	USFWS meeting to discuss Tier 1 approach, project species list, and Section 7 consultation expectations.
March 3 and 4, 2020	Mid-States Corridor Agency review meeting and bus tour.
March 23, 2020 Appendix C	USFWS response to Screening of Alternatives Report. • In response to review of the Screening of Alternatives Report, the Service indicated that the previous list of species from their September 10, 2019 response was still valid. • Additionally, the Service identified the following species that are on the National Listing Workplan and may potentially be within the Mid-States Corridor project area: ○ Round hickorynut (*Obovaria subrotunda*) ○ Salamander mussel (*Simpsonaias ambigua*) ○ Little brown bat (*Myotis lucifugus*) ○ Tricolored bat (*Perimyotis subflavus*)
June 29, 2021 Appendix C	USFWS provides updated list of endangered, threatened, candidate, and review species for each of the five proposed corridors. • Preferred Alternative P Corridor species include: ○ Indiana bat (*Myotis sodalis*) Endangered ○ Gray bat (*Myotis grisescens*) Endangered ○ Northern long-eared bat (*Myotis septentrionalis*) Threatened ○ Little brown bat (*Myotis lucifugus*) National Listing Workplan FY22 ○ Tricolored bat (*Perimyotis subflavus*) National Listing Workplan FY22 ○ Fanshell (*Cyprogenia stegaria*) Endangered ○ Sheepnose (*Plethobasus cyphyus*) Endangered ○ Rough pigtoe (*Pleurobema plenum*) Endangered ○ Fat pocketbook (*Potamilus capax*) Endangered ○ Salamander mussel (*Simpsonaias ambigua*) National Listing Workplan FY22 ○ Lake sturgeon (*Acipenser fulvescens*) National Listing Workplan FY24 ○ Monarch butterfly (*Danaus plexippus*) Candidate ○ Bald eagle (*Haliaeetus leucocephalus*) Delisted/Bald and Golden Eagle Protection Act • Based on known distribution relative to the Preferred Alternative P Corridor, the Service does not consider the following species that were previously identified for the project area as species of concern: ○ Least tern (*Sterna antillarum*) Endangered ○ Rabbitsfoot (*Quadrula cylindrica = Theliderma cylindrica*) Endangered ○ Round hickorynut (*Obovaria subrotunda*) Proposed threatened ○ Northern cavefish (*Amblyopsis spelaea*)/Hoosier cavefish (*Amblyopsis hoosieri*) National Listing Workplan FY23
May 5, 2022	Mid-States Corridor Agency Coordination Meeting
June 15, 2022	USFWS Tier 1 Biological Assessment Coordination Meeting
January 20, 2023 Appendix B	Pre-Consultation Agreement signed by FHWA and INDOT. USFWS signature pending.

8 Endangered, Threatened, Candidate, and 12-Month Proposed Listing/Proposed Critical Habitat (PLPCH) Species for Mid-States Corridor Tier 1

8.1 Endangered and Threatened Species

8.1.1 Indiana bat (*Myotis sodalis*) - Endangered

On March 11, 1967, the Indiana bat was listed as endangered under the Endangered Species Preservation Act of 1966 (USFWS 1967). On September 24, 1975, the USFWS proposed to determine critical habitat for the bat (USFWS 1975b). On September 24, 1976, critical habitat was designated (USFWS 1976b) and corrected/augmented on September 22, 1977 (USFWS 1977). Critical habitat in Indiana is limited to in Crawford County and in Greene County. On April 16, 2007, the draft Indiana Bat Recovery Plan (First Version) was released (USFWS 2007a). On September 30, 2009, a 5-year review of the Indiana bat was published (USFWS 2009b). On September 30, 2019, a subsequent 5-year review was published (USFWS 2019e).

The Indiana bat was designated as state endangered by the IDNR in the second amendment of the NRC roster listing May 1, 1992 (Natural Resource Commission 1992, IDNR 2020a). The NatureServe status ranking of the Indiana bat is G2 globally imperiled and S1 critically imperiled for the state of Indiana.

8.1.2 Northern long-eared bat (*Myotis septentrionalis*) - Endangered

On October 2, 2013, the USFWS issued a 12-month finding that the northern long-eared bat warranted consideration for listing as endangered/threatened under the Endangered Species Act, but that critical habitat was not determinable at the time (USFWS 2013b). On December 2, 2013, the comment period for listing the northern long-eared bat was extended to January 2, 2014 (USFWS 2013c). Subsequently, the northern long-eared bat was listed as threatened with an interim 4(d) rule on April 2, 2015 (USFWS 2015a). The final 4(d) rule was issued on January 14, 2016 (USFWS 2016b). On April 27, 2016, it was concluded that critical habitat for the northern long-eared bat was not prudent (USFWS 2016c). On March 22, 2022, the species status assessment (SSA) for the northern long-eared bat was published (USFWS 2022f) and subsequently updated August 1, 2022 (USFWS 2022g). On March 23, 2022, a proposed rule to reclassify the northern long-eared bat as endangered was published (USFWS 2022a). On November 30, 2022, the northern long-eared bat was elevated to endangered status (USFWS 2022c) with the final rule becoming effective on January 30, 2023. No critical habitat has been designated for the northern long-eared bat.

The northern long-eared bat was designated as state special concern by the IDNR in the fourth amendment of the NRC roster listing August 1, 2007 (Natural Resources Commission 2007), but elevated to endangered in the ninth amendment of the NRC roster listing on November 28, 2018 (Natural Resources Commission 2018, IDNR 2020a). The NatureServe status ranking of the northern long-eared bat is G2 globally imperiled and S2 imperiled for the state of Indiana.

8.1.3 Gray bat (*Myotis grisescens*) – Endangered

On April 21, 1975, the USFWS proposed listing the gray bat as endangered or threatened under the Endangered Species Act (USFWS 1975a). On April 28, 1976, the gray bat was listed as endangered under the Endangered Species Preservation Act of 1966 (USFWS 1976a). On July 8, 1982, the Gray Bat Recovery Plan was released (USFWS 1982). On September 30, 2009, a 5-year review of the gray bat was published (USFWS 2009a). No critical habitat for the gray bat has been designated in Indiana.

The gray bat was designated as state endangered by the IDNR in the second amendment of the NRC roster listing May 1, 1992 (Natural Resources Commission 1992, IDNR 2020a). The NatureServe status ranking of the gray bat is G3 globally vulnerable and S1 critically imperiled for the state of Indiana.

8.1.4 Fanshell (*Cyprogenia stegaria*) – Endangered

On October 8, 1989, the USFWS proposed listing the fanshell as endangered under the Endangered Species Act (USFWS 1989a). On June 21, 1990, the fanshell was listed as endangered under the Endangered Species Preservation Act of 1966 (USFWS 1990). On July 9, 1991, the Fanshell Recovery Plan was released (USFWS 1991). On July 8, 2019, a 5-year review of the fanshell was published (USFWS 2019d). No critical habitat has been designated for the fanshell.

The fanshell was designated as state endangered by the IDNR in the second amendment to the NRC roster listing May 1, 1992 (Natural Resources Commission 1992, IDNR 2020a). The NatureServe status ranking of the fanshell is G1 critically imperiled and S1 critically imperiled for the state of Indiana.

8.1.5 Sheepnose (*Plethobasus cyphus*) – Endangered

On January 19, 2011, the USFWS proposed listing the sheepnose as endangered under the Endangered Species Act (USFWS 2011a). On March 13, 2012, the sheepnose was listed as endangered under the Endangered Species Preservation Act of 1966 (USFWS 2012b). On June 9, 2019, the USFWS agreed to designate critical habitat for the sheepnose by 2024 (The Center for Biological Diversity 2019). On August 27, 2020 a 5-year review of the sheepnose was published (USFWS 2020d).

The sheepnose was designated as state endangered by the IDNR in the second amendment to the NRC roster listing May 1, 1992 (Natural Resources Commission 1992, IDNR 2020a). The NatureServe status ranking of the sheepnose is G3 vulnerable and S1 critically imperiled for the state of Indiana.

8.1.6 Rough pigtoe (*Pleurobema plenum*) – Endangered

On September 26, 1975, the USFWS proposed listing the rough pigtoe as endangered under the Endangered Species Act (USFWS 2075). On June 14, 1976, the rough pigtoe was listed as endangered under the Endangered Species Preservation Act of 1966 (USFWS 1976c). On August 6, 1984, the Rough Pigtoe Recovery Plan was released (USFWS 1984b). On May 10, 2021, a 5-year review of the rough pigtoe was published (USFWS 2021b). No critical habitat has been designated for the rough pigtoe.

The rough pigtoe has been designated as state endangered by the IDNR since the second amendment to the NRC roster listing May 1, 1992 (Natural Resources Commission 1992, IDNR 2020a). The NatureServe status ranking of the rough pigtoe is G1 critically imperiled and S1 critically imperiled for the state of Indiana.

8.1.7 Fat pocketbook (*Potamilus capax*) – Endangered

On September 26, 1975, the USFWS proposed listing the fat pocketbook as endangered under the Endangered Species Act (USFWS 2075). On June 14, 1976, the fat pocketbook was listed as endangered under the Endangered Species Preservation Act of 1966 (USFWS 1976c). On November 14, 1989, the Recovery Plan for the Fat Pocketbook Pearly Mussel was released (USFWS 1989b). Amendment 1 addressing amendments to the recovery criteria was released September 26, 2019 (USFWS 2019f). On March 30, 2012, a 5-year review of the fat pocketbook was published (USFWS 2012a). Subsequently, on December 26, 2019, a 5-year review was published (USFWS 2019c). No critical habitat has been designated for the fat pocketbook.

The fat pocketbook was designated as state endangered by the IDNR in the second amendment to the NRC roster listing May 1, 1992 (Natural Resources Commission 1992, IDNR 2020a). The NatureServe status ranking of the fat pocketbook is G2 imperiled and S1 critically imperiled for the state of Indiana.

8.2 Proposed Listing Species

8.2.1 Tricolored bat (*Perimyotis subflavus*)

On June 14, 2016, the USFWS received a petition from the Center for Biological Diversity and Defenders of Wildlife to list the tricolored bat as an endangered or threatened species and to designate critical habitat for the species under the Endangered Species Act (Center for Biological Diversity and Defenders of Wildlife 2016). On December 20, 2017, the USFWS published a 90-day finding that the petition presented credible evidence that listing the species may be warranted (USFWS 2017). On September 14, 2022, the USFWS published a proposed rule to list the tricolored bat as endangered (USFWS 2022b).

The tricolored bat was designated as state special concern by the IDNR in the fourth amendment of the NRC roster listing August 1, 2007 (Natural Resources Commission 2007), but elevated to endangered in the ninth amendment November 28, 2018 (Natural Resources Commission 2018, IDNR 2020a). The NatureServe status ranking of the tricolored bat is G3 globally vulnerable and S2 imperiled for the state of Indiana.

8.3 Candidate Species

8.3.1 Monarch butterfly (*Danaus plexippus*)

On August 26, 2014, the Center for Biological Diversity, Center for Food Safety, Xerces Society for Invertebrate Conservation, and Dr. Lincoln Brewer petitioned the USFWS to list the monarch butterfly as threatened under the Endangered Species Act. On December 17, 2020, USFWS determined the monarch butterfly warranted listing under the Endangered Species Act, but is precluded by higher priority species resulting in its designation as a candidate species (USFWS 2020c). The species is currently on

the 2022-27 National Listing Workplan and is undergoing a "status review" with proposed listing and proposed critical habitat designation scheduled for fiscal year 2024 (USFWS 2022d).

The monarch butterfly is not currently afforded a state status in Indiana (IDNR 2022). The NatureServe status ranking of the monarch butterfly is G3 globally apparently secure and S4 apparently secure for the state of Indiana.

8.4 12-Month PLPCH Species

8.4.1 Little brown bat (*Myotis lucifigus*)

A status review by Kunz and Reichard (2010) initiated a proactive review by the USFWS for the potential need to afford the little brown bat federal protection. The resulting USFWS status review focused on the eastern subspecies and severe population declines attributed to WNS (Tinsley 2016), but determined that listing the species was not warranted at that time. From the 2022-27 National Listing Workplan, the little brown bat is currently undergoing a "discretionary status review" for proposed listing and proposed critical habitat scheduled for fiscal year 2023 (USFWS 2022d).

The little brown bat was designated as state special concern by the IDNR in the fourth amendment of the NRC roster listing August 1, 2007 (Natural Resources Commission 2007), but elevated to endangered in the ninth amendment November 28, 2018 (Natural Resources Commission 2018, IDNR 2020a). The NatureServe status ranking of the little brown bat is G3 globally vulnerable and S2 imperiled for the state of Indiana.

8.4.2 Salamander mussel (*Simpsonaias ambigua*)

On May 22, 1984, the USFWS included the salamander mussel on a list of invertebrate species being considered for addition to the List of Endangered and Threatened Wildlife (USFWS 1984a). On April 20, 2010, the USFWS received a joint petition from the Center for Biological Diversity and other conservation organizations to list 404 species (including the salamander mussel) from the southeastern United States as endangered or threatened species and to designate critical habitat (Center for Biological Diversity 2010). On September 27, 2011, the USFWS published a 90-day finding that the petition presented credible evidence that listing the species may be warranted (USFWS 2011b). The species is currently on the 2022-27 National Listing Workplan and is undergoing a "status review" for proposed listing and proposed critical habitat designation scheduled for fiscal year 2023 (USFWS 2022d).

The species was designated as state rare/special concern by the IDNR in the second amendment to the NRC roster listing May 1, 1992 (Natural Resources Commission 1992, IDNR 2020a). The NatureServe status ranking of the salamander mussel is G3 globally vulnerable and S2 imperiled for the state of Indiana.

8.4.3 Lake sturgeon (*Acipenser fulvescens*)

On May 23, 2018, the USFWS received a petition from the Center for Biological Diversity to list the lake sturgeon as endangered/threatened under the Endangered Species Act (Center for Biological Diversity 2018). On August 15, 2019, the USFWS published a 90-day finding that the petitioned action warranted further consideration

would conduct a status review and prepare a 12-month finding (USFWS 2019a). On September 14, 2021, the Center for Biological Diversity filed suit against the Secretary of the Interior and the Assistant Director of the USFWS for failure to comply with 16 U.S.C. 1533(b)(3) and issue a finding within 12 months of receiving the petition. On September 14, 2021, the summary judgement of the U.S. District Court set a deadline of June 30, 2024 for the USFWS to publish the 12-month finding for the lake sturgeon in the Federal Register. The lake sturgeon is currently on the 2022-27 National Listing Workplan for fiscal year 2024 (USFWS 2022d).

The lake sturgeon was designated as state endangered by the IDNR in the second amendment to the NRC roster listing May 1, 1992 (Natural Resources Commission 1992, IDNR 2020a). The NatureServe status ranking of the lake sturgeon is G3 globally vulnerable and S1 critically imperiled for the state of Indiana.

9 Endangered, Threatened, 12-Month Proposed Listing/Proposed Critical Habitat (PLPCH), and Delisted Species Excluded from Mid-States Corridor Tier 1 Biological Assessment

Through project development, preferred alternative corridor selection, and species delisting, the following species previously identified as species of potential impact by the Mid-States Corridor through USFWS coordination have been excluded from the Tier 1 Biological Assessment.

9.1 Interior least tern (*Sternula antillarum*) Delisted

The final rule to list the Interior least tern as federally endangered under the Endangered Species Act was published on May 28, 1985 (USFWS 1985) and became effective June 27, 1985. On October 24, 2019, a proposed rule to delist the Interior least tern was published (USFWS 2019b), and on January 13, 2021 the final rule delisting the species was published (USFWS 2021a).

In Indiana, many of the Interior least tern records are from Gibson Lake and the immediate surrounding area, including multiple parcels of land where habitat has been constructed specifically for Interior least tern breeding. Other occurrences include multiple sand/gravel bars along the Wabash River in Gibson and Posey counties, a constructed lake in eastern Gibson County, Goose Pond Fish and Wildlife Area in Greene County, Ohio River floodplain in Dearborn County, Ohio River shoreline in Spencer County, and a cooling pond for an industrial plant in south Spencer County near the Ohio River. Since the Preferred Alternative P Corridor (expressway or super-2 facility type) would not involve any modifications to the existing US 231 facility between SR 66 and I-64 (Section 1), the proposed action would not have the potential to impact known habitat of the Interior least tern.

9.2 Rabbitsfoot (*Theliderma cylindrica*) Endangered

On September 17, 2013, was listed as threatened under the Endangered Species Preservation Act of 1966 (USFWS 2013a). In 2015, the USFWS designated critical habitat for the rabbitsfoot in 31 areas where the mussel is found, comprising approximately 1,437 river miles in Alabama, Arkansas, Indiana (Tippecanoe River in Carroll, Pulaski, Tippecanoe, and White counties), Illinois, Kansas, Kentucky, Mississippi, Missouri, Ohio, Oklahoma, Pennsylvania and Tennessee (USFWS 2015b).

In the Mid-States Corridor study area, historic rabbitsfoot records are known from Monroe, Lawrence, Martin, Perry, Spencer, Daviess, Pike, and Greene counties (IDNR 2020b). The

Indiana Natural Heritage Data Center includes multiple records of the rabbitsfoot for the East Fork White River within the Mid-States Corridor study area; however, these records represent weathered or subfossil occurrences. The USFWS considers the rabbitsfoot to only be extant in the Ohio River within the Mid-States Corridor project area. Since the Preferred Alternative P Corridor (expressway or super-2 facility type) would not involve any modifications to the existing US 231 facility between SR 66 and I-64 (Section 1), specifically within the Ohio River floodplain, the proposed action would not have the potential to impact known habitat of the rabbitsfoot.

9.3 Round hickorynut (*Obovaria subrotunda*) Proposed threatened

On September 29, 2020, the USFWS published a proposed rule to list the round hickorynut as threatened with a 4(d) rule and designate critical habitat (USFWS 2020a). In Indiana, the round hickorynut is historically known from the Tippecanoe River, Eel River, St. Joseph River, Maumee River, Wabash River, White River, and East Fork White River. In the Mid-States Corridor study area, only weathered, subfossil, and historical records of the round hickorynut are known from the East Fork White River in Daviess, Martin, and Lawrence counties (IDNR 2020b). Based on the lack of live or fresh dead specimens within the drainage, the IDNR considers the round hickorynut to be extirpated from the East Fork White River (per com. Brant Fisher).

9.4 Northern cavefish (*Amblyopsis spelaea*)/Hoosier cavefish (*Amblyopsis hoosieri*)

On April 20, 2010, the USFWS received a joint petition from the Center for Biological Diversity and other conservation organizations to list 404 species (including the northern cavefish) from the southeastern United States as endangered or threatened species and to designate critical habitat (Center for Biological Diversity 2010). On September 27, 2011, the USFWS published a 90-day finding that the petition presented credible evidence that listing the species may be warranted (USFWS 2011b). The species is currently on the 2022-27 National Listing Workplan and is undergoing a "status review" for proposed listing and proposed critical habitat designation scheduled for fiscal year 2023 (USFWS 2022d). In 2014, a genetic, geographic, and morphological evaluation of the northern cavefish (Chakrabarty et al 2014) concluded that the Indiana population was a separate species from the originally described Kentucky population and was subsequently designated as the Hoosier cavefish (*Amblyopsis hoosieri*). It is presumed that if the northern cavefish is ultimately listed as endangered/threatened that the newly described Indiana population of the Hoosier cavefish would similarly be listed.

The Hoosier cavefish is known from 30 different 12-digit HUC watersheds in Lawrence, Orange, Washington, Crawford, and Harrison counties (IDNR 2022). The Lawrence and Orange County locations are within the heavily developed karst terrain to the east and upstream of the Preferred Alternative P Corridor in the East Fork White River watershed. Habitat for the Hoosier cavefish is greater than 10 miles from the Preferred Alternative P Corridor and any alignment within this corridor would not have the potential to affect water quality within the 12-digit HUC watersheds where the species is known to occur.

10 Action Areas Defined

For the purposes of implementing Section 7 of the Endangered Species Act, the USFWS defines the action area as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02)." Direct effects from the action generally

include impacts anticipated to incur from within the right-of-way footprint for the highway, interchanges, associated access road improvements and any local road improvements directly tied to the action. Additionally, direct effects may also extend beyond the footprint of the roadway where the action has the potential to adversely affect resources used by species on the adjacent landscape. These include, but are not necessarily limited to the introduction of noise and vibration in habitats where such intrusions compromise habitat quality, water quality and stream bed degradation from new or modified streams crossings, and fragmentation of forestland or grassland for species reliant on large undisturbed expanses of habitat.

The action area for each species also takes into account possible indirect effects resulting from the proposed action that could result in potential adverse effects to the species. In accordance with "Considering Cumulative Effects Under the National Environmental Policy Act" (Council on Environmental Quality, 1997) the Transportation Economic Development Impact System (TREDIS) model was used to forecast economic development in the study area due to the Mid-States Corridor. The TREDIS model analyzes economic geographic relationships and economic response factors such as cost and access changes and labor market and income factors to forecast potential impacts of a new transportation project. The model forecasted effects in the year 2045 to document the impacts on air quality, noise, indirect land use and traffic to predict potential incremental impacts to resources within the Mid-States Corridor study area. The Traffic Analysis Zones (TAZs) for the Mid-States Corridor travel model was used as the spatial unit of measure to define areas of anticipated induced growth. From this analysis, there are 14 TAZs that are anticipated to see induced household and job growth due to the building of Alternative P corridor. For each of these TAZs, this induced growth represents the year 2045 population and/or employment that exceeds the year 2045 no-build growth estimate from the travel model. Future year forecasts from the travel model were analyzed by TREDIS to forecast increases in employment, population, household income and economic output, and this induced growth was reviewed by an internal team and reallocated geographically.

10.1 Bat action area

The Indiana bat, northern long-eared bat, gray bat, little brown bat, and tricolored bat are all highly mobile species and make frequent use of streams, trails, and woodland edges as flyways and foraging areas. Therefore, fragmentation of these corridors can have effects on the viability of the available habitat beyond the roadway footprint. Additionally, noise and vibration from equipment during construction and vehicle traffic noise from operation of the highway post-construction have the potential to affect suitability of adjacent habitat by bats. While the Indiana bat, northern long-eared bat, gray bat, little brown bat, and tricolored bat vary in their specific summer/winter habitat affinities, their preferred foraging areas, and their foraging ranges, a single action area was developed collectively for these five species instead of a species specific action area for each bat.

Alternative P represents the preferred corridor resulting from the Tier 1 NEPA process and the recommended corridor for the EIS/ROD. Since the Tier 1 level process does not yield a specific alignment with a defined proposed right-of-way, the 2000-foot corridor, including the optional routes around and through Loogootee, represent the base from which the bat action area was developed. For the Mid-States Corridor Project, construction noise was used as a means to establish the action area boundary beyond the 2000-foot corridor using a standardized methodology. Section 11.6.1.5 details the methodology used to define the effect space for

construction noise anticipated for the Mid-States Corridor project based on the *Technical Guidance for Assessment and Mitigation of the Effects of Traffic Noise and Road Construction Noise on Bats* (West 2016). Using this approach, a uniform buffer distance of 1-mile offset from the Alternative P corridor boundary was used to expand the action area for bats to account for potential impacts associated with construction noise. Although the terrain within the project area is not flat and the landscape includes a variety of ground cover types (i.e., forest, building structures) that can affect sound propagation, these factors are considered negligible in defining the action area at this level.

As noted in **Section 10 Action Area Defined**, there are 14 induced growth TAZs in the project area within which additional development through new home or business construction might result. From the TREDIS analysis, it is anticipated that due to construction of a roadway within the Alternative P corridor, there could be as many as 10 new households within any given TAZ and/or as many as 30 new job opportunities within any given TAZ. It is beyond the scope of this analysis to predict where within each TAZ this development is likely to occur and if such development would have any potential impacts to bats. Furthermore, the TAZs vary in size from less than one square mile to over 13 square miles. Since the Mid-States Corridor project is not expected to result in any induced growth at Crane NSA, the large 40 square mile TAZ identified for induced growth that included Crane NSA was reduced to exclude the military base property. Therefore, the area of potential induced growth for this TAZ is less than one square mile. Any tree clearing development occurring with Crane NSA would be conducted through separate Section 7 consultation with the USFWS.

The nine Local Improvement segments along US 231 were buffered by 575 feet to define an action area based on construction noise for these areas. With the exception of LI- 2, LI-3, and LI-4, the action area buffers for the Local Improvements are inclusive within the action area limits for the Alternative P corridor buffer and the induced growth TAZs. Therefore, LI-2, LI-3, and LI-4 are extensions of the 1-mile buffered action area and are depicted on Appendix A Map 5a.

From this approach, the bat action area as depicted on Appendix A Map 5a includes 186 square miles of the project area within Spencer, Dubois, Daviess, Martin, and Greene counties.

10.2 Mussel action area

A collective action area for the five mussel species (fanshell, sheepnose, rough pigtoe, fat pocketbook, and salamander mussel) was developed for the Mid-States Corridor Tier 1 evaluation. Mussel species likely occur in several of the stream systems (e.g., Patoka River, Hunley Creek, Hall Creek, Haw Creek, Boggs Creek, and First Creek) within the Mid-States corridor project area. However, Natural Heritage Data Center information and coordination with the USFWS and IDNR Division of Fish and Wildlife confirm that the East Fork White River is the only stream within the Mid-States Corridor project area where the five federally listed species may potentially be present. Based on this understanding, the action area for mussels has been confined to the East Fork White River waterway and adjacent lands where construction activities have the potential to affect any extant mussel bed populations.

The *Programmatic Biological Opinion: Bridge and Culvert Replacements / Repairs / Rehabilitations in Eastern North Carolina* (USFWS 2018) was used as a guide in defining the mussel assessment action area for the Mid-States Corridor.

> *"For an individual bridge or culvert project, the action area generally includes the limits of construction of the structure, the approach road, and any area receiving runoff from the construction activity, including the receiving stream extending over the distance potential discernible sedimentation effects are assumed to occur. For most bridge or culvert projects, sedimentation effects are presumed to extend no more than 400 meters (1/4 mile) downstream, although very large projects may exceed this presumed limit."*

In consideration of this guideline, the mussel action area extends approximately 1,800 feet (0.33 mile) downstream of the existing US 231 bridge at the East Fork White River and approximately 1,100 feet (0.20 mile) upstream of the bridge (Appendix A Map 5b). Perpendicular to the East Fork White River, the action area extends approximately 700 to 800 feet north and south of the respective banks to include the bridge approach construction zones where land disturbance activities potentially affecting water quality via erosion runoff are anticipated. The resulting mussel action area is approximately 100 acres centered at the existing US 231 bridge in Dubois and Martin counties. Since there are no induced development TAZs or Local Improvement segments located in the general vicinity of the East Fork White River, the action area defined only includes the Alternative P corridor crossing of the river.

For the NEPA Tier 1 EIS/ROD, a facility type (expressway versus Super-2) has not been decided. If a Super-2 facility type is ultimately selected during Tier 2, the existing US 231 bridge will likely be used, although some modifications may be warranted. For this scenario, no new bridge construction would likely be required at the East Fork White River. If an expressway facility type is selected, a new bridge across the East Fork White River will be required; however, for the current Tier 1 corridor phase it is unknown as to if the bridge would be constructed upstream (east) or downstream (west) of the existing US 231 bridge. The Tier 1 mussel action area has been developed to account for both possibilities.

10.3 Lake sturgeon action area

While the lake sturgeon is much more mobile than the sedentary mussels, the action area for this fish is synonymous with the mussel action area since construction impacts at the East Fork White River resulting from new bridge construction will primarily be confined to an approximate 0.5 mile reach of the river extending upstream and downstream of the existing US 231 bridge (Appendix A Map 4b).

10.4 Monarch butterfly action area

It is anticipated that monarch butterfly habitat is present in various sized patches scattered throughout the landscape along the Alternative P corridor. Direct impacts to the species and suitable habitat within Alternative P will be confined to the right-of-way footprint for the expressway or Super-2 facility type, whichever is selected in the Tier 2 phase. Therefore, for the Tier 1 assessment, the spatial extent of the action area is the 2000-foot corridor, including the multiple options around and through Loogootee. There is also the potential for monarch butterfly habitat along the nine proposed US 231 local improvement segments. Therefore, these locations were incorporated into the action area using the same 575-foot centerline buffer for the bats. Lastly, indirect impacts to the monarch butterfly resulting from induced growth within the 14 TAZs, as described in the bats action area narrative, have also been incorporated into the monarch butterfly action area. While specific locations for such

development within these TAZs cannot be defined, the potential exists for monarch butterfly habitat impacts resulting from this indirect action.

From this approach, the monarch butterfly action area as depicted on Appendix A Map 5c includes 80 square miles of the project area within Spencer, Dubois, Daviess, Martin, and Greene counties.

11 Bats

11.1 Indiana bat (Endangered)

The Indiana bat was first described as a distinct species by Miller and Allen (1928) from a female specimen collected by J. O. Sibert on March 7, 1904, from in Crawford County, Indiana. *Myotis* means "mouse ear," while *sodalis* is derived from the Latin word for "companion."

11.1.1 Range and Distribution

The Indiana bat range includes the eastern United States from Vermont to southern Wisconsin to eastern Oklahoma to northern Florida. USFWS (2007) reports that based on winter 2005 surveys, there were 23 total Priority 1 hibernacula in Illinois (n=1), Indiana (n=7), Kentucky (n=5), Missouri (n=6), New York (n=2), Tennessee (n=1), and West Virginia (n=1). Since then, additional Priority 1 hibernacula have been designated in Missouri (n=2), Kentucky (n=1), and New York (n=1), bringing the total to 27 (King 2019). Thirty-seven priority 1, 2, 3, and 4 hibernacula exist in Indiana (King 2019 and 2007).

A total of 269 summer maternity colonies have been documented from 16 states as of 2006, but this is considered to represent only a fraction of those that exist based on winter population estimates and average maternity colony size (USFWS 2007a). Maternity colonies appear to be more abundant in the glaciated portions of the upper Midwest than the unglaciated regions of the Midwest or the Mideast portion of the range (USFWS 2007a).

11.1.2 Population Trends

USFWS biennial population estimate data from 1981 through 2019 indicate that the population experienced a low of 526,030 in 2001 with an apparent resurgence to 664,637 in 2007 (King 2019). Possibly because of increased mortality resulting from white-nose syndrome (WNS), the population estimate has since declined to 537,297 in 2019. Based on the 2019 Range-wide Population Estimate, Missouri (36 percent), Indiana (34 percent), Illinois (15 percent) and Kentucky (10 percent) provide hibernacula for 95 percent of the population in the winter range.

Indiana populations seemingly increased slightly from estimates of 160,300 in 1965 to 238,068 in 2007; however, estimates before standardized surveys began in 1980 are unreliable (USFWS 2007a). From 2007, populations experienced a small decline to 226,572 in 2013 with a larger decline to 180,611 in 2017, followed by a small resurgence up to 184,848 in 2019 (King 2019). Redistribution of local winter populations from one cave to a nearby cave over the span of a few years has been reported in some instances (USFWS 2006 unpublished data as referenced in USFWS 2009b).

11.1.3 Diet

Moths, beetles, midges, flies, wasps, stoneflies, flying ants, caddisflies, brown leafhoppers, treehoppers, lacewings, and weevils (Kiser and Elliott 1996; Murray and Kurta 2002; Whitaker 2004) comprise the majority of the Indiana bat diet.

11.1.4 Habitat

Winter Hibernacula

In southern Indiana, winter hibernation in caves and mines generally occurs as late as November or December to as early as mid-March. Hall (1962) and LaVal and LaVal (1980) report hibernation typically occurs from October to April, while Kurta et al. (1997) and Hicks (2004) extend hibernation from September to May in northern areas including New York, Vermont, and Michigan (USFWS 2007a).

In 2005, 30 percent of the population was considered to hibernate in human-made hibernacula (mines, tunnels, dams) (USFWS 2006 unpublished data as referenced in USFWS 2009b). Caves used by Indiana bats are well ventilated (they usually have a chimney effect) and store large volumes of cool air with constant temperatures 3°C to 7.2°C (37.4°F to 45°F) (Tuttle and Kennedy 2002). Brack et al. (2003) observed that within Indiana hibernacula the highest concentrations of Indiana bats were found at sites with mid-winter temperatures of 6°C to 7°C (42.8° to 44.6°F). The Indiana bat is very sensitive to temperature changes and typically does not use caves that flood. It prefers caves that have domes, caverns, and diversity in form.

During winter hibernation, some caves support from 20,000 to 50,000 or more bats. Hibernating bats form large, compact clusters with as many as 5,000 individuals, averaging 500 to 1,000 bats per cluster (USFWS 2004). Pennsylvania Natural Heritage Program (PNHP 2007) reported clusters with 2,690 bats per square meter (250 bats per square foot) (PNHP 2007), while the New York Department of Environmental Conservation (New York Department of Environmental Conservation undated) reported more than 3,230 bats per square meter (300 bats per square foot). Several researchers have noted an inverse relationship between ambient roost temperature and the size of hibernating clusters (Clawson et al. 1980; Brack et al. 1984) as reported by USFWS (2007).

Bats go into deep hibernation (torpor) in winter, but have the ability to arouse very quickly which might be an adaptive mechanism for survival. During the hibernation period, bats arouse about once every two weeks and stay aroused for a short time period of one to two hours (Reeder et al. 2012). Cumulative arousals throughout hibernation cause much of their stored fat energy to be metabolized and not available for use in the spring. The function of the arousal is not known for sure, but it might be to drink, to exercise, or to expel waste products. However, the purpose of arousal is not to feed.

Disturbances in the winter can be deleterious. Awakening these bats can deplete their fat reserves. For this reason, gates at the entrance or fences around these caves have been used as conservation measures. When huddled together (clustered), individuals on the perimeter of the group are more susceptible to freezing than those in the middle of the mass.

Spring Staging

Spring staging generally occurs from mid-March to mid-May when males and females emerge from caves. They are hungry and thin after three to four or more months of hibernation. Indiana bats feed and congregate around these caves before migrating to their summer homes. Males usually stay near the hibernacula but might leave the area entirely (USFWS 2007a). Indiana bats have been found to migrate 64 to 80 kilometers (40 to 50 miles) a day with total distances of several hundred kilometers. One female released in southeastern New York moved 56 kilometers (35 miles) in approximately 85 minutes (Sanders et al. 2001), while one female bat released from Canoe Creek Mine in Pennsylvania traveled approximately 96 kilometers (60 miles) in one evening (Butchkoski and Turner 2005). Twelve female Indiana bats from maternity colonies in Michigan migrated an average of 476 kilometers (296 miles) to their hibernacula in Indiana and Kentucky, with a maximum migration of 574 kilometers (357 miles) (Winhold and Kurta 2006). Females usually migrate farther than males.

The females show delayed fertilization; that is, they mate with males in the fall and store sperm alive in pouches connected to the uterus. Upon an egg moving down into the uterus, sperm is discharged from these pockets and fertilizes the egg. The fertilized egg (embryo) then implants itself into the uterus. When females leave the cave, they are pregnant and prepared to start a new generation in their summer woodland habitat.

Summer Habitat

Indiana bats occupy summer habitat from mid-May to mid-August. Females and males arrive at their summer habitat in May. Summer roosting sites include primarily dead trees with cavities and/or exfoliating bark or living trees with shaggy bark (for example, shagbark hickory). Larger trees are usually preferred over smaller trees because they provide an ample amount of solar radiation and protection from the wind and rain. Numerous studies indicate that Indiana bats exhibit site fidelity to their traditional summer maternity areas (Callahan et al. 1997; Gardner, Garner, and Hofmann 1991a, 1991b; Gardner, Hofmann, and Garner 1996; Humphrey et al. 1977; Whitaker and Sparks 2003; Whitaker et al. 2004).

Nursery colonies often use several roost trees. Roost trees may be primary roost trees (emergence count ≥ 30 bats) or alternate roost trees (emergence count < 30 bats). Ideal primary roost trees are large trees with sloughing bark exposed to the sun where they secure themselves under the bark, in crevices or cavities during the day. At night, they are actively feeding on insects and use the undersides of bridges on occasion as night roosts (Kiser et al. 2002). Cervone et al. (2016) found Indiana bats roosting below a bridge during the day and night. The majority of summer maternity colonies use large dead or live trees near major streams in both bottomland and upland areas.

A maternity colony can vary greatly in size (USFWS 2007a), but typically consists of 25 to 325 adult females, averaging 80 adult females (Whitaker and Brack 2002). Although most documented maternity colonies contained 100 or fewer adult females (Harvey

2002), as many as 384 bats have been reported emerging from one maternity roost tree in Indiana (Whitaker and Brack 2002).

Young are born between late June and early July. This process is called parturition, and the adult females lactate (produce milk) at that time. Females do not carry the young unless they need to move them and, under such conditions, they will carry them on their abdomen. The young become volant (able to fly) between early July and early August, at which time the adult females become non-reproductive. Most young are volant by mid-July. Males might form bachelor colonies during the summer.

Fall Swarming

Fall swarming generally occurs mid-August to November. With the onset of fall and cooler temperatures, males return to the caves. They are at the entrances to the caves when the females and young arrive. Males then mate with females. Swarming is a milling of the bats around and out of the cave entrance. It might have several functions, but one seems to be to bring the sexes together for mating. It is not known whether juvenile females mate their first autumn. Limited mating might occur in the spring and in the cave during winter (Hall 1962).

Members of both sexes feed and gain weight through the fall, thus putting on fat (energy) needed to help them through hibernation. LaVal and LaVal (1980) found females to reach maximum weight in early October, while the males reached maximum weight in late October. The males follow the females into hibernation, and both sexes stay in the cave when outside temperatures trend towards freezing.

11.1.5 Threats

Human disturbances at winter hibernacula, summer and winter habitat loss, wind farm fatalities, and WNS are known threats to the species and chief factors for population declines. However, in recent years, WNS and wind farms have been considered the primary causes of death for Indiana bats (Boyles et al. 2011).

WNS is a disease caused by the cold-loving fungus, *Pseudogymnoascus destructans* (formerly called *Geomyces destructans*), that affects bats during winter hibernation. Since first reported in New York in 2006, the USFWS estimates that at least 5.7 million to 6.7 million bats have died from WNS (USFWS 2012c). The disease originally spread south along the Appalachian Mountains, north into Canada and southwest into Tennessee, Missouri, and Iowa. WNS was first reported in Indiana in January 2011.

Once embedded into the epidermis, the fungus causes open sores (lesions) in the epidermis and dermis in especially bare areas like the nose, forearms, and wings. If the bat survives, such lesions heal as scars. The fungus grows in temperatures around 4°C to 20°C (39.2°F to 68.0°F) (Chaturvedi et al. 2010). The upper critical temperature for growth is between 19°C and 19.8°C (66.2°F and 67.6°F). At temperatures above 12°C (53.6°F) the fungus undergoes modification of arthrospores and chlamydospores that can facilitate enhance persistence of the fungus; however, warmer temperatures generally decrease overall reproductive capacity (Verant et al. 2012).

Bats usually come into hibernation with extra grams of fat, the majority of which is used in arousals. The remaining grams of fat are needed to sustain bats through the

duration of hibernation. Fungal lesions caused by the fungus cause the bat to become more active and waste critical energy reserves. When this happens, bats might leave the cave in winter in search of food, and ultimately die in or out of the cave from starvation.

Wind farms (becoming more prevalent in the landscape) are also reported to kill many bats. Most such losses affect bats that migrate long distances, such as the hoary bat (*Lasiurus cinereus*), eastern red bat (*Lasiurus borealis*), and silver-haired bat (*Lasionycteris noctivagans*). However, an Indiana bat was killed at a wind farm in Benton County, Indiana, September 2009 (Johnson et al. 2010), with a second fatality at the same site in September 2010 (Pruitt and Reed 2022). Since then there have been an additional 13 reported wind energy Indiana bat fatalities from 2015 to 2021 in Indiana (Pruitt and Reed 2022). Range-wide a total of 34 wind related Indiana bat fatalities have been reported from Indiana, Pennsylvania, West Virginia, Ohio, Iowa, Illinois, and Missouri (Pruitt and Reed 2022).

The population may also be declining because of pesticide use, possibly through bioaccumulation from eating contaminated insects, drinking contaminated water or direct absorption of the chemicals while feeding in areas that have recently been treated (Mohr 1953; Schmidt et al. 2002; USFWS 2006, 2007).

11.1.6 USFWS and IDNR Species Records Summarization

Appendix A Map 6 includes generalized mapping of Indiana bat occurrence data from the USFWS and IDNR. Data is mapped to the Section level of the Public Land Survey System (PLSS) grid. There are multiple USFWS and IDNR Indiana bat summer capture, roost tree and winter hibernacula records for Daviess, Martin, and Greene counties, but none for Dubois County. The majority of the Daviess and Greene county records are attributed to the extensive bat survey work previously conducted for the I-69 project, while the Martin County records are primarily from Crane NSA and studies conducted on Hoosier National Forest lands. The lack of Indiana bat records from Dubois County is most certainly attributed to the lack of studies conducted within the county. The nearest capture and roost tree data to Alternative P is east of US 231 at the Crane NSA in northern Martin County. This includes captures from the 1980s, 1990s, to as recent as 2015. Documented roost trees from Crane NSA (1998), along I-69 in Daviess County (2013), and south of SR 45 in Greene County (2004) are as close as 2.9 miles from the Alternative P corridor. However, given the abundance of forested habitat in northwestern Martin and northeastern Daviess County, it is expected that additional Indiana bat roosts closer to the corridor exist.

There are also three Priority 3 and 4 hibernacula caves documented in eastern Martin County (Hoosier National Forest, the closest of which is approximately 10.0 miles from the Alternative P corridor. Additionally, there are five documented hibernacula caves in eastern Greene County, the nearest of which is a Priority 4 cave 7.0 miles to the northeast of the Alternative P corridor termini at I-69. The Alternative P corridor junction with I-69 is over 11 miles from (Priority 1) and more than 15 miles from (Priority 2). Appendix A Map 6 illustrates the 10-mile Priority 1 and 2 hibernacula fall swarming ranges and the 5-mile Priority 3 and 4 hibernacula ranges.

The proposed action would not encroach upon fall swarming woodland habitat associated with any of these hibernacula.

11.2 Northern Long-eared Bat (Endangered)

The northern long-eared bat was first recognized as a distinct species instead of a subspecies of Keen's long-eared myotis (*Myotis keenii*) by van Zyll de Jong (1985) in 1979 based on geographic separation and morphological characteristics.

11.2.1 Range and Distribution

The northern long-eared bat range includes the eastern and north-central United States and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia. In the United States, it includes 39 states from Maine west to Montana, south to eastern Kansas, eastern Oklahoma, Arkansas, and east to northern Florida. It was more commonly observed in the northeastern portion of its U.S. range than in the southern and western regions (Amelon and Burhans 2006; Caceres and Barclay 2000). Within this range, more than 780 hibernacula have been identified in 27 states, more than 60 percent of which are in Pennsylvania, Missouri, West Virginia, Michigan, and Kentucky (Whitaker and Hamilton 1998). The April 2, 2015 final listing rule and interim 4(d) rule indicated that there were 25 known hibernacula for the northern long-eared bat in Indiana (USFWS 2015a). Subsequently, the January 5, 2016 Programmatic Biological Opinion on Final 4(d) Rule revised this figure to 69 Indiana hibernacula (USFWS 2016d). As of the date of this report, USFWS unpublished data indicates that there are 93 caves being used as winter hibernacula for the northern long-eared bat.

The U.S. range has been divided into four populations (eastern, Midwest, southern, and western), although these are not considered isolated populations from each other (USFWS 2013b). It is less common in the southern and western portions of the range, but is fairly common in the Midwest population area (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin). Although Indiana has fewer known hibernacula than most of the other states that make up the Midwest population, the northern long-eared bat has historically been considered the fourth or fifth most abundant species statewide and the most frequently captured at mine entrances.

11.2.2 Population Trends

USFWS compared captures of a three-year survey conducted in northern Indiana (King 1993) and a three-summer survey in south-central Indiana (Sheets et al. 2013). In the former, only four percent of the captures were northern long-eared bats, versus 38 percent in the latter. These results suggest that habitat abundance or other environmental conditions are more favorable in the southern portion of the state. Range-wide or Indiana population estimates have not been generated by USFWS.

11.2.3 Diet

The northern long-eared bat has a diverse diet including moths, flies, leafhoppers, caddisflies, spiders, and beetles, with diet composition differing geographically and seasonally (Brack and Whitaker 2001). The most common insects found in the diets of northern long-eared bats are moths and beetles (Brack and Whitaker 2001;

Feldhamer et al. 2009), with spiders also being a common prey item (Feldhamer et al. 2009). Foraging techniques include hawking (catching insects in flight) and gleaning (picking insects off stationary features such as leaves or branches) in conjunction with passive acoustic cues (Nagorsen and Brigham 1993; Ratcliffe and Dawson 2003). Gleaning allows this species to gain a foraging advantage for preying on moths because moths are less able to detect high-frequency echolocation calls (Faure et al. 1993). Spiders, other non-flying insects, and green plant material, have also been present in their feces, which suggests considerable gleaning behavior.

11.2.4 Habitat

Winter Hibernation

Caves and mines are used by the northern long-eared bat in winter. Hibernacula used are typically large, with large passages and entrances, relatively constant and cooler temperatures, high humidity, and no air currents. The sites favored by them are often in very high-humidity areas, to such a large degree that droplets of water are often observed on their fur. They are typically found roosting in small crevices or cracks in cave or mine walls and can often be overlooked in surveys. To a lesser extent, they have been found overwintering in habitats that resemble caves or mines, habitats such as abandoned railroad tunnels and storm sewers (Goehring 1954), hydroelectric dams (Kurta and Teramino 1994), aqueducts (French 2012), or other “unsuspected retreats” where caves and mines are not present.

Northern long-eared bats have shown a high degree of philopatry (using the same site multiple years) for a hibernaculum. Other species in Indiana that commonly occupy the same hibernacula with the northern long-eared bat are the little brown bat (*Myotis lucifigus*), big brown bat (*Eptesicus fuscus*), tri-colored bat (*Perimyotis subflavus*), and Indiana bat. Northern long-eared bats often move between hibernacula throughout the winter, which may further decrease population estimates. Similarly, this species has been found to fly in and out of some of the mines and caves in southern Indiana throughout the winter (Whitaker and Mumford 2009).

Spring Staging

Both males and females emerge from caves and mines in spring. Northern long-eared bats exhibit significant weight loss during hibernation. One Indiana study showed a 41 to 43 percent loss (Whitaker and Hamilton 1998). During staging, northern long-eared bats are flying in and out of caves to feed and congregate before migrating to their summer homes.

The northern long-eared bat is not considered a long-distance migratory species. Short migratory movements between summer roost and winter hibernacula are typically between 56 to 88 kilometers (35 to 55 miles) (Griffin 1945; Nagorsen and Brigham 1993). However, movements may range from 8 to 270 kilometers (5 to 168 miles) (Griffin 1945).

When females leave the cave, they are pregnant and ready to start a new generation in their summer woodland habitat. Gestation is approximately 60 days (van Zyll de Jong 1985). Males are reproductively inactive until late July, with testes descending in

most males during August and September (Amelon and Burhans 2006; Caire et al. 1979).

Summer Habitat

During the summer, northern long-eared bats typically roost singly or in colonies underneath bark or in cavities or crevices of both live trees and snags. Males and non-reproductive females' summer roost sites may also include cooler locations, such as caves and mines (Barbour and Davis 1969). They also have been found roosting in human-made structures, such as buildings, barns, a park pavilion, sheds, cabins, under eaves of buildings, behind window shutters, and in bat houses (Amelon and Burhans 2006; Barbour and Davis 1969; Cope and Humphrey 1972; Kath, personal communication, April 9, 2013; Mumford and Cope 1964; Timpone et al. 2010; Whitaker and Mumford 2009) and below bridges (Carter and Feldhamer 2005). This species appears to be somewhat opportunistic in roost selection. Canopy cover at northern long-eared bat roosts has ranged from 56 percent (Timpone et al. 2010) to greater than 84 percent (Lacki and Schwierjohann 2001). Females tend to roost in more open areas than males, likely because of the increased solar radiation, which aids in pup development (Perry and Thill 2007). Roosts are also largely selected below the canopy, which could be attributable to the species' ability to exploit roosts in cluttered environments; their gleaning behavior suggests an ability to easily maneuver around obstacles (Foster and Kurta 1999; Menzel et al. 2002).

One study found that northern long-eared bats roost more often on upper and middle slopes than on lower slopes, suggesting a preference for higher elevations because of increased solar heating (Lacki and Schwierjohann 2001). Northern long-eared bats switch roosts often (Sasse and Pekins 1996), typically every two to three days (Carter and Feldhamer 2005; Foster and Kurta 1999; Owen et al. 2002; Timpone et al. 2010). Reasons for switching might be temperature, precipitation, predation, parasitism, and ephemeral roost sites (Carter and Feldhamer 2005). They have also been found roosting below bridges in Illinois (Feldhamer et al. 2003).

The northern long-eared bat is comparable to the Indiana bat in terms of summer roost selection, but appears to be more opportunistic (Carter and Feldhamer 2005; Timpone et al. 2010). A small amount of overlap in roost selection might occur between these two species (Foster and Kurta 1999; Timpone et al. 2010). Maternity colonies, consisting of females and young, are generally small, numbering from about 30 (Whitaker and Mumford 2009) to 60 individuals (Caceres and Barclay 2000). Adult females give birth to a single pup. Birth likely occurs in late May or early June (Caire et al. 1979; Easterla 1968; Whitaker and Mumford 2009) but can occur as late as July (Whitaker and Mumford 2009). Juveniles are volant within 21 days of birth (Krochmal and Sparks 2007; Kunz 1971). Adult longevity is estimated to be up to 18.5 years (Hall et al. 1957), with the greatest recorded age of 19 years (Kurta 1995).

Emerging at dusk, most foraging occurs above the understory, 0.9 to 3.0 meters (three to ten feet) above the ground, but under the canopy (Nagorsen and Brigham 1993) on forested hillsides and ridges, rather than along riparian areas (Brack and Whitaker 2001; LaVal et al. 1977). This coincides with data indicating that mature forests are important habitat for foraging in this species (Caceres and Pybus 1997).

Fall Swarming

With the onset of fall and cooler temperatures, males return to the caves. They are at the entrances when females and young arrive. Elevated hormone levels trigger males to mate with females. Hibernating females store sperm until spring, exhibiting delayed fertilization (*amphigonia retardata*). Swarming might have several functions, but one seems to be to bring the sexes together for mating. Members of both sexes feed and gain weight through the fall, thus putting on fat (energy) to help them survive hibernation. It is unknown whether juvenile females mate their first autumn. Limited mating might occur in the cave in winter and might even occur in the spring. When temperatures are 10°C (50°F) or less, the bats start to stay inside caves.

11.2.5 Threats

Threats to the northern long-eared bat are generally the same as those described for the Indiana bat. However, no threat is considered as severe and immediate to the northern long-eared bat's persistence as WNS. Habitat loss continues to be a contributing factor and a limiting factor in its potential for recovery. The species was relatively common in Indiana prior to the arrival and spread of WNS through the state circa 2011.

11.2.6 USFWS and IDNR Species Records Summarization

Appendix A, Map 7 includes generalized mapping of northern long-eared bat occurrence data from the USFWS and IDNR. Data is mapped to the Section level of the Public Land Survey System (PLSS) grid. There are multiple USFWS and IDNR Indiana bat summer capture, winter hibernacula records for Daviess, Martin, and Greene counties, but none for Dubois County. As with the Indiana bat, the majority of the Daviess and Greene county records are attributed to the extensive bat survey work previously conducted for the I-69 project, while the numerous northern Martin County records are primarily from studies conducted at Crane NSA. The lack of northern long-eared bat records from Dubois County is most certainly attributed to the lack of studies conducted within the county or exists as data not yet entered into the system. There are in excess of 175 northern long-eared capture records from Crane NSA dating from 1998 to as recent as 2015. However, the nearest capture record was from the I-69 survey in 2004 on Rocky Branch within the Alternative P corridor. Northern long-eared bat roost tree data is scarce within the Mid-States Corridor project area; nonetheless, there are multiple records within Crane NSA, the closest of which is from 2015 just over 2 miles from the Alternative P corridor.

Documented, northern long-eared bat hibernacula within the project area includes multiple locations in Greene County with a single 2001 record from extreme eastern Martin County more than 12 miles from the Alternative P corridor. The nearest documented Greene County northern long-eared bat hibernacula is more than 7.5 miles from the Alternative P corridor termini at I-69. Appendix A Map 7 illustrates the 5-mile hibernacula fall swarming range for the northern long-eared bat caves in Greene County. The proposed action would not encroach upon fall swarming woodland habitat associated with any of these hibernacula.

11.3 Gray Bat (Endangered)

11.3.1 Range and Distribution

Gray bat distribution extends as far north as southern Indiana (Brack et al. 1984), as far west as southeastern Kansas (Choate and Decher 1996), and as far east as western North Carolina and Virginia (Decher and Choate 1995). Because it is nearly an exclusive cave-dwelling species, the gray bat is most abundant in the karst regions of Missouri, Arkansas, Kentucky, Tennessee, and Alabama (Barbour and Davis 1969). The species is also a well-known migrant and occasionally occurs many miles outside its normal range (Stihler and Brack 1992, Tuttle et al. 2005). In Indiana, spring, summer, and fall capture data are largely confined to the Ohio River border counties of Spencer, Perry, Crawford, Harrison, Floyd, and Clark, with additional older records in Lawrence and Jennings counties. However, acoustic call data suggest possible presence elsewhere in southern Indiana.

11.3.2 Population Trends

The 2009 gray bat 5-year review summarized Ellison et al. (2003) gray bat population trend data from colonies and hibernacula concluding that 94.4 percent of the population was considered stable or increasing, while less than 6 percent was decreasing, mostly due to human disturbance (USFWS 2009a). In 2004, range wide gray bat populations were estimated at 3,400,000, an increase of approximately 104 percent since 1982.

11.3.3 Diet

Foraging habitat for the gray bat typically includes streams, lakes, or wetland features, where gray bats can forage for aquatic and terrestrial flying insects (Tuttle 1976b, LaVal et al. 1977, USFWS 1982, Clawson and Titus 1992, Best and Hudson 1996, Missouri Department of Conservation 2000). Specific macro-habitat characteristics of waterways and adjacent areas may vary in importance among different gray bat colonies (Moore et al. 2017). Forest areas surrounding caves, and flyways are also important foraging habitat for gray bats (Tuttle 1979), particularly juveniles (Brack and LaVal 2006). Individual gray bats may travel 12 to 21 miles to forage, depending on available habitat and colony size (LaVal and LaVal 1980). However, increased distances to foraging areas may lead to a decreased rate of growth by the pups (Tuttle 1976a). Gray bats commonly prey on caddisflies (*Trichoptera*), beetles (*Coleoptera*), and moths (*Lepidoptera*), and to a lesser extent stone flies (*Plecoptera*), may flies (*Ephemeropta*), and true flies (*Diptera*) (Brack and LaVal 2006).

11.3.4 Habitat

Spring Migration

Male gray bats emerge from winter hibernation in early March and begin migration to summer habitat with females following shortly thereafter in late March. During the migration between winter and summer caves, gray bats stop at well-defined sites known as transient caves through April. By mid-May females have moved to maternity caves and males to bachelor roosts. Gray bats of all ages and sexes occur at both the maternity and transient caves in July and August, marking the swarming stage of the

annual cycle. Migration to winter hibernacula from summer roosts begins in August and lasts through early November (Missouri Department of Conservation 2000). Mating occurs soon after adults arrive at the hibernaculum. Females begin hibernation immediately afterward, while males and juveniles will remain active for an additional several weeks. By the beginning of November, all bats are usually hibernating.

Winter Hibernacula and Summer Caves

Gray bats utilize different caves for both winter hibernation and summer roosting, although some gray bats are also known to use storm sewers (Harvey and McDaniel 1988, Decher and Choate 1995), bridges (Johnson et al. 2002, Cervone and Yeager 2016), quarries, mines (Brack et al. 1984), and other man-made buildings and tunnels (Elder and Gunier 1978, Evans and Drilling 1992, Missouri Department of Conservation 2016). Gray bats are philopatric to their same hibernacula, summer caves, and even migratory stop-over sites each year (LaVal and LaVal 1980). Gray bat hibernacula are often vertical caves with domed rooms where cold air enters and then gets trapped. Temperatures within these areas typically range between 6.1°C to 11.1°C (43°F to 52°F) (Tuttle 1976a; 1979). Gray bats form large, irregular clusters and have a distinctive loose armed position. In summer, females and pups form maternity colonies in caves with subterranean water sources and domed ceilings capable of trapping warm air with temperatures between 13.9°C to 26.1°C (57°F to 79°F) (Tuttle 1976a). Maternity colonies are often within 0.6 to 2.5 miles of surface water sources (Tuttle 1976b, USFWS 1997a). Male gray bats form bachelor colonies in the summer, though many do not roost separately until females give birth to a single pup in late May or early June (USFWS 1982). There are no Priority 1 or 2 maternity caves for the gray bat in Indiana (USFWS 2009a).

11.3.5 Threats

Gray bats were initially listed as endangered because of their sensitivity to disturbance, which may lead them to abandon caves or move to areas that provide protection, but also lower quality microhabitats (Tuttle 1975; 1979). As with other Myotis bat species, the gray bat is also susceptible to WNS infection. Additional threats to populations include adverse modification of caves, disturbance of bats in the caves, impoundment of waterways, chemical contamination, and climate change (USFWS 2009a). Reduction in insect prey through deforestation in foraging areas has the potential to affect gray bat populations. Flooding of caves used by gray bats resulting from waterway impoundments (USFWS 1982) can have adverse effects on roosting habitat, and organochloride pesticides have been cited as having adverse biological effects (Geluso et al. 1976, Clark et al. 1978).

11.3.6 USFWS and IDNR Species Records Summarization

Appendix A Map 8 includes generalized mapping of gray bat occurrence data from the USFWS and IDNR. Data is mapped to the Section level of the Public Land Survey System (PLSS) grid. USFWS and IDNR gray bat capture records are lacking from Daviess, Martin, Greene, and Dubois counties. The nearest documented record in these data sets is from Spencer County on the Anderson River approximately 9.8 miles

to the southeast of the Alternative P corridor. However, the gray bat has also been observed roosting under a White River bridge in Greene County in April 2007 and September 2012 (Cervone and Yeager 2016). Elsewhere, older capture records from Orange County (1959 near Bedford and 1907 near Mitchell) far to the east of Alternative P corridor and from Spencer, Perry, Crawford, and Harrison counties in south central Indiana are the only other records available. Note: IDNR has recently contracted survey work to investigate possible gray bat range expansion in Indiana; however, this data is not yet available for review.

In addition to capture records, USFWS has multiple acoustic gray bat detection records from Daviess, Martin, Dubois, and Spencer counties. These include multiple records in northwestern Daviess and southern Greene counties along the I-69 corridor, several 2018 records from Crane NSA in eastern Martin County, multiple records along Crooked Creek in southern Spencer County, as well as a few scattered records to the east and west of US 231 in southern Dubois County. While it is unknown if these acoustic identifications were visually confirmed or not, the acoustic data suggests that gray bats may forage within the project area during the summer.

The nearest documented gray bat hibernacula is more than 30 miles to the southeast in Crawford County. Appendix A Map 8 illustrates the 10-mile buffer for the August 1959 gray bat captures at a cave near Bedford, Indiana.

11.4 Little Brown Bat (12 month PLPCH)

11.4.1 Distribution

The little brown bat (*Myotis lucifugus*) is widely distributed across North America from central Alaska to central Mexico (Harvey et al. 1999). Prior to arrival of WNS, the largest colonies were found in the northeastern and Midwestern United States (Davis and Hitchcock 1965, Kunz and Reichard 2010), where some hibernacula contained tens to hundreds of thousands of individuals (Kunz and Reichard 2010). The southern edge of their distribution is limited by the lack of caves, whereas the northern edge of the range is likely defined by a limited number of suitable hibernacula and the longer length of the hibernation season (Humphries et al. 2002, Humphries et al. 2006). Most little brown bats stay within 62 miles of their hibernacula, although some make longer migrations.

11.4.2 Population Trends

In 2006, the core northeastern U.S. population for the little brown bat was estimated at 6.5 million (Frick et al. 2010) and it was considered one of the most common bats in Indiana. However, since arrival of WNS in 2010-2011 numbers have drastically declined range wide and within Indiana. The 2010 status review prepared for the species indicated that in the four years since 2006 it was estimated that at least one million little brown bats in the northeast died from WNS (Kunz and Reichard 2010).

11.4.3 Diet

Little brown bats feed predominantly by aerial hawking, gleaning behavior is rarely observed in the species (Schwartz and Schwartz 2016). Little brown bats are strictly insectivorous, preying on mayflies, caddisflies, flies, stoneflies, mosquitos, lacewings

and beetles (Schwartz and Schwartz 2016). Prey size is predominantly 3mm to 13mm in size (*The Wild Mammals of Missouri*, Schwartz and Schwartz 2016). True flies (*Diptera*) make up as much as 31% of the little brown diet (Whitaker 2010).

11.4.4 Habitat

Most little brown bat roosts use anthropogenic structures such as bat boxes, buildings, and bridges; although some bats roost in the cavities or under the bark of dead or dying trees (Humphrey and Cope 1976, Boyles et al. 2009). Trees used by maternity colonies tend to be very large and either dead or dying. Male roosts are much more varied and include virtually any place a bat can hide itself such as rock crevices, tree hollows, loose bark, bat boxes and small openings in buildings (Humphrey and Cope 1976, Boyles et al. 2009). Although a few bats roost as far away as 6.2 miles, most roost within the immediate vicinity of the hibernacula during swarming (Lowe 2012). Little brown bats often commute within corridors in open flyways (streams, woodland trails, small infrequently used roads, and possibly utility corridors) between foraging and roosting habitat (Brown and Brack 2003). Foraging habitat is primarily associated with aquatic resources and along forest edge (Belwood and Fenton 1976, Anthony and Kunz 1977, Fenton and Bell 1979, Barclay 1991, Barclay and Brigham 1991, Kunz and Reichard 2010, Bergeson 2012, Bergeson et al. 2013). Cool, stable, underground caverns are used for hibernation (called hibernacula). As little brown bats hibernate, their body temperatures drop to near cave temperatures (average temperature 45°F) with high humidity. (Barbour and Davis 1969, Humphrey and Cope 1976, Kurta 2008, Brack et al. 2010). Bats with low fat reserve select colder temperatures to maximize energy conservation, whereas bats in better condition select warmer temperatures to minimize other costs of hibernation (Boyles et al. 2007). WNS has forced bats to select colder, more variable sites (Johnson et al. 2016).

11.4.5 Threats

WNS is now the principal cause of decline that has reduced the eastern population an average of 97 percent (Tinsley 2016). Wind turbine strikes and barotrauma (injuries from drastic air pressure changes at turbine blades) are the secondary threat to little brown bats with as many as 107,000 killed at wind turbines between 2000 and 2011 (Arnett and Baerwald 2013). Pesticides are a lesser threat, but persistent organic pollutants have been found in lethal concentrations in little brown bats (Fenton and Barclay 1980, Kannan et al. 2010). Loss of important hibernacula can have regional effects, and removal of summer roosts (both trees and structures) can reduce local abundance (Whitaker et al. 2002). In addition, habitat loss and habitat fragmentation through timber harvesting, oil, gas, mineral extraction, and residential/commercial development, pose threats to continued survival and recovery of this species.

11.4.6 USFWS and IDNR Species Records Summarization

Appendix A Map 9 includes generalized mapping of little brown bat occurrence data from IDNR. Data is mapped to the Section level of the Public Land Survey System (PLSS) grid. The majority of the IDNR capture records are associated with the I-69 corridor in western Daviess County, and southern Greene County. Included among

these are capture records from Doans Creek and First Creek in the general vicinity of the northern termini for the Alternative P corridor. Capture records for Martin and Dubois County are lacking. The lack of data within the Natural Heritage Data Center system is likely attributed to IDNR not yet having the opportunity to update the system with previous records since the species became state listed. Therefore, it is presumed that there are multiple accounts of little brown bat captures from Crane NSA (Martin County) and Hoosier National Forest (Dubois County) surveys that are not represented in the IDNR system. Since the little brown bat has not yet been listed by USFWS as endangered, roost tree data for the species is lacking.

The majority of the IDNR documented little brown bat hibernacula within the Alternative P corridor project area are from southeast Greene County, northwestern Lawrence County, with additional scattered locations in Lawrence County and extreme eastern Martin County. The closest documented little brown bat hibernacula is approximately 7 miles to the northeast of the Alternative P corridor termini at I-69 (same cave as for the tricolored bat). The two Martin County little brown bat caves (2001 and 2016, same caves as for the tricolored bat) are more than 12 miles to the east of the Alternative P corridor. Appendix A Map 9 illustrates the 5-mile hibernacula fall swarming ranges for IDNR documented little brown bat caves. The proposed action would not encroach upon fall swarming woodland habitat associated with any of these hibernacula.

11.5 Tricolored Bat (Proposed Listing Species)

11.5.1 Distribution

The tricolored bat range extends from the Yucatan Peninsula to Nova Scotia, New Brunswick (Broders et al. 2001), and Quebec, and east to the Atlantic Ocean. More recently, the species has expanded across the High Plains (Damm and Geluso 2008) and into the Intermountain West region, including Texas and New Mexico (Sparks and Choate 2000, Geluso et al. 2005, White et al. 2006, Valdez et al. 2009). In Indiana, tricolored bats are largely limited to the southern half of the state from Vermillion County south (Whitaker et al. no date).

11.5.2 Population Trends

Rapid declines associated with WNS have negatively affected hibernating tricolored bat populations in northeastern states during the past decade (Turner et al. 2011). Tricolored bats are estimated to have experienced a 90 to 100% population decline across 59% of the species range (Cheng et al. 2021). Median range wide abundance declines are predicted to be as high as 93% by 2030 (USFWS 2021c).

11.5.3 Diet

Tricolored bats prey via aerial hawking on *Homoptera*, *Hemiptera*, *Diptera*, and *Lepidoptera* (Whitaker 2004, Caylor 2011). The diet of tricolored bats in Indiana is primarily composed of caddislflies and true bugs (*Hemiperta*) with secondary components of beetles and ants (Schwartz and Schwartz 2016, Whitaker 2010).

11.5.4 Habitat

Although tricolored bats frequent building structures for staging assembly, they primarily utilize clusters of dead leaves for summer maternity roost colonies, but may also be found in live leaf foliage, lichens, patches of pine needles caught in tree limbs, buildings, caves, and rock crevices (Humphrey 1975, Veilleux et al. 2003, Veilleux and Veilleux 2004a; 2004b, Veilleux et al. 2004, Perry and Thill 2007). Oak and maple trees are preferred by tricolored bat maternity colonies presumably because the ends of the branches tend to have many leaves (Veilleux et al. 2003; Veilleux et al. 2004, Perry and Thill 2007), and thus maternity colonies are more often associated with uplands than bottomland forest. Tricolored bats vary their roost position in the canopy and landscape depending on reproductive condition; reproductive female bats roost lower in the canopy and farther from forest edges than non-reproductive females. The lower position in the canopy and greater distances from the forest edge may reduce wind exposure and allow for more stable temperatures (Veilleux and Veilleux 2004b). The average size of a woodlot containing a maternity colony in suburban Indianapolis was 123.6 acres and woodlots of 12.4 acres or less were not used (Helms 2010).

Maternity colonies are generally small in number. Maternity colonies in buildings tend to give birth between May and July and contain 7-29 bats (Whitaker 1998). However, colonies roosting in foliage give birth in late June in Indiana (Veilleux and Veilleux 2004a), and the number of bats sharing a leaf cluster varies from 1-13 individuals. Most males roost in the same types of leaf clusters used by female tricolored bats (Veilleux and Veilleux 2004a), although they tend to roost at lower heights than females (16.4 feet above the ground) (Perry and Thill 2007).

Generally, tricolored bats prefer wooded habitats near water (Whitaker and Mumford 2009). Preferred habitats for foraging included forest, old field, grasslands, and agriculture; but transportation corridors, low and high density residential, commercial, industrial, and water are also used. Tricolored bats (especially pregnant females) have a low wing aspect ratio, which makes them highly maneuverable, but also less energy efficient as fliers (Norberg and Rayner 1987). They are able to forage in complex woodlands with more vertical structure and are considered clutter-adapted. Their low wing aspect ratio limits their ability to travel long-distances, with the maximum distance reported between foraging and roosting areas being 2.7 miles in Indiana (Veilleux et al. 2003).

11.5.5 Threats

WNS is the primary threat to tricolored bats, with estimated WNS related declines between 90 to 100% within 59% of the species range (Cheng et al. 2021). Collisions with wind turbine blades and barotrauma at wind energy sites in the Midwest is estimated to result in the take of 51,389 tricolored bats between 2016 and 2060 (USFWS 2016a). USFWS estimates a total of 3,227 tricolored bats are killed by wind turbines annually (USFWS 2021c). Other stressors identified include mortality from tree removals associated with a variety of activities (logging, energy extraction, and development), closure of occupied hibernacula, deaths from other diseases, losses at wind energy sites, and environmental contaminants (Center for Biological Diversity and Defenders of Wildlife 2016). The tendency of tricolored bats to occupy a wide

variety of hibernacula makes them especially likely to become entombed during mine closures (Whitaker and Stacy 1996). As with the Indiana bat, chemical contamination may kill bats directly or lead to sub-lethal effects that eventually lead to death or reduced reproduction (Eidels et al. 2016).

11.5.6 USFWS and IDNR Species Records Summarization

Appendix A Map 10 includes generalized mapping of tricolored bat occurrence data from IDNR. Data is mapped to the Section level of the Public Land Survey System (PLSS) grid. The majority of the IDNR capture records are associated with the I-69 corridor in western Daviess County, and southern Greene County. Included among these are 2004 capture records from Rocky Branch and Doans Creek, within and immediately adjacent to the northern termini for the Alternative P corridor. Capture records for Martin and Dubois County are lacking. The lack of data within the Natural Heritage Data Center system is likely attributed to IDNR not yet having the opportunity to update the system with previous records since the species became state listed. Therefore, it is presumed that there are multiple accounts of tricolored bat captures from Crane NSA (Martin County) and Hoosier National Forest (Dubois County) surveys that are not represented in the IDNR system. Since the tricolored bat has not yet been listed by USFWS as endangered, roost tree data for the species is lacking.

The majority of the IDNR documented tricolored bat hibernacula within the Alternative P corridor project area are from southeast Greene County, northwestern and southwestern Lawrence County, scattered through Orange County, and two locations in extreme eastern Martin County. The closest documented little brown bat hibernacula is approximately 7 miles to the northeast of the Alternative P corridor termini at I-69 (same cave as for the little brown bat). The two Martin County tricolored bat caves (2001 and 2016, same caves as for the little brown bats) are more than 12 miles to the east of the Alternative P corridor. Appendix A Map 10 illustrates the 5-mile hibernacula fall swarming ranges for IDNR documented tricolored bat caves. The proposed action would not encroach upon fall swarming woodland habitat associated with any of these hibernacula.

11.6 Bat Impact Assessment

The following effects analysis addresses direct, indirect, and cumulative impacts anticipated for the Indiana bat, northern long-eared bat, gray bat, little brown bat, and tricolored bat for the Mid-States Corridor Tier 1 biological assessment.

11.6.1 Direct Impacts

Potential direct impacts for bat species are summarized for direct take, forest habitat loss, maternity colony affects, flyway/foraging impacts, fall swarming habitat impacts, nighttime/light impacts, water quality impacts, construction noise impacts, and operation/maintenance impacts.

11.6.1.1 Direct Take from Tree Clearing and Building Demolition

The Indiana bat, northern long-eared bat, little brown bat, and tricolored bat primarily use live and dead trees with suitable features (exfoliating bark, cavities and crevices)

for summer roosting, whether it be for a maternity colony, non-reproductive females, or adult males. To a lesser extent, these species may also use man-made structures such as occupied or abandoned residential houses, barns, utility poles, and bridges for summer roosting or during spring and fall migration. Bats day roosting in trees or other suitable structures during these active periods are at risk of death or injury if trees are felled or structures are razed for road/bridge construction during the active season where suitable habitat is present. Tree clearing and various building demolition for the Mid-States Corridor project is unavoidable, but will be minimized to the maximum extent practical during the Tier 2 development phase. Project scheduling of tree clearing and building removal during the late fall, winter, and early spring is the most effective AMM that INDOT employs to insure direct take of bats is avoided to the maximum extent practical.

11.6.1.2 Forest Habitat Impacts

Through coordination with the USFWS Indiana Field Office (INFO) it was concluded that presence/absence surveys and field habitat surveys would not be required for effective Mid-States Corridor Tier 1 Section 7 consultation for the purposes of conducting the "jeopardy" analysis. Therefore, the assessment of potential bat habitat and impacts to listed and proposed listing bats was performed using available GIS data, National Wetland Inventory (NWI) data, and aerial photograph interpretation. Forestland is an essential landscape component for bat habitat; therefore, forest cover was used as the principal assessment metric in the analysis. For the general corridor forestland assessment, maternity colony assessments, and forest fragmentation assessments, the 2016 National Land Cover Data (NLCD) GIS information was used as the base source.

Alternative P Corridor and Working Right-Of-Way Forestland Assessment

The amount and percentage of forestland within each of the five counties that includes the bat action area serves as a comparative base for assessing relative impacts to forest tracts within the Alternative P 2000-foot wide corridor and the four Loogootee options. Figure 5 illustrates that the highly agricultural landscape of Daviess County has only approximately 18 percent forest cover, while Martin County, most of which is within the Crawford Upland region, is roughly 70 percent forest cover. Of the 186.5 square miles that comprises the bat action area, approximately 33 percent is forestland, the majority of which (12,839 acres) is within Dubois County. Appendix A Map 11 provides a general land cover perspective showing the large expanses of forest habitat relative to the Alternative P Corridor.

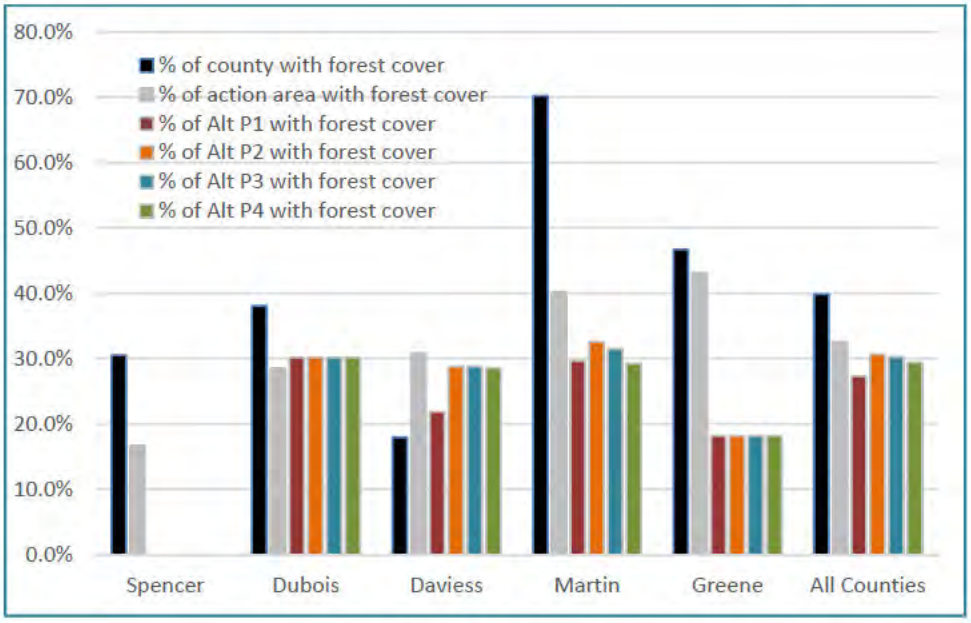


Figure 5. Forest cover percentages in Mid-States Corridor counties, bat action area, and Alternative P corridors

Figure 6 illustrates the cumulative acreage for each Alternative P corridor alignment by county for four major land use classes (agriculture, forest, developed, and other). Because Loogootee is located at the extreme western edge of Martin County, the western route (Alternative P1) places more of the corridor within adjacent Daviess County than the eastern routes, thus the overall greater acreage and greater acreage of agricultural land for this Loogootee alignment. For the three eastern Loogootee alignments, Alternative P4 has slightly more forest habitat than Alternative P3 and 29 percent more than Alternative P2.

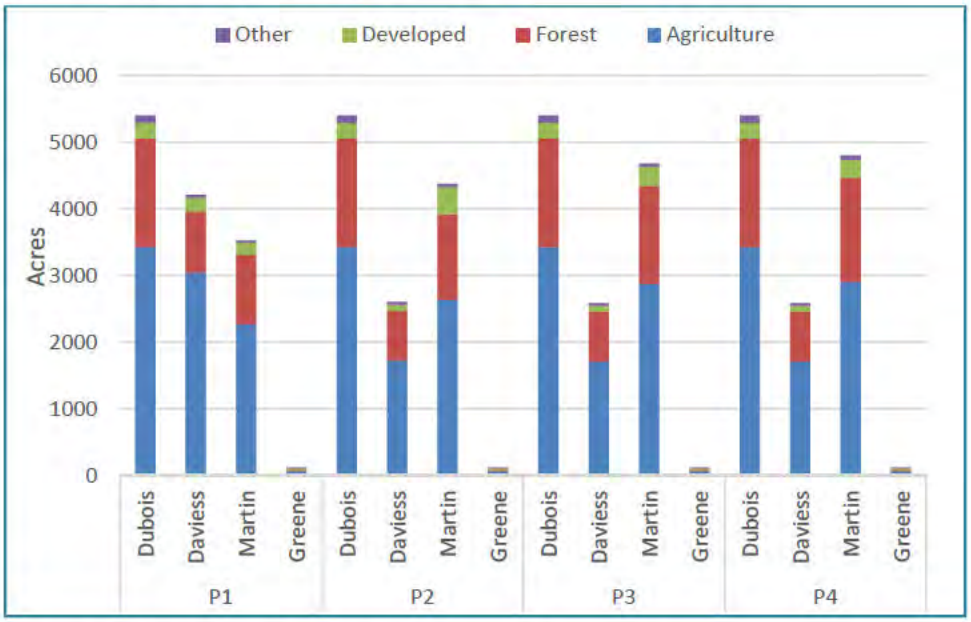


Figure 6. Land use cover by county for Alternative P corridors

Figure 7 provides a breakdown of forest acreage for each Alternative P corridor by county. Forest impacts within Daviess County would be greatest for the Alternative P1 corridor (927 acres). Conversely, forest impacts would be greatest in Martin County for the Alternative P4 corridor (1,577 acres). Overall, the Alternative P4 corridor has the greatest forest coverage at 3,956 acres, with Alternative P3 slightly less at 3,866 acres.

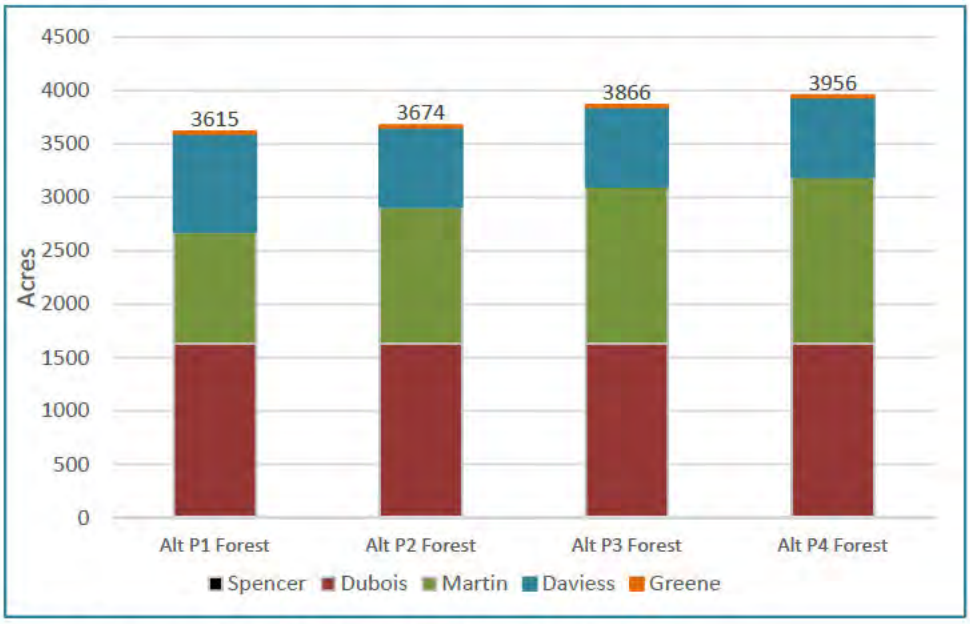


Figure 7. Forestland cover for Alternative P corridors by county

To provide a general sense of the amount of forestland habitat that would potentially be lost resulting from construction of an a roadway within the Alternative P corridor, a Tier 1 analysis was conducted using the NLCD forest data set. Preliminary right-of-way limits for a "working alignment" based on the centerline of the Alternative P corridors were developed for both the expressway and Super 2 facility types. From these general limits, the acreage of forestland estimated for clearing was determined. Figure 8 illustrates the estimated "working alignment" forestland acreage for each Alternative P alignment. The lower end of the range indicates forestland for a Super 2 facility type throughout the entire alignment, while the upper end of the range illustrates an expressway facility type throughout the entire alignment. The Alternative P2 alignment through Loogootee was assessed only as a Super 2 facility for its entire length. From this analysis, forestland loss is estimated from 547 acres to 815 acres.

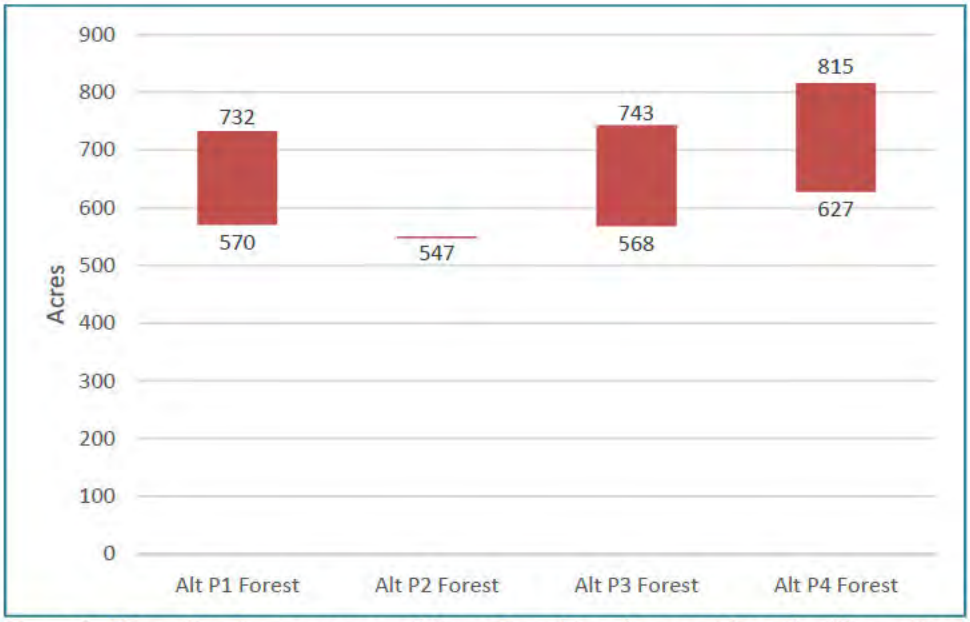


Figure 8. Alternative P expressway and Super 2 working alignment forestland loss estimates

Local Improvement Forestland Assessment

For each of the nine Local Improvement segments along US 231, preliminary right-of-way limits were developed to assess potential impacts to land uses, including forestland. The Local Improvement segments vary in length from 0.8 mile (LI8) south of West Boggs Lake to 3.2 miles (LI2) between Huntingburg and Jasper (Figure 9). From the analysis, forestland impacts are estimated to range from 0.0 acres (LI4) to 28.5 acres (LI6) with a collective total of 59.0 acres for all nine.

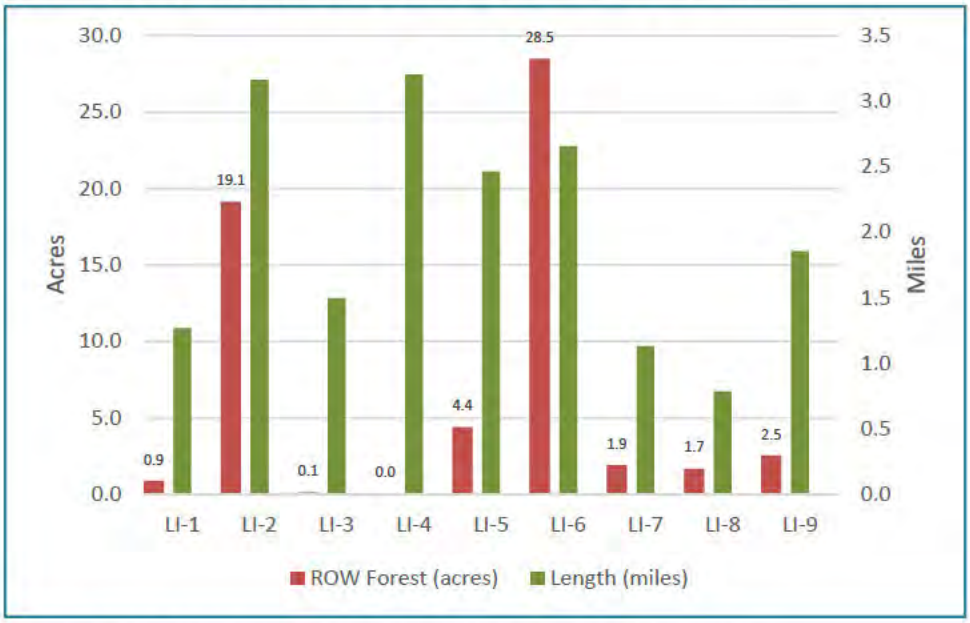


Figure 9. Local Improvement preliminary forestland impact summary

Forest Fragmentation

Highly mobile species are often reliant on large expanses of undisturbed or minimally disturbed habitat for breeding, rearing young, refuge from predators, and foraging for prey. Bats are no exception to this dependence on habitat that has not been highly fragmented through land development activities (e.g., agriculture, mining, residential/business development, utility corridors, and roadways). While bats have become adapted to patchwork habitat distribution on the landscape (i.e., forest cover), the quality of the habitat is degraded as the degree of fragmentation increases resulting in smaller and smaller isolated tracts for available forest or frequent severance of flyway corridors.

From a small-scale perspective, the very large expansive forest tracts within the Mid-States Corridor project area are to the east of the Alternative P corridor in Martin County and eastern Dubois County and have been avoided through selection of the Alternative P corridor as the preferred corridor. Nonetheless, there are still medium to large intact bottomland/wetland and upland ridgetop forest tracts scattered throughout the Alternative P corridors. Utility and transportation corridor projects have the greatest potential to fragment these forest habitats. Fragmentation can occur in various fashions, ranging from severance of a contiguous narrow riparian corridor along a stream or river, to cleaving a small section of woods from a larger tract, to bifurcation of a large intact forest tract.

To provide a general sense of the forest fragmentation potential for the Alternative P corridor, NLCD forest cover data and the Alternative P “working alignment” were used to identify forest tracts that would be fragmented into two or more smaller tracts. To cull out scenarios where the working alignment would fragment a forest tract and only yield two very small tracts or would cleave a small tract from a much larger forest tract, a minimum size threshold of 10 acres was used. Therefore, a forest tract was only considered to be fragmented if the two resulting forest tracts on either side of the working alignment were 10 acres or greater.

From this analysis, there were between 20 and 23 forest tracts associated with the Alternative P corridors that resulted in two or more 10-acre tracts as a result of the fragmentation. Table 3 summarizes the results of the fragmentation analysis with the original tract size and the resulting fragment sizes for each of the alternative variations and facility types. Forest fragmentation will be evaluated in greater detail as part of the Tier 2 analysis for the final preferred Alternative P alignment. Appendix A Map 12 illustrates the locations where fragmentation generates multiple larger (>10 acre) forest tracts.

Table 3. Summary of forest fragmentation greater than 10 acres for Alternative P Corridors

Original forest tract size (acres)	Alt P1		Alt P2	Alt P3		Alt P4	
	Expressway (acres)	Super 2 (acres)	Super 2 (acres)	Expressway (acres)	Super 2 (acres)	Expressway (acres)	Super 2 (acres)
81	45/21	49/23	49/23	45/21	49/23	45/21	49/23
413	47/284/63	48/285/63	48/285/63	47/284/63	48/285/63	47/284/63	48/285/63
469	375/68	377/71	377/71	375/68	377/71	375/69	377/71
1401	925/399	932/406	932/406	925/399	932/406	925/399	932/406
556	280/263	280/265	280/265	280/263	280/265	280/263	280/265
Patoka River							
123	76/37	79/39	79/39	76/37	79/39	76/37	79/39
210	115/55	126/63	126/63	155/55	126/63	155/55	126/63
East Fork White River							
253	147/64	148/66	148/66	147/64	148/66	147/64	148/66
82	60/10	61/10	61/10	60/10	61/10	60/10	61/10
566	363/151/26	367/153/29	367/153/29	363/151/26	367/153/29	363/151/26	367/153/29
658	602/45	603/46	603/46	602/45	603/46	602/45	603/46
39			27/10				
632				610/17	610/18	505/76	510/82
92					77/11		
53					33/11		
91				61/24		57/21	59/22
75				41/10	49/11		
117						70/25	71/26
72	41/20	41/20					
70						49/15	49/15
1175	1134/38	1135/39	1115/39/16	1114/39/16	1115/39/16	1112/38/21	1113/39/21
178	100/43/12	101/43/14	101/43/14	100/43/12	101/43/14	100/43/12	101/43/14
105	56/40	56/41	56/41	56/40	56/41	56/40	56/41
70	40/19	41/19	41/19	40/19	41/19	40/19	41/19
328	197/117	197/117	197/117	197/117	197/117	197/117	197/117
98	45/42	45/42	45/42	45/42	45/42	45/42	45/42
760	165/441/77/14	169/441/77/14	169/441/77/14	165/441/77/14	169/441/77/14	165/441/77/14	169/441/77/14
207	149/28	149/28	149/28	149/28	149/28	149/28	149/28

Core Forest Impacts

Core forest habitat can be a valuable resource for wildlife since it is often less likely to be disturbed by invasive species and neighboring land uses (i.e., row crops, pasture, residential, industrial, etc.). However, for the Indiana bat and the northern long-eared bat, core forest is not necessarily a priority requirement for foraging, roosting, and maternity colony establishment. Many times, quality maternity trees with high occupancy are located along or very near the edge of forest tracts and not deep within the interior of the forest.

For the purposes of the Mid-States Corridor Tier 1 analysis, core forest is defined as interior woodland habitat that is 328 feet (100 meters) from a forest edge. The forest edge is defined by any adjacent cleared polygon (fields, residential parcels) or linear features (roadways, large streams, cleared utility easements). Narrow ATV trails, old logging roads with canopy cover, or other minor clearings in an otherwise intact forest tract are not generally considered forest edge delineators.

Based on this definition, the NLCD data was used to estimate forest tracts within the Alternative P corridor, where core forest habitat could be potentially impacted either through bifurcation or removal of existing forest edge habitat. Because the NLCD data lacks the spatial resolution required to conduct an accurate evaluation of core forest loss with the Alternative P "working alignment" (Super 2 and expressway facility type), The Tier 1 assessment was confined to identifying locations where core forest intersects the corridor. Table 4 summarizes the number of core forest areas, total

acreage of the core forest, core forest acreage within the corridor, and the percentage of the core forest within the corridor. Figure 10 illustrates the collective acreage of core forest affected by the corridors and the collective acreage within the corridors. Core forest acreage within the Alternative P corridors ranges from 471 acres for Alternative P1 (west of Loogootee) to 539 acres for Alternative P4 (to the far east of Loogootee). Appendix A, Map 13 illustrates the distribution of core forest throughout the Alternative P Corridor.

Table 4. Core forest summary for Alternative P corridors

	Core forest size classes	Number of core forest tracts	Total core forest acres for corridor tracts	Core forest acres in corridor	Percent of core forest in corridor
P1	1 to 5 acres	8	18	12	68%
	5 to 10 acres	4	29	12	42%
	10 to 25 acres	9	129	57	45%
	25 to 50 acres	6	233	96	41%
	100 to 200 acres	3	420	66	16%
	200 to 500 acres	4	1,225	118	10%
	500 to 1000 acres	2	1,148	127	11%
	Total	**36**	**3,204**	**488**	**15%**
P2	1 to 5 acres	7	16	11	68%
	5 to 10 acres	4	29	12	42%
	10 to 25 acres	9	129	57	45%
	25 to 50 acres	5	192	74	39%
	100 to 200 acres	4	576	72	12%
	200 to 500 acres	4	1,225	118	10%
	500 to 1000 acres	2	1,148	127	11%
	Total	**35**	**3,316**	**471**	**14%**
P3	1 to 5 acres	7	16	11	68%
	5 to 10 acres	4	29	12	42%
	10 to 25 acres	9	129	57	45%
	25 to 50 acres	5	192	74	39%
	100 to 200 acres	6	833	74	9%
	200 to 500 acres	4	1,225	118	10%
	500 to 1000 acres	2	1,148	127	11%
	Total	**37**	**3,573**	**473**	**13%**
P4	1 to 5 acres	10	21	13	60%
	5 to 10 acres	6	45	13	30%
	10 to 25 acres	9	129	57	44%
	25 to 50 acres	4	156	74	47%
	100 to 200 acres	6	833	137	17%
	200 to 500 acres	4	1,225	118	10%
	500 to 1000 acres	2	1,148	127	11%
	Total	**41**	**3,558**	**539**	**15%**

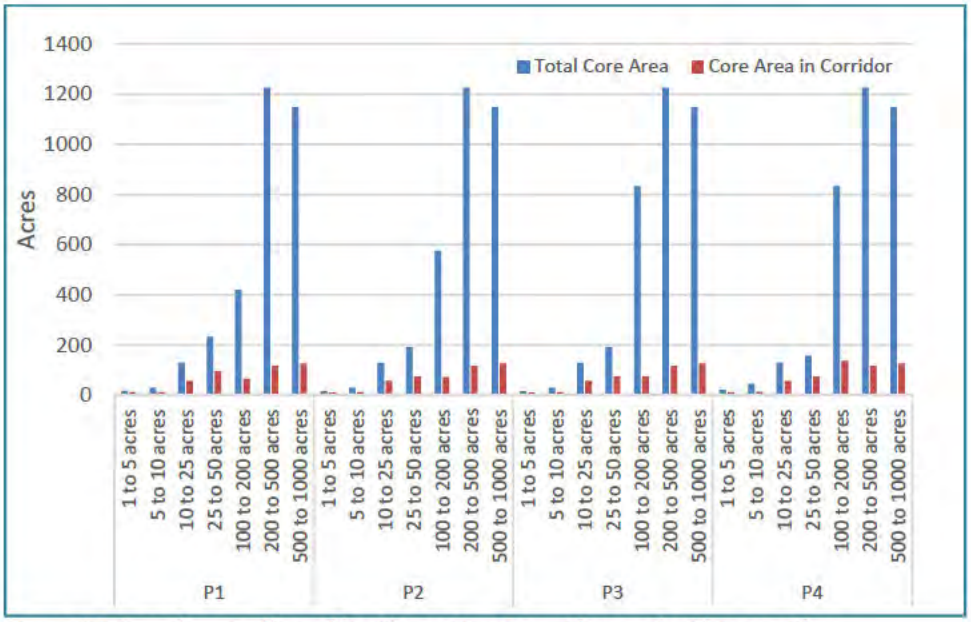


Figure 10. Core forest affected by Alternative P corridors and within corridors

Bat Maternity Colony Assessment

Reproductive fecundity is the foundation whereby species maintain sustainable populations. For the Indiana bat, northern long-eared bat, little brown bat, and tricolored bat, nursery colony establishment is dependent upon forests which include trees suitable for rearing young and associated foraging habitat in the immediate vicinity. Bat nursery colony habitat for these species is commonly associated with bottomland/wetland floodplain forest habitats, but can also include more mesic and upland habitats with easy access to adjacent rivers and streams.

The scope of work for the Tier 1 biological assessment analysis does not include field surveys (i.e., mist netting, radio-telemetry tracking, and maternity roost tree identification) to identify specific maternity colonies within the project area and capture/roost data from USFWS and IDNR for these species throughout most of the Mid-States Corridor project area is generally absent due to the lack of previous studies conducted within these spatial limits. Therefore, the Tier 1 level nursery colony impact analysis was dependent upon on the use of available GIS data, aerial photography, and familiarity with the project area landscape resources to identify likely nursery colony locations using professional judgement. Factors influencing the placement of predicted nursery colonies included:

- Relatively large forest cover within the nursery colony boundary.
- Skewed toward bottomland/wetland floodplain habitats associated with perennial rivers/streams and forested oxbow habitats.
- Locations where large numbers of dead snag trees are known to occur.
- Landscape within the colony boundary includes multiple interconnecting flyway and foraging corridor opportunities in the form of second and third order perennial streams.

- Colonies were centered as close to the Alternative P Corridor as deemed reasonable considering distribution of suitable landscape features proximal to the corridor.
- Colony boundaries were not precluded from overlapping, but overlap was limited to no more than 20 percent.
- Colonies were not necessarily oriented immediately adjacent to each other in a contiguous fashion, thus allowing for some gaps along the Alternative P Corridor where no potential colony was designated.

Indiana Bat, Little Brown Bat, and Tricolored Bat Colonies

For the Indiana bat, it is customary for the USFWS to use a 2.5-mile buffer around a primary roost tree or the centroid of multiple primary/secondary roost trees to establish the epicenter of a specific maternity colony. This spatial parameter has also been used to define potential Indiana bat colony boundaries for the Mid-States Corridor assessment. Because the little brown bat and the tricolored bat are proposed listing species, USFWS has not yet defined a standard default maternity colony limit for either of these species. Through intra-agency coordination with other USFWS Regional bat biologists, the USFWS INFO biologists have recommended that the 2.5-mile buffer also be used for each of these species based on a review of available foraging research.

While maternity colonies for each of these species would not likely realistically share the same epicenter, for the purposes of the Mid-States Corridor maternity colony assessment the same maternity colony locations were used for the Indiana bat, little brown bat, and the tricolored bat. Therefore, the generalized habitat descriptions provided for each of the potential maternity colony locations are considered suitable for each of these three species for the purposes of the Tier 1 assessment.

Commencing from south to north, the following narrative provides descriptions of the ten potential colony locations along the Alternative P corridor for the Indiana bat, little brown bat, and tricolored bat. Appendix A Maps 14a and 14b show the general location of the ten potential colonies for the Indiana bat group (including little brown bat and tricolored bat). Appendix A Maps 15a through 15e shows the individual potential colonies relative to the action area, Alternative P corridor, and Local Improvements.

Hunley Creek Maternity Colony

This potential Hunley Creek colony is centered on Hunley Creek to the east of Huntingburg approximately 1.5 miles east of the Alternative P corridor. There are large tracts of wetland woods to the north and south of SR 64 that form a nearly contiguous riparian corridor along the stream to its confluence with the Patoka River northwest of Huntingburg. Approximately 26 percent of the potential colony is forest habitat, with 10 percent wetland cover. Dubois County Park, Huntingburg Municipal Park, and a NRCS WRP parcel are included within the Hunley Creek colony. The Hunley Creek colony overlaps 7 percent with the Patoka River colony to the north. Approximately 5.35 miles of Alternative P traverses through the west and north

portions of the colony and would cross Hunley Creek roughly midway between the colony center and the Patoka River. This colony also includes a small portion of Local Improvement 2 (0.4 mile) on US 231 through between Huntingburg and Jasper.

Hunley Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	3317 acres	26%	1235 acres	10%
Action area	1709 acres	22%	792 acres	10%
Corridor	389 acres	30%	145 acres	11%
Working ROW range	49 - 68 acres	20% - 22%	13 - 18 acres	6%

Patoka River Maternity Colony

This potential Patoka River colony is centered within a large wetland forest tract along the Patoka River between Huntingburg and Jasper approximately 1.5 miles northwest of the Alternative P corridor. This portion of the Patoka River has extensive associated floodplain/wetland habitat to the east and west of US 231. Approximately 33 percent of the potential colony is forest habitat, with 14 percent wetland cover. The Barnes-Seng Wetland Conservation Area and Fromme Wildlife Habitat Area are included within the Patoka River colony. The Patoka River colony overlaps 7 percent with the Hunley Creek colony to the south and 6 percent with the Buffalo Pond Nature Preserve colony to the north. Approximately 4.47 miles of Alternative P traverses through the southeast portion of the colony south of the Patoka River. This colony also includes 2.44 miles of Local Improvement 2, 1.50 miles of Local Improvement 3, and the southern 0.74 mile of Local Improvement 4 on US 231 north of Huntingburg and into Jasper.

Patoka River maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	4281 acres	34%	1789 acres	14%
Action area	2250 acres	33%	662 acres	10%
Corridor	376 acres	35%	41 acres	4%
Working ROW range	82 - 103 acres	25% - 26%	3 - 4 acres	1%

Buffalo Pond Nature Preserve Maternity Colony

This potential Buffalo Pond Nature Preserve colony is centered near the eastern edge of a large wetland forest tract within the Buffalo Pond Nature Preserve north of Jasper immediately west of the Alternative P corridor. This location is only separated from additional bottomland wetland forest habitat along the Patoka River to the southeast by Jasper Kellerville Road. Approximately 34 percent of the potential colony is forest habitat, with 11 percent wetland cover. The Buffalo Pond Nature Preserve and multiple Jasper parks (Armory Park, Jasper Parklands, Sultan's Run Golf Course, and Jasper Municipal Golf Course) are included within the Buffalo Pond Nature Preserve colony. The Buffalo Pond Nature Preserve colony overlaps 6 percent with the Patoka River colony to the south and 18 percent with the Wening-Sherritt Seep Springs Nature Preserve colony to the northwest. Approximately 5.07 miles of Alternative P traverses through the center of the colony from southeast to northwest. The Alternative P corridor would cross the Patoka River immediately southeast of the colony center. This colony also includes 2.96 miles of Local Improvement 4, and 1.20 miles of Local Improvement 5 north of Jasper.

Buffalo Pond Nature Preserve maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	4413 acres	35%	1440 acres	11%
Action area	3176 acres	37%	963 acres	11%
Corridor	362 acres	30%	62 acres	5%
Working ROW	57 - 72 acres	22%	4 -5 acres	2%

Wening-Sherritt Seep Springs Maternity Colony

This potential Wening-Sherritt Seep Springs colony is centered near the eastern edge of the Wening-Sherritt Seep Springs Nature Preserve northwest of Jasper approximately 1.5 miles west of the Alternative P corridor. The nature preserve is part of a large (300+ acre) forest tract associated with Mill Creek and East Fork Mill Creek, most of which is wetland forest. This represents the largest forest cover patch within the colony. Approximately 21 percent of the potential colony is forest habitat, with 6 percent wetland cover. The Wening-Sherritt Seep Springs Nature Preserve is the only managed land within the colony. The Wening-Sherritt Seep Springs Nature Preserve colony overlaps 18 percent with the Buffalo Pond Nature Preserve colony to the south and 17 percent with the East Fork White River South colony to the northeast. Approximately 3.14 miles of Alternative P traverses through the eastern portion of the colony. This colony also includes a 0.45 mile portion of Local Improvement 4 and 2.46 miles of Local Improvement 5 on US 231 through the north part of Jasper.

Wening-Sherritt Nature Preserve maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	2745 acres	22%	736 acres	6%
Action area	1467 acres	33%	173 acres	4%
Corridor	250 acres	33%	6 acres	1%
Working ROW	44 - 71 acres	26% - 31%	1 acre	<1% - 1%

East Fork White River South Maternity Colony

This potential East Fork White River South colony is centered on forested bottomland/wetland habitat associated with an East Fork White River tributary immediately east of the Alternative P corridor and approximately 0.3 mile from the existing US 231 bridge. This represents a proximal high probability floodplain location along the East Fork White River for bat roosting habitat with abundant surrounding upland woods habitat. Approximately 21 percent of the potential colony is forest habitat, with 2 percent wetland cover. There are no managed land properties within the East Fork White River South colony. The East Fork White River South colony overlaps 17 percent with the Wening-Sherritt Nature Preserve colony to the southwest. Approximately 5.13 miles of Alternative P traverses through the center of the colony along U231 from southwest to northeast. The Alternative P corridor would cross the East Fork White River immediately west of the colony center. This colony also includes a small 0.41 mile portion of Local Improvement 5 on US 231 through the north part of Jasper.

East Fork White River South maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	4481 acres	36%	201 acres	2%
Action area	2586 acres	35%	114 acres	2%
Corridor	435 acres	36%	15 acres	1%
Working ROW	110 - 145 acres	43% - 44%	1 acre	<1%

Haw Creek Maternity Colony

This potential Haw Creek colony is centered on forested bottomland/wetland habitat associated with Haw Creek nearest to the Alternative P corridor. While the Haw Creek riparian corridor is fragmented and experiences agricultural development to the top of bank in multiple areas much of the stream valley still supports bottomland and associated upland forest habitat throughout the colony limits eastward to the confluence with the East Fork White River. Approximately 35 percent of the potential colony is forest habitat, with 2 percent wetland cover. There are no managed land properties within the Haw Creek colony. The Haw Creek colony overlaps less than 1 percent with the East Fork White River North colony to the northeast. Approximately 5.07 miles of Alternative P traverses through the center of the colony from south to north. The Alternative P corridor would cross Haw Creek approximately 0.5 southeast of the colony center. This colony also includes a 1.09 mile section of Local Improvement 7 on US 231 south of Loogootee.

Haw Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	4395 acres	35%	229 acres	2%
Action area	3027 acres	37%	172 acres	2%
Corridor	299 acres	24%	7 acres	<1%
Working ROW	30 - 41 acres	15% - 16%	<1 acre	<1%

East Fork White River North Maternity Colony

This potential East Fork White River North colony is centered on forested bottomland/wetland habitat associated with Boggs Creek at the confluence with the East Fork White River southeast of Loogootee, approximately 0.6 mile east of Alternative P4. This represents a proximal high probability floodplain location along the East Fork White River for bat roosting habitat with abundant surrounding upland woods habitat, especially to the east of the river. Approximately 44 percent of the potential colony is forest habitat, with 2 percent wetland cover. Managed lands within the colony include the Hoosier National Forest and Martin County Fairgrounds. The East Fork White River North colony overlaps less than1 percent with the Haw Creek colony to the southwest and 15 percent with the West Boggs Creek colony to the northwest. Approximately 2.26 miles of Alternative P2, 3.42 mile of Alternative P3, and 4.15 miles of Alternative P4 traverse through the northwestern portion of the colony. The Alternative P1 corridor is beyond the colony limits to the west. There are no Local Improvement segments included within the potential East Fork White River North colony.

East Fork White River North maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	5695 acres	45%	309 acres	2%
Action area	2536 acres	38%	203 acres	1%
Corridor	0 – 341 acre	0% - 43%	0 - 30 acres	0% – 3%
Working ROW	0 - 107 acre	0% - 49%	0 - 3 acres	0% – 1%

West Boggs Creek Maternity Colony

This potential West Boggs Creek colony is centered on forested bottomland/wetland habitat associated with Boggs Creek north of Loogootee and is located within or immediately adjacent to the Alternative P corridors. This area includes a large tract of forest within the northeast portion of the potential colony and West Boggs Lake in the northwest portion. Approximately 39 percent of the potential colony is forest habitat, with 7 percent wetland cover (mostly West Boggs Lake). Managed lands within the colony include the West Boggs Lake, Mt. Calvary Wildlife Management Area, and Crane NSA. The East Fork White River North colony overlaps 15 percent with the East Fork White River North colony to the southwest. Approximately 5.24 miles of Alternative P1, 5.11 miles of Alternative P2, 5.24 miles of Alternative P3, and 5.21 miles of Alternative P4 traverse through the northwestern portion of the colony. This colony also includes a 0.78 mile section of Local Improvement 8 on US 231 north of Loogootee.

West Boggs Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	4906 acres	39%	857 acres	7%
Action area	4168 acres	42%	673 acres	7%
Corridor	439 - 538 acres	0% - 43%%	19 - 45 acres	1% - 4%
Working ROW	29 - 73 acres	27% - 35%	<1 – 3 acres	<1% - 1%

North Fork Prairie Creek Maternity Colony

This potential North Fork Prairie Creek colony is centered on forested bottomland/wetland habitat less than 0.1 mile west of the Alternative P corridor. Upstream and downstream of this center point, the North Fork Prairie Creek riparian corridor includes various degrees of associated forest habitat along the main channel and tributaries. Approximately 29 percent of the potential colony is forest habitat, with 2 percent wetland cover. The Crane NSA property is the only managed land within the colony. The North Fork Prairie Creek colony does not overlap with any other potential colonies. Approximately 5.06 miles of Alternative P traverses through the center of the colony from southeast to north. The Alternative P corridor would not likely cross the North Fork Prairie Creek. There are no Local Improvement segments included within the potential North Fork Prairie Creek colony.

North Fork Prairie Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	3738 acres	30%	298 acres	2%
Action area	2260 acres	29%	234 acres	3%
Corridor	270 acres	22%	29 acres	2%
Working ROW	32 - 41 acres	16% – 17%	<1 - 1 acre	<1%

First Creek Maternity Colony

This potential First Creek colony is centered on forested bottomland/wetland habitat less than 0.1 mile west of the Alternative P corridor. The First Creek corridor throughout most of the potential colony limits supports large expanses of wetland habitat and associated upland forest communities. Approximately 55 percent of the potential colony is forest habitat, with 4 percent wetland cover. Managed lands within the First Creek colony include Crane NSA, Gantz Woods Nature Preserve, and I-69 bat habitat mitigation property in Greene County. The First Creek colony does not overlap with any other potential colonies. Approximately 4.90 miles of Alternative P traverses through the center of the colony from southwest to north on the west side of US 231. The Alternative P corridor crosses First Creek immediately east of the colony center. This colony also includes a 1.85 mile section of Local Improvement 9 on US 231 south of I-69.

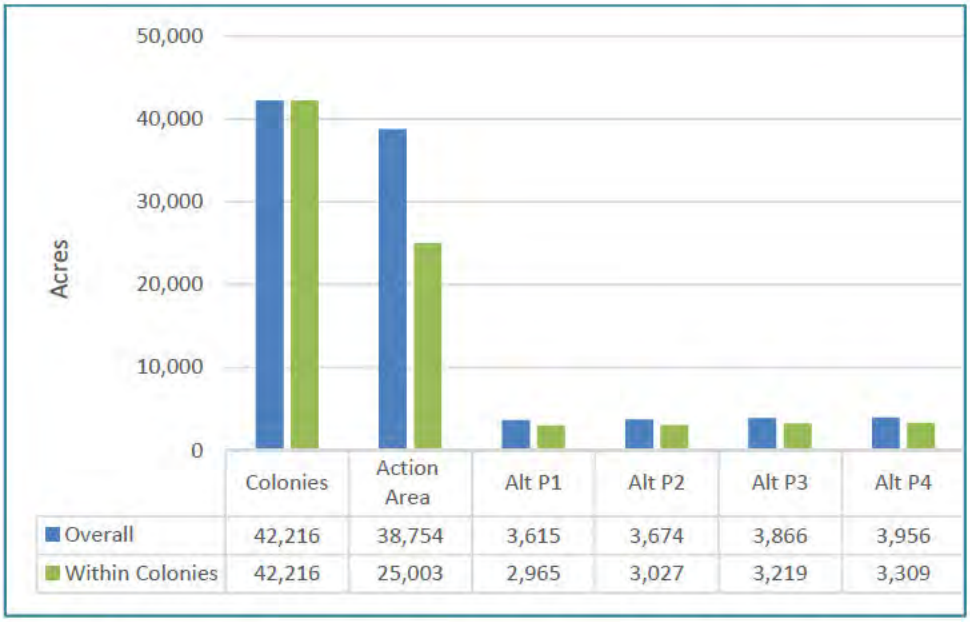
First Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	6761 acres	54%	502 acres	4%
Action area	4013 acres	50%	268 acres	3%
Corridor	478 acres	45%	27 acres	3%
Working ROW range	99 - 108 acres	40% - 41%	3 acres	1%

Indiana Bat, Little Brown Bat, and Tricolored Bat Cumulative Colonies Summary

Collectively, the ten 2.5-mile radius potential maternity colonies for the Indiana bat, little brown bat, and tricolored bat (Indiana bat group) cover 183.8 square miles of the Mid-States Corridor project area landscape. Figure 11 illustrates the total amount of forest acreage within the colonies, the total amount of the action area forest within the combined colony boundary, and the total amount of Alternative P corridor forest within the combined colony boundary. Approximately 65 percent of the forest within the action area is within the combined colony boundary. Similarly, approximately 82 percent (Alternatives P1 and P2) to 84 percent (Alternative P4) of the forest cover within the corridors is within the combined colony boundary. Therefore, there is only 16 to 18 percent of forest within the corridors that is not within one of the ten potential maternity colony areas.

The cumulative estimated forested acreage of the 2000-foot corridors within the potential 2.5-mile radius maternity colonies for the Indiana bat group ranges from 2,965 acres for Alternative P1 to 3,309 acres for Alternative P4.



	Colonies	Action Area	Alt P1	Alt P2	Alt P3	Alt P4
Overall	42,216	38,754	3,615	3,674	3,866	3,956
Within Colonies	42,216	25,003	2,965	3,027	3,219	3,309

Figure 11. Summary of forest habitat for the Alternative P 2000-foot corridors and action area within the 2.5 mile Indiana bat group potential maternity colonies

Northern Long-Eared Bat Colonies

For the northern long-eared bat, it is customary for the USFWS to use a 1.5-mile buffer around a primary roost tree or the centroid of multiple primary/secondary roost trees to establish the epicenter of a specific maternity colony. This spatial parameter has also been used to define potential colony boundaries for the Mid-States Corridor assessment.

Commencing from south to north, the following narrative provides descriptions of the fourteen potential colony locations along the Alternative P corridor for the northern long-eared bat. Appendix A Maps 16a and 16b show the general location of the ten potential colonies for the northern long-eared bat. Appendix A Maps 17a through 17e shows the individual potential colonies relative to the action area, Alternative P corridor, and Local Improvements.

NLEB Hunley Creek Maternity Colony

The potential NLEB Hunley Creek colony is centered on Hunley Creek to the east of Huntingburg approximately 0.2 mile east of the Alternative P corridor. There are large tracts of wetland woods to the north of SR 64, and to a lesser extent to the south, that form a nearly contiguous riparian corridor along the stream to its confluence with the Patoka River northwest of Huntingburg. The Hunley Creek confluence is beyond the 1.5-mile colony radius limit. Approximately 28 percent of the potential colony is forest habitat, with 15 percent wetland cover. A NRCS WRP parcel and a small portion of Huntingburg Municipal Park are included within the NLEB Hunley Creek colony. The NLEB Hunley Creek colony does not overlap any other northern long-eared bat colonies. Approximately 3.22 miles of Alternative P traverses through the west and north portions of the colony and would cross Hunley Creek approximately 0.9 mile

north of the colony center. There are no Local Improvement segments along US 231 within the NLEB Hunley Creek colony.

NLEB Hunley Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	1273 acres	28%	689 acres	15%
Action area	1151 acres	29%	635 acres	16%
Corridor	312 acres	40%	138 acres	18%
Working ROW range	33 – 48 acres	24% - 28%	13 – 18 acres	10%

NLEB Patoka River Maternity Colony

This potential NLEB Patoka River colony is centered within a large wetland forest tract along the Patoka River between Huntingburg and Jasper and is a little greater than 1.5 miles northwest of the Alternative P corridor. There are extensive associated floodplain/wetland habitat to the east and west of US 231 along the Patoka River. Approximately 28 percent of the potential colony is forest habitat, with 24 percent wetland cover. The Barnes-Seng Wetland Conservation Area is included within the Patoka River colony. The NLEB Patoka River colony does not overlap any other northern long-eared bat colonies. Because the center of this potential colony is greater than 1.5 miles from the corridor edge, none of the corridor or corridor centerline are within the colony limits. This colony also includes 1.37 miles of Local Improvement 2 on US 231 crossing the Patoka River and 1.00 mile of Local Improvement 3 on US 231 into Jasper.

Patoka River maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	1820 acres	40%	1060 acres	24%
Action area	582 acres	31%	258 acres	14%
Corridor	0 acres	0%	0 acres	0%
Working ROW range	14 acres	17%	0 acres	0%

NLEB Buechlein Maternity Colony

This potential NLEB Buechlein colony is centered on an unnamed Hall Creek headwaters tributary within a large forest tract south of SR 164, east of Jasper, and within the Alternative P corridor. The colony limits also includes smaller watersheds north of SR 164 that drain directly to the Patoka River. Despite the large size of the forest within this watershed, its lacks a continuous forest riparian connection to the Patoka River. Approximately 56 percent of the potential colony is forest habitat, with 2 percent wetland cover. The Sultan's Run Golf Course is the only managed land within the NLEB Buchlein colony. The NLEB Buechlein colony does not overlap any other northern long-eared bat colonies. Approximately 3.03 miles of Alternative P traverses through the central portion of the colony. There are no Local Improvement segments along US 231 within the NLEB Buechlein colony.

NLEB Buechlein maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	2522 acres	56%	87 acres	2%
Action area	2180 acres	55%	82 acres	2%
Corridor	448 acres	61%	18 acres	2%
Working ROW range	85 – 111 acres	60% - 64%	<1 – 1 acres	<1%

NLEB Buffalo Pond Nature Preserve Maternity Colony

This potential NLEB Buffalo Pond Nature Preserve colony is centered near the eastern edge of a large wetland forest tract within the Buffalo Pond Nature Preserve north of Jasper immediately west of the Alternative P corridor (same centroid as the larger potential colony used for the Indiana bat, little brown bat, and tricolored bat). Jasper Kellerville Road separates the nature preserve from additional bottomland wetland forest habitat along the Patoka River to the southeast. Approximately 40 percent of the potential colony is forest habitat, with 20 percent wetland cover. The Buffalo Pond Nature Preserve, Sultan's Run Golf Course, and Jasper Municipal Golf Course are managed lands included within the NLEB Buffalo Pond Nature Preserve colony. The NLEB Buffalo Pond Nature Preserve colony does not overlap any other northern long-eared bat colonies. Approximately 2.95 miles of Alternative P traverses through the eastern portion of the colony from southeast to northwest. The Alternative P corridor would cross the Patoka River immediately southeast of the colony center. There are no Local Improvement segments along US 231 within the NLEB Buffalo Pond Nature Preserve colony.

NLEB Buffalo Pond Nature Preserve maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	1826 acres	40%	888 acres	20%
Action area	1772 acres	42%	838 acres	20%
Corridor	203 acres	29%	56 acres	8%
Working ROW range	32 – 41 acres	25% - 26%	3 -5 acres	3%

NLEB Wening-Sherritt Seep Springs Nature Preserve Maternity Colony

This potential NLEB Wening-Sherritt Seep Springs colony is centered to the east of the Wening-Sherritt Seep Springs Nature Preserve northwest of Jasper approximately 0.6 miles west of the Alternative P corridor. The potential colony includes a large 300+ acre forest tract associated with Mill Creek and East Fork Mill Creek, but is centered more towards the east to include other forested habitats and provide overlap with the Alternative P corridor. Approximately 34 percent of the potential colony is forest habitat, with 11 percent wetland cover. The Wening-Sherritt Seep Springs Nature Preserve is the only managed land within the colony. The NLEB Wening-Sherritt Seep Springs Nature Preserve colony abuts, but does not overlap the adjacent NLEB East Fork White River colony to the northeast. Approximately 2.35 miles of Alternative P traverses through the eastern portion of the colony. This colony also includes 2.40 miles of Local Improvement 5 on US 231 within the NLEB Wening-Sherritt Seep Springs Nature Preserve colony.

NLEB Wening-Sherritt Seep Springs Nature Preserve maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	1525 acres	34%	486 acres	11%
Action area	933 acres	32%	131 acres	4%
Corridor	138 acres	24%	5 acres	1%
Working ROW range	26 – 39 acres	19% - 23%	1 acres	1%

NLEB East Fork White River Maternity Colony

This potential NLEB East Fork White River colony is centered on forested bottomland/wetland habitat associated with an East Fork White River tributary immediately east of the Alternative P corridor and approximately 0.3 mile from the existing US 231 bridge (same centroid as the larger potential colony used for the Indiana bat, little brown bat, and tricolored bat). This represents a proximal high probability floodplain location along the East Fork White River for bat roosting habitat with abundant surrounding upland woods habitat. Approximately 35 percent of the potential colony is forest habitat, with 1 percent wetland cover. There are no managed land properties within the NLEB East Fork White River colony. The NLEB East Fork White River colony abuts, but does not overlap the adjacent NLEB Wening-Sherritt Seep Springs Nature Preserve colony to the southwest. Approximately 2.91 miles of Alternative P traverses through the center of the colony along U231 from southwest to northeast. The Alternative P corridor would cross the East Fork White River immediately west of the colony center. There are no Local Improvement segments along US 231 within the NLEB East Fork White River colony.

East Fork White River maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	1587 acres	35%	41 acres	1%
Action area	1292 acres	34%	27 acres	1%
Corridor	253 acres	38%	2 acres	<1%
Working ROW range	80 – 100 acres	46% - 49%	<1 acres	<1%

NLEB Slate Creek Maternity Colony

This potential NLEB Slate Creek colony is centered within forested habitat in the upper portion of the Slate Creek watershed where woodland habitat is more prevalent. Riparian cover along Slate Creek downstream of the colony is intermittent until just before the confluence with the East Fork White River. The center of the colony is within Alternative P corridor and approximately 0.3 mile west of existing US 231. Approximately 35 percent of the potential colony is forest habitat, with 1 percent wetland cover. There are no managed land properties within the NLEB Slate Creek colony. The NLEB Slate Creek colony does not overlap any other northern long-eared bat colonies, but is less than 0.3 mile from the NLEB Haw Creek colony to the north. Approximately 3.22 miles of Alternative P traverses through the center of the colony from southeast to northwest. This colony also includes 2.39 miles of Local Improvement 6 on US 231 north the East Fork White River.

NLEB Slate Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	1579 acres	35%	67 acres	1%
Action area	1395 acres	34%	66 acres	2%
Corridor	227 acres	29%	12 acres	2%
Working ROW range	52 – 70 acres	25% - 28%	<1 – 1 acres	<1%

NLEB Haw Creek Maternity Colony

This potential NLEB Haw Creek colony is centered on Haw Creek less than 0.2 mile east of the Alternative P corridor. While the Haw Creek riparian corridor is fragmented and experiences agricultural development to the top of bank in multiple areas, much

of the stream valley still supports bottomland and associated upland forest habitat. The colony is centered to the east of Alternative P since there is noticeably more forest habitat in this location than to the west of the corridor. Approximately 42 percent of the potential colony is forest habitat, with 2 percent wetland cover. There are no managed land properties within the NLEB Haw Creek colony. The NLEB Haw Creek colony overlaps 5 percent with the NLEB Friends Creek colony to the northwest. Approximately 2.83 miles of Alternative P traverses through the western portion of the colony from south to north. The Alternative P corridor would cross Haw Creek approximately 0.4 west of the colony center. There are no Local Improvement segments along US 231 within the NLEB Haw Creek colony.

NLEB Haw Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	1902 acres	42%	92 acres	2%
Action area	1628 acres	41%	88 acres	2%
Corridor	201 acres	29%	5 acres	1%
Working ROW range	20 – 26 acres	19%	<1 acres	<1%

NLEB Friends Creek Maternity Colony

This potential NLEB Friends Creek colony is centered on a Friends Creek tributary southwest of Loogootee within the Alternative P corridor. The colony center is approximately 2.4 miles from the Friends Creek confluence with the East Fork White River. The central portion of the Friends Creek watershed exhibits the greatest amount of associated forestland habitat, although in many locations in only occurs on one side of the stream. Approximately 14 percent of the potential colony is forest habitat, with 1 percent wetland cover. There are no managed land properties within the Haw Creek colony. The NLEB Friends Creek colony overlaps 5 percent with the NLEB Haw Creek colony to the southeast. Approximately 3.08 miles of Alternative P1, 3.07 mile of Alternative P2, 3.14 miles of Alternative P3, and 3.08 miles of Alternative P4 traverse through the central portion of the colony. The Alternative P corridor would cross a Friends Creek tributary immediately east of the colony center. This colony also includes 1.13 miles of Local Improvement 7 on US 231 south of Loogootee.

NLEB Friends Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	613 acres	14%	35 acres	1%
Action area	613 acres	15%	35 acres	1%
Corridor	61 - 70 acres	8% - 9%	1 – 2 acres	<1%
Working ROW range	8 – 11 acres	7% - 9%	0 acres	0%

NLEB Boggs Creek Maternity Colony

This potential NLEB Boggs Creek colony is centered within forested bottomland/wetland habitat associated with Boggs Creek approximately 1.0 mile north of the confluence with the East Fork White River southeast of Loogootee, and approximately 0.1 mile east of Alternative P4. This represents a high probability floodplain location within the lower portion of the Boggs Creek watershed for bat roosting habitat with abundant surrounding upland woods habitat, both north and south of the East Fork White River. Approximately 49 percent of the potential colony is forest habitat, with 4 percent wetland cover. Managed lands within the colony

include the Hoosier National Forest and Martin County Fairgrounds. The NLEB Boggs Creek colony overlaps <1 percent with the NLEB West Boggs Creek colony to the northwest. Approximately 1.80 miles of Alternative P3 and 2.76 miles of Alternative P4 traverse through the western portion of the colony. The Alternative P1 and P2 corridors are beyond the colony limits to the west. There are no Local Improvement segments included within the potential East Fork White River North colony.

NLEB Boggs Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	2235 acres	49%	175 acres	4%
Action area	1619 acres	45%	158 acres	4%
Corridor	0 – 351 acres	0% - 53%	3 – 26 acres	1% - 4%
Working ROW range	0 – 96 acres	0% - 58%	0 – 3 acres	0% - 2%

NLEB West Boggs Creek Maternity Colony

This potential NLEB West Boggs Creek colony is centered on forested bottomland/wetland habitat associated with Boggs Creek north of Loogootee and is located within or immediately adjacent to the Alternative P corridors. This area includes a large tract of forest within the northeast portion of the potential colony and most of West Boggs Lake in the northwest portion. Approximately 45 percent of the potential colony is forest habitat, with 8 percent wetland cover (mostly West Boggs Lake). Managed lands within the colony include the West Boggs Lake and Mt. Calvary Wildlife Management Area. The NLEB West Boggs Creek colony overlaps less than1 percent with the NLEB Boggs Creek colony to the southwest. Approximately 2.72 miles of Alternative P1, 3.00 miles of Alternative P2, 3.00 miles of Alternative P3, and 3.12 miles of Alternative P4 traverse through the northwestern portion of the colony. This colony also includes a 0.78 mile section of Local Improvement 8 on US 231 north of Loogootee.

NLEB West Boggs Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	2042 acres	45%	363 acres	8%
Action area	1926 acres	44%	362 acres	8%
Corridor	242 – 265 acres	35% - 38%	13 – 32 acres	2% - 4%
Working ROW range	14 – 35 acres	19% - 26%	<1 – 1 acres	<1%- 1%

NLEB Seed Tick Creek Maternity Colony

This potential NLEB Seed Tick Creek colony is centered on the southern end of a dammed reservoir within the western portion of Crane NSA approximately 1.4 miles northeast of the Alternative P corridor. The landscape within Crane NSA is heavily forested and comprises approximately 75 percent of the potential colony, with 8 percent wetland cover (mostly West Boggs Lake). Managed lands within the colony include the Crane NSA. The NLEB Seed Tick Creek colony does not overlap any other northern long-eared bat colonies, but is approximately 0.7 mile from the NLEB West Boggs Creek colony to the south and the 0.7 miles from the NLEB North Fork Prairie Creek colony to the northwest. While there is a minor amount of the Alternative P corridor within the southwest portion of the colony limits, none of the centerline for the corridor is within the colony boundary. There are no Local Improvement segments included within the potential East Fork White River North colony.

NLEB Seed Tick Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	3386 acres	75%	360 acres	8%
Action area	846 acres	49%	19 acres	1%
Corridor	4 acres	15%	0 acres	0%
Working ROW range	0 acres	0%	0 acres	0%

NLEB North Fork Prairie Creek Maternity Colony

This potential NLEB North Fork Prairie Creek colony is centered on forested bottomland/wetland habitat less than 0.1 mile west of the Alternative P corridor (same centroid as the larger potential colony used for the Indiana bat, little brown bat, and tricolored bat). Upstream and downstream of this center point, the North Fork Prairie Creek riparian corridor includes various degrees of associated forest habitat along the main channel and tributaries. Approximately 29 percent of the potential colony is forest habitat, with 3 percent wetland cover. There are no managed land properties within the Haw Creek colony. The NLEB North Fork Prairie Creek colony does not overlap with any other potential colonies. Approximately 2.85 miles of Alternative P traverses through the eastern portion of the colony from southeast to north. The Alternative P corridor would not likely cross the North Fork Prairie Creek. There are no Local Improvement segments included within the potential North Fork Prairie Creek colony.

NLEB North Fork Prairie Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	1311 acres	29%	155 acres	3%
Action area	1170 acres	31%	143 acres	4%
Corridor	146 acres	21%	20 acres	3%
Working ROW range	13 – 16 acres	12% - 13%	0 acres	0%

NLEB First Creek Maternity Colony

This potential NLEB First Creek colony is centered on forested bottomland/wetland habitat less than 0.1 mile west of the Alternative P corridor. The First Creek corridor throughout most of the potential colony limits supports large expanses of wetland habitat and associated upland forest communities. The NLEB First Creek colony does not extend north to the I-69 interchange. Approximately 60 percent of the potential colony is forest habitat, with 5 percent wetland cover. Managed lands within the First Creek colony include Gantz Woods Nature Preserve and a small portion of Crane NSA. The First Creek colony does not overlap with any other potential colonies and is approximately 2.3 miles north of the NLEB North Fork Prairie Creek colony. Approximately 3.01 miles of Alternative P traverses through the center of the colony from southwest to north on the west side of US 231. The Alternative P corridor crosses First Creek immediately east of the colony center. This colony also includes a 1.00 mile section of Local Improvement 9 on US 231 south of I-69.

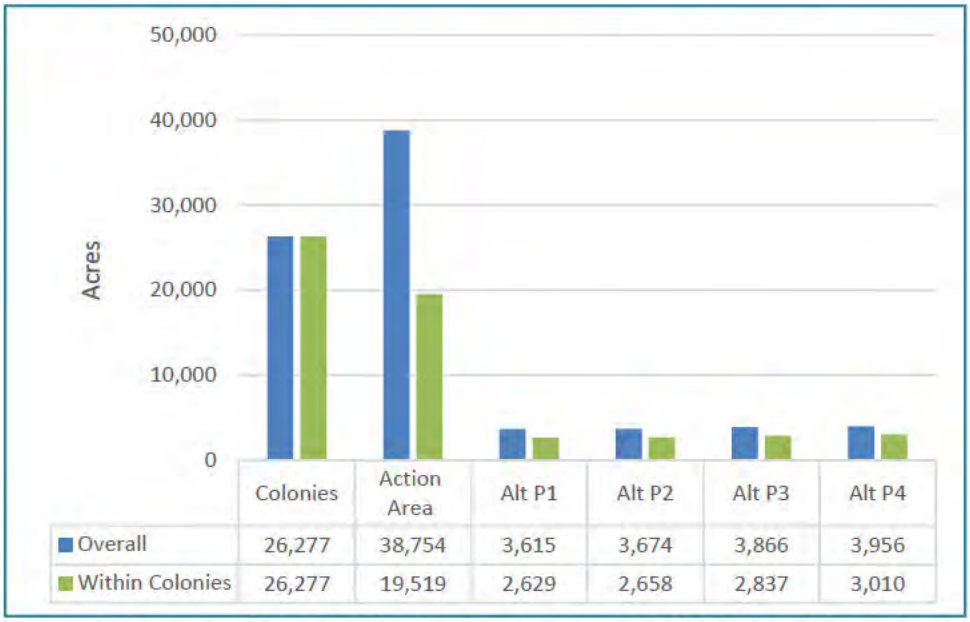
NLEB First Creek maternity colony forest and wetland composition summary

	Forest Acres	Forest Percent	Wetland acre	Wetland percent
Colony	2708 acres	60%	243 acres	5%
Action area	2464 acres	63%	209 acres	5%
Corridor	404 acres	58%	26 acres	4%
Working ROW range	89 – 94 acres	52%	3 acres	2%

Northern Long-Eared Bat Cumulative Colonies Summary

Collectively, the fourteen 1.5-mile radius potential maternity colonies for the northern long-eared bat cover 98.6 square miles of the Mid-States Corridor project area landscape. Figure 12 illustrates the total amount of forest acreage within the colonies, the total amount of the action area forest within the combined colony boundary, and the total amount of Alternative P corridor forest within the combined colony boundary. Approximately 50 percent of the forest within the action area is within the combined northern long-eared bat colony boundary. Similarly, approximately 72 percent (Alternative P1) to 76 percent (Alternative P4) of the forest cover within the corridors is within the combined colony boundary. Therefore, there is only 24 to 28 percent of forest within the corridors that is not within one of the fourteen potential maternity colony areas. The higher percentage compared to the 2.5-mile colonies for the Indiana bat colony group is attributed to the greater distances between the 1.5-mile colonies established for the northern long-eared bat.

The cumulative estimated forested acreage of the 2000-foot corridor within the potential 1.5-mile radius maternity colonies for the northern long-eared bat range from 2,629 acres for Alternative P1 to 3,010 acres for Alternative P4.



	Colonies	Action Area	Alt P1	Alt P2	Alt P3	Alt P4
Overall	26,277	38,754	3,615	3,674	3,866	3,956
Within Colonies	26,277	19,519	2,629	2,658	2,837	3,010

Figure 12. Summary of forest habitat for the Alternative P 2000-foot corridors and action area within the 1.5 mile northern long-eared bat potential maternity colonies

11.6.1.1 Fall Swarming Habitat Impacts

Each of the five bat species undergo fall swarming prior to entering winter hibernation. During this period bats become active within suitable habitat in the vicinity of their hibernaculum cave. These areas may or may not be the same forest habitats used for summer habitat. For the Indiana bat, the USFWS considers suitable habitat within 10 miles of Priority 1 and 2 hibernacula and within 5 miles of Priority 3 and 4 hibernacula to be of value and concern for fall swarming activities. Similarly, a 5-

mile buffer was used when considering assessment of potential impacts to northern long-eared bats during fall swarming. Since the little brown bat and tricolored bat have not yet been listed by the USFWS, the Service has not prioritized hibernacula or designated a fall swarming buffer zone for these species; therefore, a 5-mile radius was adopted to describe the landscape surrounding known hibernacula where fall swarming impacts may potentially be a concern. Lastly, as per USFWS guidance, a 10-mile buffer is also used to establish a fall swarming zone of concern around gray bat hibernacula.

Appendix A Map 6 illustrates the respective 10-mile and 5-mile limits for previously documented Indiana bat hibernacula. While the Alternative P corridor does not encroach upon any of the 10-mile or 5-mile Indiana bat fall swarming zones, the action area, which includes an anticipated induced growth area north of I-69, is located within 10 miles of (P1) and (P2) in Greene County. Figure 13 illustrates the percentage of action area and action area forest within each hibernacula 10-mile buffer.

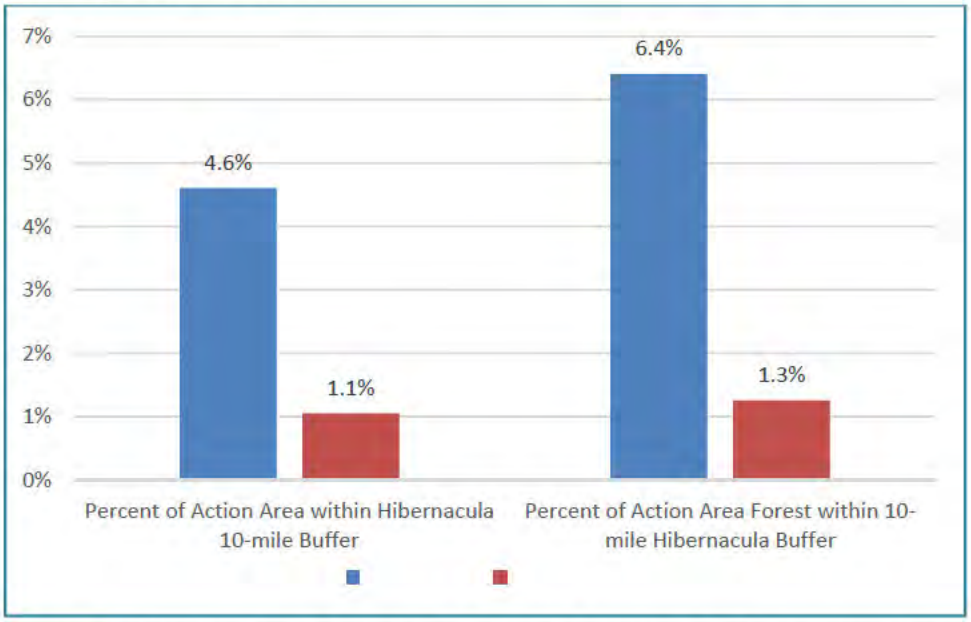


Figure 13. Percentage of action area within 10-mile hibernacula buffer and percentage of action area forest within 10-mile hibernacula buffer for and

Appendix A Map 7 illustrates the 5-mile limits for previously documented northern long-eared bat hibernacula. The Alternative P corridor and the action area is beyond the 5-mile buffer for any of the known northern long-eared bat hibernacula in Green and Martin counties.

Appendix A Map 9 illustrates the 5-mile limits for previously documented little brown bat hibernacula. The Alternative P corridor and the action area is beyond the 5-mile buffer for any of the known little brown bat hibernacula in Green and Martin counties.

Appendix A Map 10 illustrates the 5-mile limits for previously documented tricolored bat hibernacula. The Alternative P corridor and the action area is beyond the 5-mile buffer for any of the known tricolored bat hibernacula in Green and Martin counties.

11.6.1.2 Patoka River and East Fork White River Bridges

While there are many third order streams with bridges that may serve as bat roosting habitat within or near the Alternative P Corridor, the East Fork White River and Patoka River are the two largest streams spanned by the corridor.

There are 34 bridges (including railroad) that span the 96 miles of the Patoka River through Pike and Dubois counties to Patoka Lake. The exiting US 231 bridge across the Patoka River (Asset No. (231)-45-19-05165C, NBI No. 016680) south of Jasper built in 1964 and reconstructed in 2017. The current bridge is a 297-foot 5-span prestressed concrete girder superstructure with a cast-in-place concrete deck. Under normal water conditions the central span crosses the channel, while the two northern and two southern spans bridge the floodway. There are no vertical abutment gaps or expansion seams beneath the bridge for day or night bat roosting. Roosting features are limited to the vertical concrete faces of the beams and end bents, concrete diaphragms, and defects in the concrete ceiling. A bridge inspection conducted on December 6, 2022 showed no signs of consistent roosting use (i.e., staining or large guano deposits) and no likelihood of maternity use, although a few trace guano pellets were observed on the sides of concrete beams on the south side of the Patoka River. This bridge has a well-developed forested riparian corridor upstream and downs stream of US 231 with extensive associated forest wetland habitat. The Alternative P corridor crosses the Patoka River approximately 11 river miles upstream of US 231 where there is similar large expanses of forest wetland habitat within the floodplain. Local Improvement 2 includes the portion of US 231 that spans the Patoka River. However, details on potential changes to the Patoka River bridge are not available at the Tier 1 phase of the project. Figures 14 and 15 show the current conditions of the Patoka River Bridge.

Figure 14. East side of US 231 bridge from north bank of Patoka River

Figure 15. West side of US 231 bridge from south bank of Patoka River

There are eight bridges that span the 93 miles of the East Fork White River from its confluence with the White River at the Daviess/Pike/Knox County line to SR 37 at Bedford (SR 57, I-69, SR 257, Portersville Road at Portersville, US 231 at Hayesville, SR 550 at Loogootee, US 50 at Shoals, and SR 37 at Bedford). The existing US 231 bridge across the East Fork White River (Asset No. 231-19-08231, NBI No. 016711) was built in 2007 to replace the old steel truss structure that was located approximately 150 feet upstream of the current structure. The current bridge is a 700-foot long 5-span

prestressed concrete Tee-beam structure with a cast-in-place concrete deck and a steel stay-in-place form floor. Under normal water conditions the four southern spans convey water under US 231, while the northern span bridges the floodway. There are no vertical abutment gaps or expansion seams beneath the bridge for day or night bat roosting. Roosting features are limited to the vertical concrete faces of the beams and abutments and the metal edges/seams of the stay-in-place form. Figures 16 and 17 show the current condition of the East Fork White River Bridge.

Figure 17. East side of US 231 bridge from north bank of East Fork White River

Figure 16. West side of US 231 bridge from north bank of East Fork White River

A bridge inspection conducted on September 18, 2022 revealed several locations where guano was present in small scattered areas at the tops of the Tee-beams on both sides of the bridge. These locations did not exhibit staining or accumulations of guano on the riprap beneath the bridge, suggesting a lack of large group and repeated summer roosting use.

Presence and use of the US 231 bridge, as well as all bridges affected by the Alternative P alignment, will be investigated further during the Tier 2 phase.

11.6.1.3 Night Construction and Temporary Lighting Impacts

Bat species react differently to the presence of light, be it natural (moonlight) or artificial (streetlight or dusk-to-dawn light). Some species are documented to avoid illuminated areas, while other species favor foraging in lit areas because of the insects that are attracted to the light. Spoelstra (2017) found that *Myotis* species in the Netherlands tended to avoid artificially white light areas, while *Pipistrellus* (currently *Perimyotis*) species were undeterred and favored the insect densities around streetlights. *Eptesicus serotinus* (serotine bat) were also found to be equally abundant in white light streetlight areas as in dark locations.

The need for night construction using temporary lighting on roadway and/or bridge projects of this magnitude is always a possibility for various reasons. Night construction and light intrusion within high quality flyway and foraging corridors, such as streams, is of particular concern. It is beyond the scope of the Tier 1 assessment to determine which bat flight corridors might be at the greatest risk of being compromised by construction activities for bridges and/or installation of culverts. Data collected through Tier 2 bat studies will be evaluated to ascertain which flight

corridors warrant avoidance and minimization measures for night construction temporary lighting restrictions.

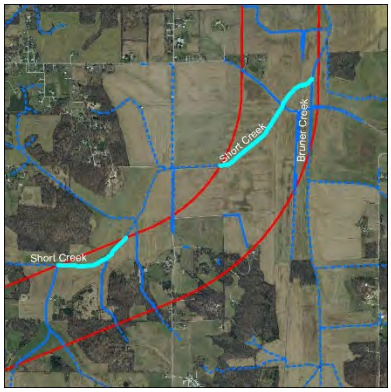
Details on permanent lighting locations for Alternative P (Super 2 or expressway facility type) are unknown at the Tier 1 design stage. The most probable locations include grade-separated interchanges and/or specific at-grade intersections, depending on location and need. During the Tier 2 design plan development, potential impacts to bats from permanent lighting (nearby roosting and foraging corridor affects) will be evaluated and incorporated in the Tier 2 biological assessment.

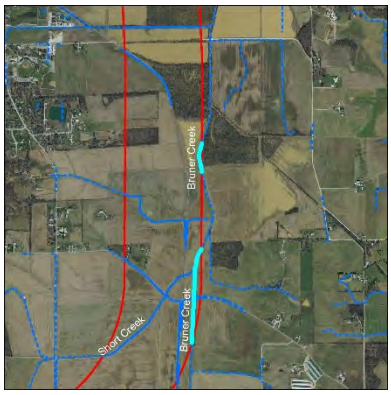
11.6.1.4 Water Quality Impacts

Stream water quality (chemical components and suspended solids), as well as stream substrate structure, influence insect composition and prey availability for foraging bats. Bats also use streams as a source of drinking water. Therefore, streams that experience high levels of contaminants from road runoff (grease/oil, salts, and heavy metals) and agricultural runoff (pesticides, herbicides, and fertilizers) may serve as sources for bioaccumulation of toxic compounds in bats that frequent these waters. Poor water quality reflects negatively on the habitat potential for all five of the bat species included in the Mid-States Corridor Tier 1 biological assessment.

Including first order headwater ephemeral and intermittent streams, there are in excess of 200 stream segments within the Alternative P corridor. Many of these are crossed by local roads or state highways and receive runoff from roadside ditches and/or bridge drainage system discharges, which have the potential to transport road contaminants into the local watersheds. Additionally, many of these streams are subject to agricultural runoff, which may contain residue from fertilizers, pesticides, and herbicides. The following narrative provides profiles of the larger streams (i.e., those with Geographic Names Information System (GNIS) designations) within the Alternative P corridor. However, there are a multitude of tributaries to each of these streams that also occur within the corridor, several of which likely exhibit high potential for bat use and a strong need to maintain good water quality.

Short Creek includes 5,456 feet along the western edge and across the corridor in the lower portion of the watershed. The stream is heavily channelized and water quality is influenced by agriculture practices. There is no riparian cover along the channel locally and bat flyway potential is low. Short Creek and several of its tributaries would be crossed by any Tier 2 alignment through the Alternative P corridor.





Bruner Creek includes 3,220 feet along the eastern edge of the corridor. The stream is heavily channelized and water quality is influenced by agriculture practices. There is little riparian cover along most of the channel; however, there are larger tracts of wetland forest within and adjacent to the corridor along the channel that likely offer quality bat habitat. Bruner Creek would not likely be crossed by a Tier 2 alignment through the Alternative P corridor; however, multiple tributaries to this north-south channel would require bridges/culverts.

Hunley Creek includes 2,895 feet crossed by the corridor approximately 2 mile upstream of the Patoka River. The stream is heavily channelized, but locally includes extensive floodplain and oxbow wetlands throughout most of its length. Within the corridor, the forestland habitat is fragmented by CR W400S, but is otherwise contiguous along Hunley Creek. Water quality is likely influenced by agriculture practices in the upper watershed. This reach offers high quality bat habitat. Hunley Creek and several of its tributaries would be crossed by any Tier 2 alignment through the Alternative P corridor.

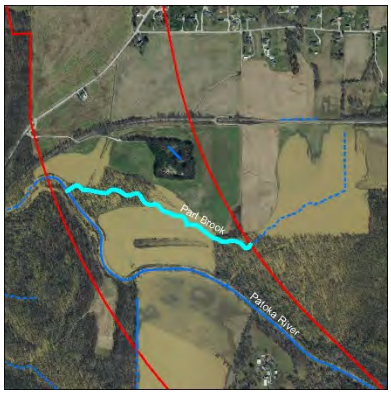
Straight River includes 2,053 feet crossed by the corridor in the vicinity of the existing SR 162 bridge. Locally, the stream is channelized and likely influenced by agriculture practices. Riparian cover is generally absent within the corridor, but becomes more evident in the lower portion of the watershed near the East Fork White River confluence. Locally, bat flyway potential is low. Straight River and several of its tributaries would likely be crossed by any Tier 2 alignment through the Alternative P corridor.

Flat Creek includes the lower 740 feet reach of the stream within the corridor immediately upstream of the confluence with Hall Creek and the Straight River. The stream is channelized and influenced by agriculture practices. Riparian cover is sparse throughout its entire length with infrequent small isolated woodlots along the banks. This stream has very low potential for bat use. Flat Creek would only be crossed by a Tier 2 alignment that follows along the far eastern edge of the Alternative P corridor.

Hall Creek includes the lower 881 feet reach of the stream within the corridor immediately upstream of the confluence with Flat Creek and the Straight River. The stream is channelized and influenced by agriculture practices. Riparian cover is sparse to absent in the lower reaches; however, there is a small bottomland forest immediately adjacent to the north side of the stream west of Saint Anthony Road. This stream has very low potential for bat use. Hall Creek would only be crossed by a Tier 2 alignment that follows along the far eastern edge of the Alternative P corridor.

Patoka River includes 5,928 feet that extends longitudinally across the corridor south of Jasper Kellersville Road. Large expanses of bottomland/wetland forest are associated with both sides of the river throughout much of its length. However, a large portion of the floodplain on both side of the channel within the corridor has been cleared of forestland for agriculture, such that only a narrow riparian strip remains along the top of bank. The Alternative P corridor targeted this location for a river crossing in an effort to minimize forestland impacts. While local runoff into the river is buffered and filtered through the forested floodplain, agriculture influences on water quality are still evident throughout the contributing watersheds. The Patoka River corridor represents high quality potential bat habitat.

Plain Drain includes a short 398-foot long headwater reach for this Patoka River tributary. The entire stream flows through heavily forested Patoka River floodplain habitat along the northern toe of an east-west upland ridge. An agriculture field in the floodplain north of the channel immediately west of the corridor limits is the only portion of the watershed lacking forest cover. While there are scattered residential properties and smaller cleared fields on the neighboring ridge, watershed land uses are otherwise compatible with good water quality. Plain Drain would not likely be crossed by a Tier 2 alignment through the Alternative P corridor.



Part Brook includes 2,784 feet of the lower stream reach at the confluence with the Patoka River. The channel traverses diagonally across the corridor and the majority of the stream flows through agriculture fields, with the exception of the lowermost reach in the corridor, which flows through wetland forest. Water quality is influenced by agriculture practices within the small watershed. The lower reach immediately upstream of the confluence likely supports high quality bat habitat; however, the remainder of the stream channel lacks a suitable flight corridor. Part Brook would be crossed by any Tier 2 alignment through the Alternative P corridor.

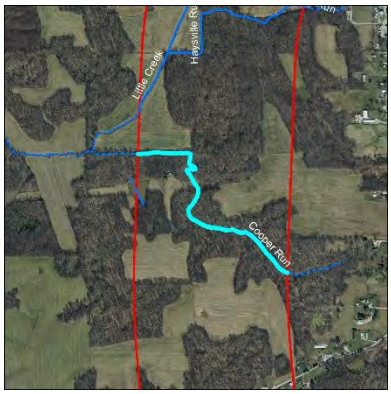
Buffalo Stream includes 2,112 feet within the upper portion of the watershed where the corridor crosses CR 400N. The channel is generally perpendicular to the corridor crossing. Stream water quality is heavily influenced by the extensive agriculture practices within the watershed. Riparian cover is absent throughout the entire watershed with the exception of a small forest tract west of the corridor and the associated Patoka River floodplain forest wetland at the confluence. Locally, the reach within and upstream of the corridor has low potential for bat use. Buffalo Stream would be crossed by any Tier 2 alignment through the Alternative P corridor.

Calf Branch includes 516 feet within the headwater portion of this small watershed tributary to Buffalo Stream. The stream traverses the entire corridor width north of CR 400N. Much of the watershed landscape is influenced by agriculture practices; however, the channel emerges from an isolated forest tract and there is a short reach of the stream that flows through the edge of another small forest tract at the western edge of the corridor. Despite the headwater forest habitat, the stream corridor has low potential for bat use. Calf Branch would be crossed by any Tier 2 alignment through the Alternative P corridor.

Bison Branch includes 965 feet is a small watershed tributary to Buffalo Stream north of CR 400N. The stream flows through the western portion of the corridor immediately south of CR 500 N. Water quality in the entire watershed is influenced by agriculture practices and lacks any riparian cover except for two short reaches in the lower portion of the stream where small one-sided forest tracts remain. Due to the highly agricultural nature of this small watershed, bat use of the stream as a flyway is low. Bison Branch would be crossed by any Tier 2 alignment through the western half of the Alternative P corridor.

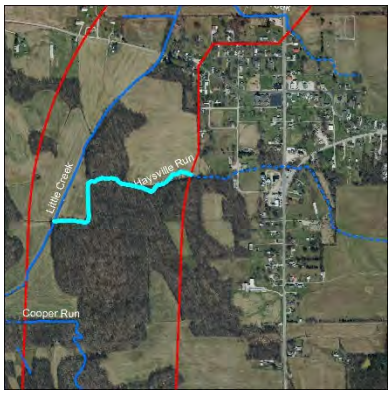
East Fork Mill Creek includes 2,186 feet in the middle portion of the watershed. East Fork Mill Creek is one of the larger watersheds within the Mid-States Corridor project and traverses the entire corridor where the existing US 231 highway spans the stream. While there are numerous forest tracts of various sizes within the watershed down to its confluence with Mill Creek, much of the stream channel lacks riparian cover, or only exhibits forest habitat adjacent to one bank. Agriculture practices and a few poultry farms are potential landscape features influencing water quality. Although the stream channel does not represent a quality flight corridor, bat use of the forest habitat is probable. East Fork Mill Creek would be crossed by any Tier 2 alignment through the Alternative P corridor.

Shoal Run includes 871 feet of stream along US 231 at the confluence with East Fork Mill Creek. To the north beyond the US 231 roadside reach, the stream flows though primarily upland forest habitat with scattered cleared fields for crops and pasture. US 231 runoff and limited agriculture practices are the primary influences to water quality. The short reach of the stream within the corridor lacks quality riparian cover for bat flyway or foraging use, but is a connecting component to higher quality habitat upstream. Shoal Run would be crossed by any Tier 2 alignment through the eastern half of the Alternative P corridor.



Cooper Run includes 3,289 feet of sinuous stream within the corridor and comprises the majority of the total stream length between US 231 and its confluence with Little Creek. The watershed exhibits heavy forest cover throughout with cleared patches of agriculture land on the flat upland ridges between tributary streams. With the exception of a clearing for an east-west transmission line, the entire length of Cooper Run is border by forest habitat. The entire reach of Cooper Run represents high potential bat flyway, foraging, or roosting habitat. Cooper Run would be crossed by any Tier 2 alignment through the Alternative P corridor.

Little Creek includes 5,915 feet of channelized stream west and north of Hayesville within the corridor. The corridor reach extends from US 231 to the west then south across CR W775N and longitudinally to the western edge of the corridor. There are large tracts of upland forest within the watershed, but agriculture practices along the entire reach of the stream and roadway crossings within the corridor are the primary influences to water quality. The majority of the reach within the corridor lacks riparian cover with the exception of one-sided adjacent forestland west of Hayesville. While potential quality bat habitat is present in the watershed, the stream has limited potential as a flyway or foraging corridor. Little Creek would be crossed by any Tier 2 alignment through the Alternative P corridor.

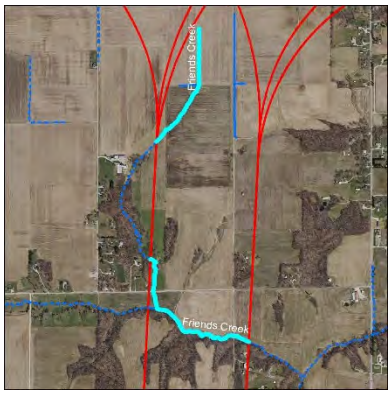


Hayesville Run includes 2,452 feet of the lower portion of the channel upstream of the Little Creek confluence. The upper portion of the stream beyond the corridor limits runs through pastureland and Hayesville where it is crossed by US 231. The reach within the corridor flows through or adjacent to bottomland and upland forest habitat between Hayesville and Little Creek. Agriculture practices and Hayesville runoff drainage are the primary water quality influences. Although the Little Creek stream corridor may not provide an optimal bat travel corridor, the Hayesville Run reach within the corridor has potential for bat flyway, foraging, or roosting habitat. Hayesville Run would be crossed by any Tier 2 alignment through the Alternative P corridor.

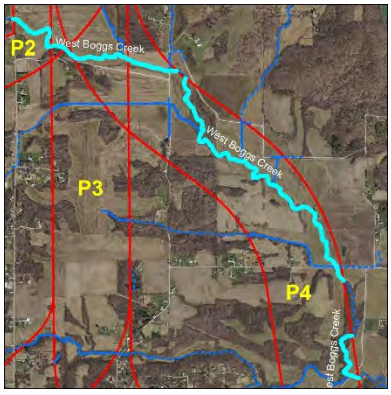
East Fork White River includes 1,902 feet of river channel within the corridor centered along US 231 north of Hayesville. Nearly all of the adjacent floodplain has been cleared for agriculture leaving minimal riparian buffer along the tops of the bank throughout the area. Indiana bat use of the US 231 bridge provided through guano DNA analysis and I-69 survey data confirms that the East Fork White River supports flyway and foraging movements and that associated bottomland and upland forest associated with the river may also provide roosting habitat for listed bat species. East Fork White River would be crossed by any Tier 2 alignment through the Alternative P corridor.

Slate Creek includes 11,075 feet of stream within the middle of the watershed that flows from north to south longitudinally across the corridor. Any alignment through within this corridor would cross Slate Creek. While the landscape along the stream includes more forest cover in the upper headwater reaches and the lower portion towards the confluence with the Patoka River, the middle section is largely agriculture with multiple poultry farms. Slate Creek follows along the west side of US 231 for approximately 0.5 mile at the north end of the corridor reach and receives direct roadway runoff. There is a short 0.5 mile reach of the stream within the corridor with an adjacent forest tract along the west bank, otherwise the channel lacks riparian cover and does not represent a quality flyway or foraging corridor for bats. Slate Creek would be crossed by any Tier 2 alignment through the Alternative P corridor.

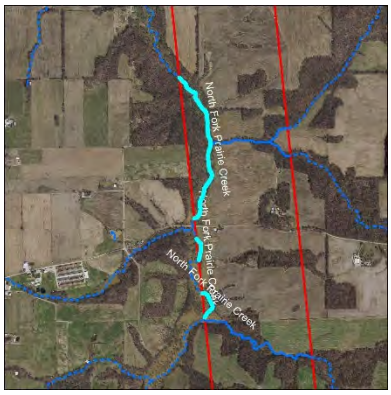
Haw Creek includes 3,902 feet in the middle of the watershed that flows west to east through the corridor. Existing US 231 spans Haw Creek within the corridor. Agriculture practices and runoff from US 231 are the primary water quality influences. Much of the local Haw Creek reach supports riparian cover, although in most cases it is limited to one side of the stream with agriculture fields along the opposite bank. Although riparian cover throughout the watershed is fragmented, Haw Creek provides potential high quality foraging and roosting habitat within the neighboring bottomland and upland forests. Haw Creek would be crossed by any Tier 2 alignment through the Alternative P corridor.



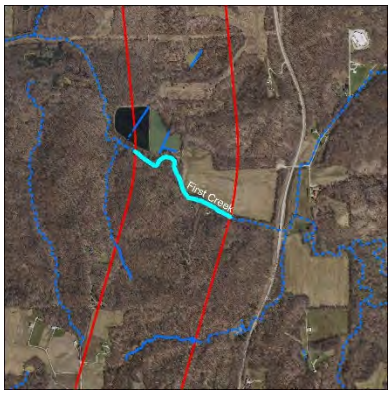
Friends Creek includes 5,725 feet (two separate reaches) within the extreme upper headwaters of the watershed. The upper reach is bordered exclusively by agricultural land, while the lower reach includes a combination of agriculture (north side) and forest (south side) land uses within the corridor. Agriculture practices are the primary water quality influence. Downstream of the corridor to the confluence with the East Fork White River, Friends Creek support riparian cover (one-side or two-sided) throughout most of its length with few fragmentation breaks (namely US 231). Therefore, with the exception of the extreme northern reach, Friends Creek provides potential high quality foraging and roosting habitat, including within the corridor. Friends Creek would be crossed by any Tier 2 alignment through the Alternative P corridor.



West Boggs Creek extends from its confluence with the Boggs Creek east of Loogootee to West Boggs Lake northeast of Loogootee. Agriculture practices are the primary water quality influence within this portion of the watershed. Water quality is further influenced by land development and recreational use practices associated with West Boggs Creek west of US 231. While much of the adjacent land use along the stream is agriculture to the top of bank, there are a few small forest remnants that border the stream. Elsewhere, riparian cover is limited to very narrow tree rows along the banks. The lower portion of the watershed within the corridor exhibits the greatest degree of adjacent forest habitat. Alternative P2 corridor includes 2,108 feet, while Alternative P4 corridor includes 13,180 feet of the stream since this alignment generally follows through the West Boggs Creek valley. West Boggs Creek would be crossed by any Tier 2 alignment through each of the Alternative P Loogootee corridor options.



North Fork Prairie Creek includes 4,204 feet (total of three separate reach segments) within the middle/upper headwater portion of the watershed. The stream flows north to south along the western edge of the Alternative P corridor. Although agriculture practices and poultry farms are the primary water quality influences, bottomland wetland and upland forest abuts the majority of the stream channel (one-sided or two-sided) throughout the corridor. The lower half of the stream length within the corridor is within the tailwaters of the North Fork Prairie Creek reservoir lake. This tailwater region includes extensive forested wetland habitat considered potential high quality bat habitat. Tier 2 alignments through the eastern portion of the Alternative P corridor would avoid crossing North Fork Prairie Creek and direct impacts to the tailwater wetlands, but would still cross multiple unnamed tributaries of the stream.



First Creek includes 2,646 feet within the upper portion of the watershed to the west of US 231. The entire northwestern corner of Crane NSA drains into First Creek. While the lower and middle areas of the First Creek watershed are heavily influenced by agriculture practices, the upper part of the watershed is largely forested with few cleared agriculture or residential developments. Within the Alternative P corridor, the entire south side is forested. The eastern portion north of the stream includes a small agriculture field and the western portion includes a man-made pond. However, the pond is not the result of First Creek impoundment. Due to the heavily forested landscape, undisturbed stream channel, abundance of wetland habitat, First Creek represents potential high quality bat roosting and foraging habitat. First Creek would be crossed by any Tier 2 alignment through the Alternative P corridor. Crossing within the corridor is likely to be through the eastern portion across the agriculture field to avoid impacts to the constructed pond feature.

Rocky Branch includes 3,410 feet within the middle/upper portion of this small watershed. While land use in the upper portion of the watershed east of US 231 is predominantly agriculture influenced, the entire lower portion is exclusively bordered by bottomland/upland forest to its confluence with First Creek. Within the corridor, adjacent land use to the stream is forestland, cleared field residential and commercial (east of US 231) development. Due to the contiguous riparian cover along much of Rocky

Branch, this stream has high potential for bat roosting and foraging habitat. Rocky Branch would be crossed by any Tier 2 alignment through the Alternative P corridor. Crossing the stream through the central portion of the corridor would avoid impacts to the higher quality riparian forest along the western edge.

Stone Branch includes 578 feet in the upper headwaters of the watershed of this Doans Creek tributary stream. The Stone Branch watershed in primarily influenced by agriculture; however, the entire stream length includes a forest buffer that widens down gradient to the northeast. Within the corridor at the extreme headwater reach of the stream, the riparian cover is at its narrowest and otherwise surrounded by agriculture fields. The entire Stone Branch reach, including the portion within the corridor has high potential for bat roosting and foraging habitat. The extreme headwater reach of Stone Branch would likely be crossed by any Tier 2 alignment through the Alternative P corridor.

11.6.1.5 Construction Noise Impacts

Bats are exposed to a variety of sound sources including echolocation calls (their own and other bat species), communication signals, prey and predator sounds, as well as continuous and episodic sounds from anthropogenic sources, including highway traffic and construction (West 2016). Highway noise, both construction and traffic, can cause acute acoustic trauma, disturbance and displacement (food and shelter resources), and signal masking, which can result in adverse effects such as roost abandonment, avoidance of foraging areas, inefficient allocation of time and energy, and degradation of physiological, conditional, and social order (West 2016). Background noise throughout the Mid-States Corridor project consists of a complex assemblage of sound sources including residential (mowers, air conditioners, barking dogs, etc.), commercial/industrial, recreational, roadway traffic, and natural components (birds, wind/rustling leaves, insects).

The specific inventory of construction equipment required for the Mid-States Corridor project is unknown; however, it is anticipated to include a variety of noise sources such as heavy hauler and excavation equipment engines, bucket rattling, and percussive impacts (mounted impact hammers, hoe rams, and jackhammers). Table 5 includes sound level ranges for various types of construction equipment in dBA at 50 feet (West 2016).

Table 5. Noise levels for common construction equipment

Equipment Type	Sound Level Range (L_{eq})*	Average Sound Level (L_{eq})*
Pickup truck	55 to 71 dBA	63.0 dBA
Chain saws	75 to 86 dBA	80.5 dBA
Ground compactor	80 to 82 dBA	81.0 dBA
Jackhammer	74 to 89 dBA	81.5 dBA
Backhoe	80 to 84 dBA	82.0 dBA
Concrete truck	81 to 85 dBA	83.0 dBA
Pumps, generators, compressors	81 to 87 dBA	84.0 dBA
Paver	80 to 89 dBA	84.5 dBA
Compressor	80 to 90 dBA	85.0 dBA
Mounted impact hammer hoe-ram	85 to 90 dBA	87.5 dBA
Dump truck	82 to 98 dBA	90.0 dBA
Diesel truck	85 to 96 dBA	90.5 dBA
Track hoe	71 to 106 dBA	98.5 dBA

A generalized impact assessment of point source construction noise was conducted based on methodology in the Technical Guidance for Assessment and Mitigation of the Effects of Traffic Noise and Road Construction Noise on Bats (West 2016) to determine the "effect space", or approximate distance from the Alternative P "working alignment" that the anticipated construction noise is equal to the background noise. A construction noise estimate of 90.5 dBA was used based on the anticipated equipment with SPL ratings provided in Table 5. Background levels throughout the Alternative P corridor vary greatly from reasonably quiet (40 to 50 dBA) in rural forest and agricultural landscapes to very noisy (70+ dBA) in urban/suburban commercial/industrial settings. For the purposes of a general Tier 1 construction noise evaluation, a background level of 40 dBA was used to represent the remote areas along Alternative P that experience minimal noise intrusions.

Following the methodology and equations provided in West (2016), construction noise level is expected to equal the background level through attenuation at a horizontal distance of approximately 5,200 feet (approximately 1 mile) from the Alternative P alignment. Figure 18 illustrates the expected attenuation of construction noise progressing away from an alignment within Alternative P. The 1-mile distance was used in part to define the action area used for bats in this Tier 1 biological assessment. Note that this reflects a maximum distance of noise effects on bats since terrain and other factors were not factored into this analysis.

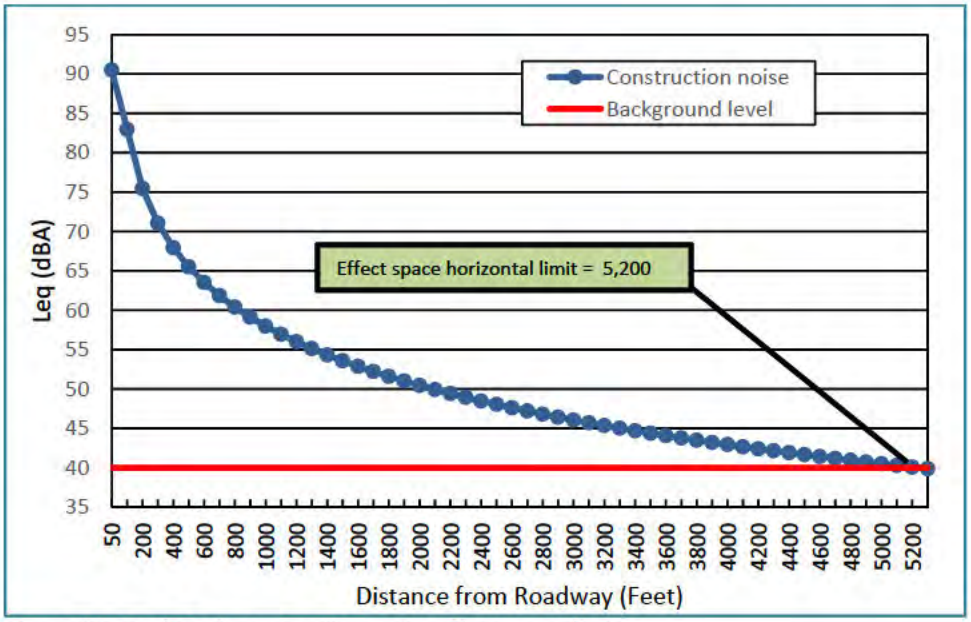


Figure 18. Predicted construction noise effect space limit

West (2016) identifies five special zones for highway projects within which bats may potentially experience effects from noise. Sudden and loud percussive sounds associated with road construction have the potential for temporary or permanent hearing loss in bats. Zones 1 and 2 closest to the highway are the areas where permanent and temporary loss is possible. Acoustic trauma resulting in hearing and echolocation loss in bats is regarded as unlikely because they have developed behavioral morphological (e.g., changing shape and orientation of ear or folding tragus), and physiological (e.g., tympanic muscle contraction) mechanisms to reduce the risk. It is more likely that any bats roosting on or near a bridge would abandon the area (behavioral response) during project staging or early disruptive construction activities before being subjected to exceptionally loud damaging noise from construction equipment. Masking of echolocation signals (Zones 1 through 3) is also considered low risk for bats because the spectrum for construction noise does not overlap with the ultrasonic frequencies of bats, particularly the high echolocation frequencies of *Myotis* bats. Construction noise does however have some potential for masking of passive listening of acoustic signals, environmental sounds, and social vocal communication occurring at lower frequencies.

Since the Indiana bat, northern long-eared bat, little brown bat, and tricolored bat have the potential to be present during the day (roosting) and night (foraging), construction noise during any part of the day is considered to be a point of concern for bats depending on their proximity to the construction area. The estimated noise effect space for potential effects related to traffic noise are covered in Section 11.6.1.6 Operation and Maintenance.

11.6.1.6 Operation and Maintenance Impacts

Once construction as either an expressway or Super-2 facility is complete, operation and maintenance of the Mid-States roadway has the potential for impacts to bats beyond loss and fragmentation of habitat.

Traffic Noise

Since an alignment within the Alternative P corridor would establish a new heavily travelled roadway through areas of the landscape where no such facility currently exists, there will be a notable increase in traffic volumes and associated noise levels along the highway.

Traffic noise has been shown to deter bats from foraging in the vicinity of highways (Siemers and Schaub 2011). Traffic noise is less likely to result in permanent (PTS) or temporary (TTS) threshold shift (reduction in auditory sensitivity) when volumes are relatively low to moderate. However, depending on the species of bat, traffic noise, especially on heavily traveled roadways, has the potential for echolocation masking, passive listening effects, and vocal communication disruption. Echolocation masking occurs when competitive sound sources of sufficient intensity interfere with a bats ability to clearly detect its and others echolocation signals for navigation and prey detection/capture while foraging. Overlap of bat echolocation frequencies with the traffic noise spectrum is more likely with low frequency bats like the big brown bat than high frequency bats like *Myotis sp*. Passive listening disruption from traffic noise can affect a bats ability to interpret biologic information sounds like wind, insect prey, communication with other bats, predator detection, and assessment of other threats. Frequencies used for vocal communication between bats and their offspring in roosts often overlaps with the spectrum of highway noise. Therefore, where highway noise is of sufficient intensity proximal to roosts (nearby trees or below bridges), the potential exists for vocal communication disruption.

A general desktop evaluation of traffic noise impact was conducted using the *Technical Guidance for Assessment and Mitigation of the Effects of Traffic Noise and Road Construction Noise on Bats* (West 2016) and the FHWA Traffic Noise Model (TNM 2.5) to estimate anticipated sound pressure levels (SPL) from 2046 design year traffic volume estimates. Table 6 includes the traffic data generated from the Mid-States Travel Demand Model (TDM) that was used to determine the distances at which traffic noise would dissipate to 40 dBA, 45 dBA, and 50 dBA levels.

Table 6. TDM 2046 design year traffic data for roadway segments along Alternative P alignment

From/To	AADT Total	AADT Trucks	% Trucks	DHV	Leq @ 50ft
I-64 / SR 64	6,650	1,091	16.4	998	71.6 dBA
SR 64 / SR 162	8,150	1,234	15.1	1,223	71.3 dBA
SR 162 / 6th St	11,200	1,412	12.6	1,680	72.3 dBA
6th St / 15th St	8,750	1,203	13.7	1,313	71.4 dBA
15th St / 36th St	8,750	1,203	13.7	1,313	71.4 dBA
36th St / 47th St	8,750	1,203	13.7	1,313	71.4 dBA
47th St / SR 56	8,700	1,365	15.7	1,305	71.7 dBA
SR 56 / US 50S	8,600	1,416	16.5	1,290	71.7 dBA
US 50S / US 50N	8,400	1,346	16.0	1,260	71.6 dBA
US 50N / SR 58	8,550	1,345	15.7	1,283	71.6 dBA
SR 58 / I-69	9,700	1,367	14.1	1,455	71.9 dBA

Based on 2046 DHV traffic, the TNM 2.5 predicted hourly SPL ranging from 71.3 to 72.3 dBA at 50 feet from the roadway. Figure 19 illustrates the approximate 2046 effect space distances from the Alternative P roadway segments where the 2046 highway traffic noise is equal to background levels of 40 dBA, 45, dBA, and 50 dBA. Although episodic peaks in noise from loud passing trucks are likely, the overall traffic noise levels at 300 feet from the roadway are estimated at 60 dBA or less and these levels are believed to be tolerable by myotid bats.

Figure 19. Estimated distances from Alternative P segments where traffic noise levels equal background levels.

Vehicle-Bat Collisions

The existing roadway infrastructure within the Mid-States Corridor project area includes a wide variety of facility types from low volume gravel roads to medium and high volume two-lane state highways to high-speed interstates (I-64 and I-69). Each of these facility types have the potential to result in vehicle-bat collisions if the roadway traverses through bat flyway/foraging and migratory corridors. This may be more likely across smaller stream crossings with low clearance bridges/culvert where good riparian cover exists along the flyway to the roadway. Nonetheless, bat fatalities are also possible for larger span bridges where there is ample space for bats to fly beneath the bridge.

On September 12 and 19, 2022, two dead bats (hoary bat and eastern red bat, respectively) were observed on the shoulder of the US 231 bridge over the East Fork White River. It is presumed that these fatalities were the result of vehicle collisions. As indicated in Section 11.16.1.2, DNA analysis of guano samples from beneath the US 231 bridge confirmed that Indiana bats are present along this reach of the East Fork White River and would be at risk of injury/death from traffic if they opt to fly across instead of beneath the bridge. The addition of a second bridge spanning the East Fork White River would result in a wider highway cross section for bats to traverse, but otherwise there would be no increase in risk above that which already exists. The

many new bridge crossings across bat flyway/foraging corridors that would be required elsewhere throughout the Alternative P corridor, including the Patoka River, would introduce potential collision hazards in areas currently free of such obstructions.

Permanent Street Lighting

The Tier 1 Alternative P corridor location phase for the Mid-States Corridor project does not provide a plan or estimate as to where street lighting along the expressway or Super-2 facility type might be anticipated, nor does this analysis include any anticipated lighting needs for the Local Improvement segments. The location of permanent lighting, if any, along the new roadway will be evaluated during the Tier 2 biological assessment phase.

Road Maintenance

Anticipated routine maintenance activities (i.e., pothole repair, seasonal shoulder mowing, snow removal) along the Alternative P expressway or Super-2 roadway are considered to have minimal to no potential for adverse effects to bats. However, periodic bridge maintenance has the potential to disturb roosting bats beneath the bridge depending on the nature and duration of the maintenance activity.

Compounds and solutions (e.g., sand, salt, or brine solution) used in the winter to abate snow and ice buildup have the potential to be transported into nearby waterbodies as runoff and modify water quality. Seasonal mowing of the shoulder areas will be scheduled by the District as it is for all other state highways.

Road Contaminant Runoff and Hazardous Spills

Heavy metals, salts, oil, grease, and other volatile organic compounds (VOCs) deposited on highways are eventually flushed from the pavement and may ultimately migrate to nearby wetlands and streams. Contaminants or hazardous materials from spills (inadvertent discharges or releases from accidents) can also quickly be transported into nearby stream systems and potentially affect the aquatic macroinvertebrate communities which bats rely on for prey.

11.7 Avoidance and Minimization Measures

To reduce and minimize the effects of the Mid-States Corridor project to federally listed and candidate bat species, INDOT has developed general avoidance and minimization measures (AMMs) at the Tier 1 phase and will continue to develop and/or refine additional more detailed AMMs throughout the Tier 2 Alternative P design phase for implementation prior to, during, and after construction.

11.7.1 Project Timing/Scheduling

Seasonal timing of construction during the late fall, winter, and early spring can be a very beneficial avoidance measure and a primary AMM for road and bridge construction projects since the work can be conducted during a period when Indiana bats, northern long-eared bats, gray bats, little brown bats, and tricolored bats are not active in these habitats. However, for large-scale projects such as the Mid-States Corridor, it is impractical to restrict construction of the roadway and bridge entirely to

the inactive bat season. Therefore, project timing and scheduling of specific construction activities will be addressed and developed into AMMs during the Tier 2 phase.

11.7.2 Tree Clearing and Structure Demolition Restrictions

Impacts to forests and the need to clear trees for any Tier 2 alignment developed within the Alternative P corridor is unavoidable. The Tier 1 evaluation of the "working alignment" through the center of the Alternative P corridor estimates approximately 547 acres to 815 acres of forest clearing. Additionally, forest clearing for the Local Improvements is estimated at approximately 59 acres. To avoid potential impacts to individual and groups of Indiana bats, northern long-eared bats, little brown bats, and/or tricolored bats roosting in trees during the summer maternity season an AMM that prohibits tree clearing from 1 April through October 1 shall be incorporated as a special provision into the contracts for all SIU construction segments.

At present, an evaluation of available hibernacula data does not indicate that the Alternative P corridor is within the fall swarming buffer zones for any of the five bat species. Therefore, for the purposes of the Tier 1 Section 7 consultation, extending the tree clearing restriction period to November 15 is not warranted.

While the Indiana bat, northern long-eared bat, little brown bat, and tricolored bat typically make use of live or dead trees (bark, crevices, foliage) for summer roosting and maternity colony establishment, each species on occasion also use man-made structures such as abandoned houses, barns, and out buildings. Based on the results of Tier 2 inspections and/or pre-construction inspections of such structures, an AMM to seasonally restrict demolition of specific structures in the winter will be given consideration as warranted in Tier 2.

11.7.3 Bridge and Building Structure Inspections

Demolition of existing bridge structures and building structures is anticipated for the Mid-States Corridor, but identification of specific locations is beyond the scope of the Tier 1 evaluation for the Alternative P corridor. As per INDOT guidelines, all bridges and building structures designated for removal based on the Tier 2 preferred alternative design will be inspected prior to demolition to confirm absence of current use by bats. In the event that pre-construction inspections reveal bat presence at a building or bridge, an AMM to resolve this situation will be developed during Tier 2.

Construction of piers and bridge decks often require the use of false work and forms for pouring concrete. These temporary structures can sometimes create gaps and crevices that bats opportunistically chose to use for day and night roosting. Subsequent removal of such temporary features can result in injury or death of bats that opportunistically use these structures for day roosting. In an effort to avoid such conflicts, an AMM requiring routine inspections of the bridge for bats during construction will be developed during the Tier 2 phase and subsequently incorporated into the project construction contract.

In the event that bats are found to be using portions of the bridge for roosting during construction, an AMM to use physical exclusion techniques (Styrofoam sheets, foam

backer rolls, expansion foam) to seal off gaps and crevices will be evaluated and implemented if deemed appropriate.

11.7.4 Night Construction Restrictions

Spoelstra et al. (2017) determined that bats of the *Myotis* genus tended to be light shy and avoid areas where artificial white and green light was present in otherwise dark and undisturbed environments. Much of the Mid-States Corridor project area is located in rural landscapes where there are no streetlights or other lighting sources, except residential and commercial security lighting. These existing scattered light intrusions are not expected to preclude Indiana bat, northern long-eared bat, little brown bat, tricolored bat, and/or gray bat presence from otherwise suitable roosting and foraging habitat for the species.

It is anticipated that the majority of the Mid-States Corridor construction work will take place during daytime hours and would therefore not require any temporary lighting or construction activities in the evening. However, for particular phases of the construction process (e.g., summertime concrete pours), INDOT and/or the contractor may elect to conduct all or part of a particular construction element at night when temperatures are cooler, thus requiring the use of portable temporary lighting. The Tier 2 biological assessment will explore the need to include an AMM that prohibits or restricts night construction and the use of temporary lighting for roadway and bridge construction within portions of the project area where such intrusions may unduly affect and disturb night foraging.

11.7.5 Erosion Control

Bat diets are diverse and consist of moths, beetles, midges, flies, wasps, stoneflies, flying ants, caddisflies, brown leafhoppers, treehoppers, lacewings, spiders, beetles, and weevils (Brack and Whitaker 2001, Feldhamer et al. 2009, Kiser and Elliott 1996; Murray and Kurta 2002; Whitaker 2004). While the diets of these bats are not restricted to a specific insect or group of insects, they are still reliant on an abundant selection of prey. Since a diverse insect community is in part dependent on water chemistry, reduced sedimentation, and structural stream components for habitat (i.e., gravel, cobble, boulders, woody debris, and macrophyte vegetation), bat foraging presence along a stream is directly related to maintaining good water quality. Additionally, bats use standing water in wetland habitats as a direct source of drinking water.

When best management practices (BMPs) for road and bridge construction projects are not properly developed and implemented, these activities can result in temporary and long-term degradation of water quality through increased siltation or introduction of hazardous materials (e.g., fuel, oils, grease, and solvents) into streams and wetlands via on-site spills. Substantial ground disturbance will occur throughout all of the local watersheds through roadway and bridge construction actions. An erosion control plan sensitive to the unique challenges of controlling erosion and runoff of suspended and dissolved solids into neighboring streams and wetlands will be developed in accordance with INDOT standards and Indiana Department of Environmental Management (IDEM) requirements as part of the design plans.

11.7.6 Water Quality

Migration of roadway contaminants (e.g. metals, oil, grease, and volatile organic compounds (VOCs), from roadway runoff into streams and adjacent wetlands is of particular concern due to the high quality of some of the aquatic systems present within the project area. To protect these water resources during and post-construction, roadway design will incorporate specific measures to intercept contaminants leaving the roadway prior to discharge into sensitive aquatic resources. Where possible, bridge designs will avoid the use of drop drains on bridge decks which discharge runoff directly in to stream channels. Tier 2 bridge designs will make all efforts to use enclosed drainage systems and direct the discharge onto adjacent floodplains where the runoff water can be filtered via floodplain soils and vegetation.

11.8 Habitat Loss Conservation Measures

11.8.1 Forest Habitat Loss

Through selection of the Alternative P corridor, impacts to suitable bat habitat have been minimized to the extent possible at the Tier 1 corridor development/placement level. Nonetheless, due to large expanses of forested habitat associated with watersheds such as Hunley Creek, Hall Creek headwaters, Patoka River, Cooper Run and Haysville Run headwaters, Slate Creek headwaters, Haw Creek, Boggs Creek/West Boggs Creek, North Fork Prairie Creek, and First Creek, the goal to minimize forest loss everywhere is hampered by the need to adhere to engineering design standards.

To compensate for the unavoidable and irreversible loss of suitable bat roosting and foraging habitat (i.e., forest loss), INDOT is committed to the development of a compensatory mitigation plan during the Tier 2 phase of the Mid-States Corridor project. The framework of the plan will be structured around one or a combination of the following mitigation approaches.

Range-Wide Indiana Bat In-Lieu Fee Program

The Range-Wide Indiana Bat In-Lieu Fee Program was developed to provide an in-lieu fee option to compensate for unavoidable impacts to Indiana bats (also northern long-eared bats) and their habitats from actions conducted under the jurisdiction of the FHWA, other federal transportation agencies, and other entities, if authorized by the USFWS. The ILF was developed by the USFWS and administered through an agreement with The Conservation Fund, the program sponsor. While the ILF is typically used in conjunction with the Programmatic Biological Opinion for Transportation Projects in the Range of the Indiana Bat and Northern Long-Eared Bat (USFWS 2018), its use for individual informal/formal Section 7 biological opinions is permissible as well. Proposed payment into the in-lieu fee (ILF) program is determined using the following approach:

(Acres of suitable habitat loss) x (Replacement ratio) x (Per acre cost)

Use of the ILF outside of the Programmatic BO warrants additional coordination with the USFWS during Tier 2 to confirm the variables for determining the specific payment. The current state based fee schedule for calculating compensatory mitigation fees (Exhibit E Table 2 of the Program Instrument August 2022 – December

2022) sets the estimated per acre compensatory mitigation fee for the state of Indiana at $10,528/acre for collective loss of habitat to the Indiana bat and northern long-eared bat (stacking). In most instances, the USFWS considers 3:1 to be an appropriate replacement mitigation ratio for bat habitat forest impacts, although a 1.5:1 ratio may be applicable to loss of suitable bat habitat less than 300 feet from existing paved roads. Use of the ILF for compensatory mitigation (total or in-part) on the Mid-States Corridor project will be further coordinated with the USFWS during Tier 2 and throughout the project development process.

Mitigation Banking Credits

The purchase of banking credits represents a second alternative strategy in fulfilling compensatory mitigation needs for unavoidable habitat loss to endangered species such as the Indiana bat and northern long-eared bat, as well as the little brown bat and the tricolored bat. Mitigation banks developed by private environmental organizations provide the opportunity to purchase compensatory mitigation credits from conservation banks created through habitat restoration and/or conservation easements on properties known to support endangered species. Magnolia Land Partners, LLC is a nationally based land management firm that provides credit banking services for a variety of needs including wetland/stream compensatory mitigation and endangered species mitigation. Magnolia currently has two complete endangered bat species banks established in Indiana: Jug Hole Bank Site (Orange County) and Bear Creek Mitigation Complex (Brown County). The potential use of mitigation banking credits through Magnolia or other credit banking organizations operating in Indiana will be further investigated through coordination with USFWS and INDOT during the Tier 2 phase of the project.

Site Specific Mitigation Parcel Development

The use of project specific mitigation property development would involve a concerted effort to actively search for suitable parcels from local landowners that could be developed into bat mitigation habitat through restoration of forest bottomland/upland habitat either through fee simple land purchases or conservation agreements. While viable and acceptable, this approach to mitigation development is less desirable than in-lieu fee payments or purchasing of banking credits because of the large labor effort and expense required to identify suitable properties, design restoration plans, purchase property/easements, construct the site (earthwork and planting), conduct multi-year monitoring for success compliance, and maintenance actions to ensure mitigation parameters are being meet. In the event this approach is pursued for the Mid-States Corridor project, additional coordination with USFWS and INDOT during the Tier 2 phase of the project would be required to arrive at a crediting scheme suitable to the USFWS.

Habitat Preservation through Conservation Easement

Procuring conservation easements with restrictive covenants on forestland properties that are known to provide maternity colony and/or high quality roosting and foraging habitat for Indiana bats, northern long-eared bats, tricolored bats, and/or little brown bats within the project area represents another option for consideration. Mitigation crediting ratios for this approach would need to be negotiated with USFWS on a case-

by-case basis. Habitat preservation typically would not be acceptable as the lone mitigation method since this approach does not does not achieve the no net loss goal.

11.8.2 Hibernacula Mitigation

At the Tier 1 biological assessment level, it is currently not evident that winter hibernacula (i.e., caves) or forest habitat within fall swarming zones around hibernacula for any of the bat species of concern would be affected by the proposed action. Therefore, the need to develop a mitigation plan to address such impacts is not currently considered warranted. In the event that Tier 2 investigations identify previously undocumented winter hibernacula within the vicinity of the Alternative P alignment, additional coordination with the USFWS will be conducted to determine the need for suitable mitigation beyond the proposed forest loss compensation.

11.9 Bat Effects Analysis

The following effects analysis addresses direct and indirect/cumulative impacts anticipated for the Indiana bat, northern long-eared bat, gray bat, little brown bat, and tricolored bat for the Mid-States Corridor project.

11.9.1 Direct Impacts

Potential direct impact assessments for the five bat species have been organized according to general construction activities and other potential impact concerns. The effects pathway for each activity is provided to document the stressor, spatial/temporal exposure, species response, avoidance/minimization measure, and pathway. The USFWS previously generated a comprehensive listing of potential Indiana bat stressor responses for the I-69 Biological Opinion. These have been adopted for use on the Mid-States Corridor project as a standardized method for classification and are used in the Tier 1 level assessment for all of the bat species.

- No response
- Startled with increased respiration rate
- Death/injury of adults and/or offspring
- Flees from roost during daylight with increased predation risk
- Abandons roost site
- Abandons foraging area
- Shifts focal roosting and/or foraging areas
- Increased energy expenditures with reduced fitness (short term)
- Reduced energy expenditures with increased fitness (long-term)
- Aborted pregnancy, reproductive failure
- Increased torpor, delayed development/parturition, and/or sexual maturation of offspring
- Short-term reduction in colony reproductive rate (3-4 seasons)
- Short-term reduction in colony/hibernaculum size (3-4 season)
- Long-term increase in colony reproductive rate
- Long-term increase in colony/hibernaculum size/fitness level
- Long-term decrease in colony/hibernaculum size/fitness level

11.9.1.1 Tree Removal

Activity	Tree clearing
Stressor	Felling trees during the bat active season when Indiana bats and/or northern long-eared bats are present in trees within the right-of-way as either a maternity colony or individual bats.
Bat Species of Concern	Indiana bat Northern long-eared bat Little brown bat Tricolored bat
Temporal Exposure	Spring, summer, and fall active season.
Spatial Exposure	All woodland areas within the preferred alternative right-of-way where suitable habitat is present.
Response	• No response. • Death/injury of adults and/or offspring. • Flees from roost during daylight with increased predation risk. • Abandons roost site. • Abandons foraging area. • Shifts focal roosting and/or foraging areas. • Increased energy expenditures with reduced fitness (short term). Displaced pregnant females removed from primary and alternate roosts expend additional energy finding substitute roosts. • Short term reduction in colony reproductive rate. Death of pregnant female results in the loss of two bats. • Long-term decrease in colony/hibernaculum size/fitness level. •
Relevant AMMs	• Contractor shall be required to clear all trees between April 1 and October 1.
Pathway	Without implementation of a seasonal summer tree clearing restriction for construction, bats roosting in trees within the right-of-way during the summer could potentially be flushed from the tree during the day or injured/killed when a roost tree is felled. Adherence to the INDOT Standard Specification AMM will ensure that the seasonal tree clearing restriction will be included throughout the project planning process and implemented during construction.

11.9.1.2 Habitat Loss and Forest Fragmentation

Activity	Tree removal and grubbing.
Stressor	Direct loss of high quality primary and/or secondary maternity roost trees. Increased disturbance to maternity roosts adjacent to the new roadway from construction activities and/or post-construction operation of the roadway. Modification or elimination of existing flyways and foraging corridors.
Bat Species of Concern	Indiana bat Northern long-eared bat Gray bat Little brown bat Tricolored bat
Temporal Exposure	• Permanent loss of potential roosting habitat. • Permanent loss or displacement of maternity roosts or entire maternity colony. • Temporary disturbance within fall swarming habitat. • Permanent severance of existing flyways connecting roosting habitat to foraging habitat. • Permanent encroachment across quality foraging corridors.
Spatial Exposure	• All locations where potential maternity colonies occur within the action area, particularly in close proximity to the new roadway. • All primarily flight corridors.
Response	• No response. • Abandons roost site. • Shifts focal roosting and/or foraging areas. • Increased energy expenditures with reduced fitness (short term). Bats returning in the spring forced to find new roosts within colony. • Aborted pregnancy. • Short-term reduction in colony reproductive rate resulting from the new highway while the species adjusts to the changes in the landscape. • Abandons all or portions of existing foraging areas.
AMMs and Conservation Measures	• There are no specific AMMS recommended to avoid or minimize impacts to flight/foraging corridors. Maximum minimization has been accomplished through alternative selection. • A Construction in a Floodway permit (CIF) from the IDNR for tree clearing within multiple floodways will require compensatory mitigation through tree planting within floodplain habitat. This project related action would indirectly benefit bats in the area through habitat restoration. • Compensatory mitigation through conservation measure to either use the Indiana bat ILF or purchase mitigation banking credits, and/or development of site specific mitigation restoration properties or habitat preservation through conservation easements.
Pathway	Severe changes in landscape setting can alter macro- and micro-habitat conditions, including flight corridors and roosting habitat, that bats are reliant on for quality suitable habitat.

11.9.1.3 Bridge Demolition, Reconstruction, and New Bridge Construction

Activity	Demolition of bridges and construction of new bridges.
Stressor	Loss of known day/night roosting feature.
Bat Species of Concern	Indiana bat Northern long-eared bat Gray bat Little brown bat Tricolored bat
Exposure Temporal	Roosting resource unavailable throughout all or part of the spring/summer/fall period of occupancy.
Exposure Spatial	Confined to bridge structure.
Response	• Death/injury of adults and/or offspring. • Startled with increased respiration rate. • Flees from roost during daylight with increased predation risk. • Abandons roost site (bridge). • Increased energy expenditures with reduced fitness (short term). Return to a roost that is no longer available. • Aborted pregnancy, reproductive failure.
AMMs and Conservation Measures	• Conduct visual inspections of all potential roost areas on bridge one week and immediately prior to bridge demolition. • Conduct routine inspections of crevices and cracks on concrete forms and scaffolding for the presence of bats, especially immediately prior to concrete pouring. • Dismantle all concrete forms, scaffolding, and supporting structures at the earliest possible opportunity to reduce the period of time that such structures might be exploited by roosting bats.
Pathway	Without implementation of a seasonal summer AMM restriction for construction, bats that would day and/or night roost on the structure in spring/summer/fall could potentially be killed, injured, or flushed from under the bridge where they have already become accustomed to roosting in the summer. Bats risk increased energy expenditure when forced to find new roosting areas if a bridge is no longer present or suitable upon return in the spring. The use of the inspection AMM would avoid inadvertent taking of any bats that might unexpectedly day roost at the bridge during the scheduled construction period.

11.9.1.4 Night Construction/Lighting

Activity	Night construction.
Stressor	Construction activity within flyways during foraging. The use of high intensity lights for night work.
Bat Species of Concern	Indiana bat Northern long-eared bat Gray bat Little brown bat Tricolored bat
Temporal Exposure	Temporary effect during construction from spring to late summer during period of bat activity.
Spatial Exposure	Confined to immediate vicinity of road and bridge construction areas.
Response	• No response. • Abandons foraging area. • Abandons roost site. • Shifts focal roosting and foraging areas. • Abandons use of tree(s) as maternity colony roost(s). • Increased energy expenditures with reduced fitness (short term).
AMMs and Conservation Measures	• Limit nighttime construction activities using temporary portable lights to the least number of nights required. • Prohibit night construction and temporary lighting at proposed bridges that cross streams used by listed bats as determined through Tier 2 surveys. • Direct temporary lighting away from adjacent woodland foraging habitat.
Pathway	Construction activities that require the use of bright lights at night would discourage bats from back-and-forth movements along foraging flyways during construction. Bats roosting in the vicinity of bridges under construction might be cut off from available foraging habitat on the opposite side of the bridge.

11.9.1.5 Water Quality

Activity	Road and bridge construction and post-construction operation in proximity to streams.
Stressor	Water quality degradation from construction site runoff and potential hazardous chemical spills into streams and groundwater during construction and from post-construction roadway operation.
Bat Species of Concern	Indiana bat Northern long-eared bat Gray bat Little brown bat Tricolored bat
Temporal Exposure	Primary exposure during construction period. Secondary long-term exposure post-construction.
Spatial Exposure	All stream crossings.
Response	• No response • Abandons foraging area. • Shifts focal roosting and foraging areas.
AMMs and Conservation Measures	• Maintain erosion and sediment runoff control measures in accordance with INDOT best management practices (BMPs) to reduce suspended solids from migrating into streams. • Use temporary and permanent seeding to minimize erosion and sediment migration into streams during construction and post-construction. • Confine fueling and other hazardous material activities at locations where accidental spills can be best managed. • Bridge drainage systems will be designed to prevent runoff from being deposited directly into streams crossed from deck drains. All roadway runoff will be captured and discharged onto the floodplain to allow for filtering of roadway contaminants.
Pathway	Water quality degradation from construction activities via sedimentation or introduction of hazardous fluids into streams can have long-term effects on aquatic habitat for macroinvertebrates which serve as prey for bats. Similarly, migration of road runoff contaminants from post-construction operation can have permanent detrimental effects to streams through introduction of dissolved solids and increased sediment loads.

11.9.1.6 Construction Noise and Vibration

Activity	Use of equipment for roadway and bridge construction.
Stressor	Percussive impacts and machinery noise during construction.
Bat Species of Concern	Indiana bat Northern long-eared bat Gray bat Little brown bat Tricolored bat
Temporal Exposure	Temporary effect from construction equipment for multiple years during construction from spring through fall.
Spatial Exposure	Road/bridge construction noise impacts have the potential to extend less than one mile from the roadway alignment.
Response	• No response. • Startled with increased respiration rate. • Flees from roost during daylight with increased predation risk. • Abandons roost site. • Abandons foraging area. • Shifts focal roosting and/or foraging areas. • Increased energy expenditures with reduced fitness (short term). • Aborted pregnancy, reproductive failure.
AMMs and Conservation Measures	• Maintain equipment in good working order. • Restrict construction within stream corridors known as listed species flyways to daytime except for nighttime pouring of concrete bridge deck if needed. • Conduct Tier 2 bat mist netting surveys and radio telemetry tracking to determine if roost trees are in close proximity to roadway construction zone.
Pathway	Noise of sufficient energy resulting from construction activities has the potential to disturb and displace bats roosting in the immediate vicinity of the bridge in the summer. Signal masking of echolocation and low frequency communication is not likely to be of concern.

11.9.1.7 Post-Construction Operation and Maintenance

Activity	Vehicle traffic on roadway and maintenance of roadway and right-of-way for compliance with INDOT standards.
Stressor	Traffic noise, vehicle-bat collisions, permanent lighting, road maintenance, and hazardous spills post-construction.
Bat Species of Concern	Indiana bat Northern long-eared bat Gray bat Little brown bat Tricolored bat
Temporal Exposure	In perpetuity throughout the life of the highway.
Spatial Exposure	Within and immediately adjacent to the highway right-of-way.
Response	• No response. • Startled with increased respiration rate. • Death/injury to adults or juveniles from vehicle-bat collisions. • Abandons nearby roost site. • Abandons local foraging areas. • Shifts focal roosting and/or foraging areas. • Increased energy expenditures with reduced fitness (long term).
AMMs and Conservation Measures	• Bridge drainage systems will be designed to prevent runoff from being deposited directly into streams crossed from deck drains. All roadway runoff will be captured and discharged onto the floodplain to allow for filtering of roadway contaminants. • Permanent lighting, if/where needed, will use downward facing/full cut-off lenses to meet BUG system thresholds of "0" for uplight and the lowest backlight level practical for the roadway lighting needs.
Pathway	Post-construction operation and maintenance of a roadway within the Alternative P corridor through multiple pathways poses the same risks to bats that the existing roadway network currently does.

11.9.2 Indirect and Cumulative Impacts

As stated in Section 2.2 Project Need, the core goals of the Mid-States Corridor project is to increase accessibility to major business markets, provide more efficient freight transportation, and improve intermodal access. While economic development is not a primary goal of the project, Alternative P from I-64 to I-69 is anticipated to directly result in an influx of new job opportunities and housing developments.

TREDIS modeling identified fourteen TAZs from south of I-64 to north of I-69 where inducted growth was anticipated as an indirect result of a new roadway for the Alternative P corridor. For each of these TAZ areas, the model estimates 10 or more new households and/or 10 to 30 new job opportunities. Each of the TAZs vary in size and land use composition. Note: TAZ 180534 which is a very large tract of land that includes all of Crane NSA was modified to exclude the military installation from the TAZ since induced growth is not anticipated within this large government property. Figure 20 summarizes the overall size and land use composition within each TAZ. It is unknown as to where within each TAZ induced growth is likely to occur; therefore, the

anticipated impacts to bat habitat (i.e., forest loss) cannot be determined with any certainty at the Tier 1 level. Figure 20. Induced growth TAZ land use composition summarizes the land use within each of the induced growth TAZs. With the exception of TAZ 180531 (between I-69 and Bedford), 180534 (adjacent to Crane NSA), and 180468 (south of Loogootee) forest cover percentage is a minor component of the land use. Nonetheless, areas already cleared of forest are more likely to be developed; therefore, bat habitat loss from indirect induced growth is likely negligible. A more comprehensive evaluation of indirect and cumulative impacts to bat habitat will be conducted during the Tier 2 phase.

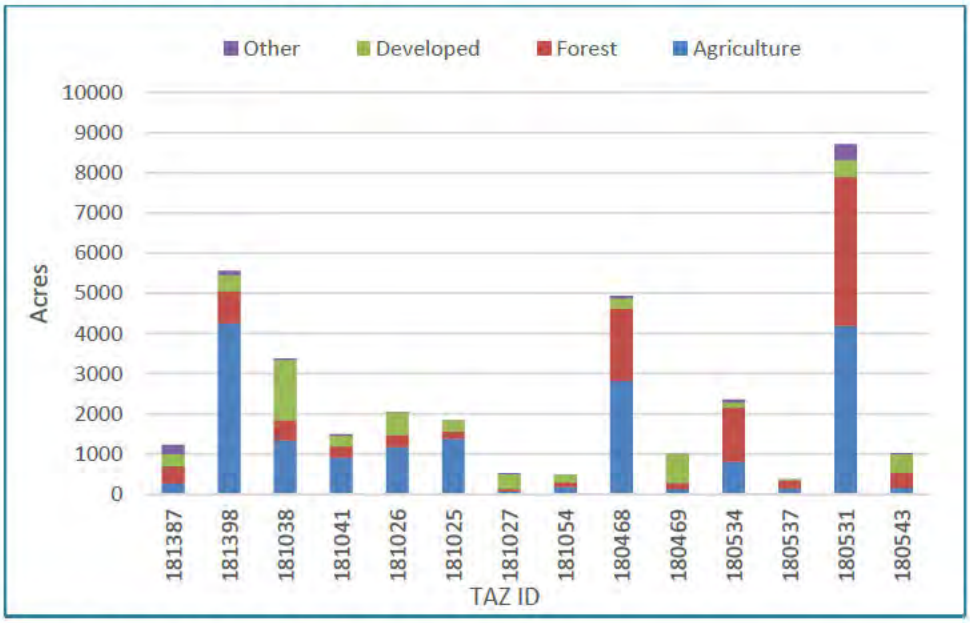


Figure 20. Induced growth TAZ land use composition

12 Mussels

12.1 Fanshell (Endangered)

12.1.1 Range Distribution

The fanshell is found throughout the Ohio River system including the Tennessee and Cumberland rivers (Watters et al. 2009). Extant populations are known from Indiana, Kentucky, Ohio, Tennessee, Virginia, and West Virginia. Reproductively viable populations are now believed to inhabit only the Clinch River of Virginia and the Green, Licking, and Rolling Fork Rivers of Kentucky (USFWS 2019d). In the Mid-States Corridor study area, historical fanshell records are known from Monroe, Lawrence, Martin, Dubois, Daviess, Pike, and Greene counties (IDNR 2020b).

In Indiana, the fanshell has been recorded in the Wabash River, Tippecanoe River, and East Fork White River (USFWS 2019d). There are numerous records (1990 through 2014) for the fanshell on the East Fork White River in Daviess, Dubois, Martin, Lawrence, Jackson, and Bartholomew counties. Because many of these accounts are live or fresh dead specimens observed within the last 20 years, the fanshell is

considered extant in the East Fork White River. Higher concentrations of the species occur downstream of the Williams Dam.

12.1.2 Population Trends

Although an additional viable population was discovered along a 9-mile stretch of the Rolling Fork River in Kentucky, there is no evidence that the distribution of the fanshell has changed substantially since the species' listing in 1990. The various fanshell populations are all highly restricted in range and sparsely distributed making it unlikely that gene exchange occurs between these populations (with the possible exception of locations where the fanshell have been transplanted from the Licking River) (USFWS 2019d).

Outside of the rivers showing evidence of recruitment, few publicly available and statistically valid surveys of populations of fanshells are available. The fanshell can be difficult to detect due to their tendency to burrow completely into the substrate (e. g. complete hypobenthic) resulting in limited information about fanshell distribution and abundance. Additional survey efforts are needed in portions of the fanshell's historical range to accurately assess the species' status (USFWS 2019d).

12.1.3 Life Cycle

Freshwater mussels have a complicated reproductive cycle and are obligatory parasites on host fishes or amphibians (Woolnough 2006, Haag 2012). Fanshell are bradytictic mussels, referred to as long-term brooders. Spawning occurs in the summer and females brood larvae until the next spring (Jones and Neves 2002). Males release sperm into the water column that are acquired by females through their siphons during feeding and respiration. Gravid females have been observed from late October to late May (USFWS 2019d). Females retain fertilized eggs in their marsupium attached to the outer gill until larvae (glochidia) fully develop (Jones and Neves 2002). Upon completion of the brooding cycle, conglutinant packets (i.e., clustered glochidia) resembling spiral worms are expelled into the water column to attract host fishes, including small bodied species from Percidae (i.e., darters) and Cottidae (i.e., sculpins) (USFWS 1997b, Jones and Neves 2002). Glochida that escape predation latch on to the gills and body of the host fish, where they remain for a short period of time as encysted parasites. Following maturation on the host fish, the juvenile life stage begins when individuals detach from the host fish and settle onto or into the streambed (Jones and Neves 2002). The fanshell typically lives 12 or 13 years, although 26 years has been observed (Jones and Neves 2002).

12.1.4 Habitat

The fanshell inhabits medium to large rivers in areas of moderate current with stable gravel and sand substrates (Watters et al. 2009, USFWS 1991). It buries itself leaving only the edge of the shell and siphons exposed.

12.1.5 Threats

Impoundments, navigation projects, pollution (including agricultural runoff), and in-stream habitat alterations likely contributed to the decline of the fanshell. Additional and ongoing threats to the species include water quality degradation from point and

non-point sources, natural resource exploration and extraction, land development, disease, predation, and competition from invasive species. The current isolation of fanshell populations from one another restricts the natural interchange of genetic material between populations and exacerbates threats to the species (USFWS 2019d).

12.1.6 USFWS and IDNR Species Records Summarization

The USFWS and the Indiana Natural Heritage Data Center include multiple records for the fanshell on the East Fork White River in the Mid-States Corridor study area. The majority of these accounts include fresh dead and a few live mussel captures from the early 1990s through 2014 between US 231 and the Williams Dam. Based on this data, USFWS identify a 129-mile reach of the White River and East Fork White River from the Wabash River confluence to Williams Dam (Lawrence County) as likely habitat for the fanshell (Appendix A Map 18). The nearest record to the Preferred Alternative 3 corridor is of a weathered dead mussel documented in 1990 approximately 2 miles upstream of the existing US 231 bridge.

12.2 Sheepnose (Endangered)

12.2.1 Range and Distribution

The sheepnose occurs within the Upper Mississippi, Lower Mississippi, Missouri, Ohio, and Tennessee basins (USFWS 2020d). Extant populations of the sheepnose are known from 14 states: Alabama, Illinois, Indiana, Iowa, Kentucky, Minnesota, Mississippi, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin (Butler 2002). The sheepnose is eliminated from two-thirds of the total number of streams where it was historically known (25 streams currently compared to 77 streams historically). In Indiana, the sheepnose occurs in the Ohio, Tippecanoe, and Eel rivers (Butler 2002) and is considered extirpated from the White River system (USFWS 2020d).

12.2.2 Population Trends

There have been no new extant populations documented since the publication of the May 2012 listing final rule, which identified 25 sheepnose populations. These 25 populations correspond to each of the 25 stream systems where the species is considered extant. Both positive and negative population trends have been documented since the species' listing. In the Allegheny, Big Sunflower, Bourbeuse, Holston, Kentucky, Licking, and Tennessee Rivers, the population trend has been moved to an unknown status due to a lack of new or sufficient information. The population status improved in the Ohio River. The Walhonding River was reclassified from unknown to stable. The Powell River's population status has been moved from stable to declining, as live specimens have become rarer and recent recruitment has not been observed. Recent recruitment was observed in the Green River, showing the stabilization of that population. The Eel River population in Indiana has continued to decline and could be extirpated (USFWS 2020d).

Recruitment has been documented within 10 of the 25 populations via the last known or recent survey efforts. These 10 populations are located within the Upper Mississippi, Tennessee, and Ohio River basins. The Lower Missouri and Lower

Mississippi river basins have not shown evidence of recent recruitment (USFWS 2020d).

12.2.3 Life Cycle

Freshwater mussels have a complicated reproductive cycle and are obligatory parasites on host fishes or amphibians (Woolnough 2006, Haag 2012). Sheepnose is a tachytictic (short-term) brooder that spawn in the spring and brood larvae from mid-May to early August of the same year (Watters et al. 2009, Hove et al. 2015). Males release sperm into the water column where it is acquired by females through their siphons during feeding and respiration. Females retain fertilized eggs in their marsupium attached to the outer gill until larvae (glochidia) fully develop (Hove et al. 2015). Upon completion of the brooding cycle, pink to red narrow oval shaped conglutinant packets (i.e., clustered glochidia) resembling small worms (Ortmann 1919) are expelled into the water column to attract host fishes. Sauger (*Sander canadensis*) is the only known host under wild conditions (Surber 1913, Wilson 1914); however, in laboratory conditions glochidia successfully develop while encysted on multiple species of minnows and topminnows (Hove et al. 2015, Watters et al. 2005, Wolf et al. 2012). Glochidia that escape predation latch onto the gills and body of the host fish, where they remain for a short period of time as encysted parasites. Following maturation on the host fish, the juvenile life stage begins when individuals detach from the host fish and settle onto/into the streambed (Watters et al. 2009). Sheepnose mussels are reported living up to 30 years (Watters et al. 2009).

12.2.4 Habitat

The sheepnose is found in large streams. Sheepnose primarily occur in shallow shoal habitats with a moderate or swift current and substrate comprised of coarse sand and gravel (USFWS 2020d). Sheepnose may also be found in substrates partially comprised of cobble and boulders. Sheepnose in larger rivers may occur at depths greater than 6 meters (USFWS 2020d).

12.2.5 Threats

The impoundment of much of the habitat within the sheepnose's historical range was likely the greatest cause of the species' decline and imperilment. Short, isolated patches of habitat remain, resulting in population fragmentation and isolation. Additional identified threats to the sheepnose include channelization, chemical contaminants, mining, sedimentation, disease, predation, inadequacy of existing regulatory mechanisms, invasive species, oil and gas development, temperature, climate change, and overutilization for commercial purposes (USFWS 2020d).

12.2.6 USFWS and IDNR Species Records Summarization

In the Mid-States Corridor study area, historic records of sheepnose are known from Lawrence, Martin, Perry, Spencer, and Warrick Counties (IDNR 2020b). The USFWS data set and the Indiana Natural Heritage Center Database collectively include only historic, subfossil, and weathered dead records (1967 through 2010) for the sheepnose on the East Fork White River in eastern Martin and western Lawrence counties. Based on this data, the USFWS have identified a 42-mile reach of the East

Fork White River from the Dubois/Martin County line to the Martin/Lawrence County Line as the only likely habitat for the sheepnose in the river (Appendix A Map 18). While there are relatively recent live and fresh dead occurrences of the species in the Ohio River, lack of similar accounts for the East Fork White River suggests that the sheepnose may no longer be extant in this aquatic system. The most recent live sheepnose was reported in 1992 by the IDNR a few miles downstream of Williams Dam.

12.3 Rough Pigtoe (Endangered)

12.3.1 Distribution

The rough pigtoe was once found from Pennsylvania south to Alabama and west to Kansas (USFWS 1984b), but extant populations are now restricted to the Clinch, Tennessee, Green, Barren, Licking, and Cumberland rivers of Alabama, Kentucky, Tennessee, and Virginia (USFWS 2021b). A single individual was captured in the East Fork White River in Martin County, Indiana in 1992, but the species has not been observed there since that time. The species is likely extirpated from Indiana (Fisher 2006).

12.3.2 Population Trends

Rough pigtoe populations continue to show declines. The species is limited to only a few small populations and shows evidence of recruitment in only the Clinch (Virginia and Tennessee) and Green (Kentucky) rivers. Since the recovery plan was prepared in 1984 (USFWS 1984b), no new populations have been discovered and there has been no indication that the species' distribution has changed substantially. Rough pigtoe populations have persisted in the Green, Clinch, and Tennessee rivers, and a small population was reintroduced into the Licking River (Kentucky). Populations have not been documented from the Barren River (Kentucky), Cumberland River (Kentucky and Tennessee), and East Fork White River (Indiana) in recent years, although this could be due to the lack of comprehensive survey efforts.

12.3.3 Life Cycle

Freshwater mussels have a complicated reproductive cycle and are obligatory parasites on host fishes or amphibians (Woolnough 2006, Haag 2012). Rough pigtoe is a tachytictic (short-term) brooder that spawns in the spring and females brood larvae until late summer of the same year (Watters et al. 2009, Lane et al. 2021, USFWS 1984b). Males release sperm into the water column that are acquired by females through their siphons during feeding and respiration. Females retain fertilized eggs in their marsupium. Frierson (1927) indicated the marsupium may occasionally occupy all four gills as opposed to other mussels whom only occupy the outer two gills. Upon completion of the brooding cycle, small irregular conglutinant packets (i.e., clustered glochidia) resembling aquatic macroinvertebrates expelled into the water column to attract host fishes (Lane et al. 2021). While native fish hosts are currently unknown, laboratory studies have yielded live juvenile rough pigtoe with spotfin shiner (*Cyprinella spiloptera*), striped shiner (*Luxilus chrysocephalus*), longnose dace (*Rhinichthys catarctae*) and the western blacknose dace (*Rhinichthys obtusus*) as hosts (Lane et al. 2021, USFWS 1984b). Glochidia that escape predation latch on to the gills

and body of the host fish, where they remain for a short period of time as encysted parasites. Following maturation on the host fish, the juvenile life stage beings when individuals detach from the host fish and settle onto/into the streambed (Watters et al. 2009). Rough pigtoe are reported living up to 30 years (Watters et al. 2009).

12.3.4 Habitat

The rough pigtoe is an inhabitant of medium to large rivers (20 m wide or greater) and prefers silt, sand and gravel substrates, particularly in shoal areas (USFWS 1984b, USFWS 2007b). The rough pigtoe does not appear to have a microhabitat preference and has been found at the substrate surface in runs leading up to glides and riffles, as well as in high flow areas buried several inches below the substrate surface (Lane et al. 2021).

12.3.5 Threats

Impoundments for flood control, navigation, hydroelectric power, and recreation are the greatest threat to the rough pigtoe due to reduced water flow, changes in temperature, and anoxic conditions (USFWS 1984b). Additionally, sedimentation results in increased turbidity, which reduces light penetration and generates suspended solids that are an irritant to mussel gills (USFWS 1984b). Additional ongoing threats to the rough pigtoe include water quality degradation from point and non-point sources, pollution (including agricultural runoff), in-stream habitat alterations, natural resource exploration and extraction, land development, disease, predation, climate change, and competition from invasive species (USFWS 2021b). The current isolation of rough pigtoe populations from one another restricts the natural interchange of genetic material between populations and exacerbates threats to the species.

12.3.6 USFWS and IDNR Species Records Summarization

The USFWS data set and the Indiana Natural Heritage Center Database collectively include weathered dead (2005, 2007, and 2010), and live mussel records (1992 and 1993) for the rough pigtoe within the East Fork White River in Martin and western Lawrence counties. The USFWS identify a 46-mile reach of the East Fork White River upstream of the Dubois/Martin County line to Williams Dam as the only likely habitat for the rough pigtoe within the Mid-States Corridor project area (Appendix A Map 18). Although the most recent live records are from the early 1990s within the upper 15 miles of this reach, the rough pigtoe is thought to possibly be extirpated in the East Fork White River.

12.4 Fat Pocketbook Mussel (Endangered)

12.4.1 Distribution

The fat pocketbook occurs in the St. Francis, Ohio, and Mississippi river drainages (USFWS 2019c). In Indiana, the fat pocketbook has been documented in the Ohio River, lower Wabash River, lower White River, and East Fork White River (USFWS 1989b). Within the Mid-States Corridor study area, historical records of the fat pocketbook are known from Dubois, Daviess, and Pike counties along the White River and East Fork White River (IDNR 2020b).

12.4.2 Population Trends

Since its listing in 1989, the fat pocketbook has shown signs of population increases and expansion in the St. Francis, Ohio, and Mississippi river drainages, mainly through the documentation of multiple new site locations. The species populations have increased from locally rare to locally common in the Ohio and Wabash rivers (USFWS 2019c). Natural recruitment and persistence have been documented within multiple stream reaches in all three drainages (USFWS 2019c).

In the St. Francis River drainage, multiple studies have documented successful recruitment via the rapid recolonization of areas following ditch cleanouts. Multiple site locations and multiple age and size classes have been documented at most sites in the St. Francis River and Ohio River drainages. Although population trends have been difficult to measure in the Lower Mississippi River, the species is short lived and its persistence for over two decades since its first documentation suggests population stability and recruitment (USFWS 2019c).

12.4.3 Life Cycle

Freshwater mussels have a complicated reproductive cycle and are obligatory parasites on host fishes or amphibians (Woolnough 2006, Haag 2012). Fat pocketbook are bradytictic (long-term) brooder that spawn in the summer and generally brood larvae until the next year (Watters et al. 2009). Males release sperm into the water column that are acquired by females through their siphons during feeding and respiration. Gravid females have been observed from June to December (Cummings and Mayer 1993). Females retain fertilized eggs in their marsupium attached to the outer gill until larvae (glochidia) fully develop (Cummings and Mayer 1993). Upon completion of the brooding cycle, white conglutinant packets (i.e., clustered glochidia) are expelled into the water column to attract the only known host species, freshwater drum (*Aplodinotus grunniens*) (Cummings and Mayer 1993, New York Department of Environmental Conservation 2013, Watters et al. 2009). Glochidia that escape predation latch on to the gills and body of the host fish, where they remain for a short period of time as encysted parasites. Following maturation on the host fish, the juvenile life stage beings when individuals detach from the host fish and settle onto/into the streambed (Watters et al. 2009). Despite their large size, fat pocketbook mussels are a short lived species, typically living less than 5 years (Watters et al. 2009).

12.4.4 Habitat

The fat pocketbook is generally confined to large rivers with flowing water ranging from a few inches to 20 feet deep over stable sand, silt, gravel, and/or clay substrates (USFWS 1989b, Lewis 2007). The fat pocketbook is typically found in sand or sandy silt (USFWS 1989b) and shows a preference for backwater habitats and other flow refugia habitats (Watters et al. 2009). Fat pocketbook can occur in relatively natural and stable streams or in highly channelized or impounded streams (USFWS 2019c).

12.4.5 Threats

The destruction and modification of historical habitats by navigation and flood control activities such as impoundment, channelization, channel maintenance, and dredging likely contributed to the decline of the fat pocketbook. There have also been concerns about impacts from siltation and pollution (USFWS 1989b).

Since the fat pocketbook recovery plan was published in 1989, impoundment and hydropower projects have been completed with minimal impact to the species. Fat pocketbook mussels have increased in abundance and range within channelized ditches affected by agricultural runoff and within navigational river channels subject to dredging, which shows resiliency to non-point source pollution and channel maintenance activities. Several studies have shown that fat pocketbook populations survive channel clean out operations and rapidly reoccupy channel habitats post-dredging. Although there have not been studies conducted on the effects of siltation on the fat pocketbook, the species' habitat preference for silty substrate suggests a level of tolerance to siltation (USFWS 2019c).

The fat pocketbook mussel is locally vulnerable to spills, illegal discharges, and other point source pollution. Runoff from the illegal discharge of glycerin on agricultural fields in 2007 killed more than 90 fat pocketbooks along 7 miles of Belle Fountain Ditch (Davidson 2007). The species' expanded range ameliorates this threat, as such events are rare and localized.

12.4.6 USFWS and IDNR Species Records Summarization

The USFWS and the Indiana Natural Heritage Data Center include scattered historic, subfossil, fresh dead, and live mussel records (1995 through 2010) for the fat pocketbook on the White River and East Fork White River from the confluence with the Wabash River to the Martin/Dubois county line. The USFWS considers an 83-mile reach from the White River confluence to near the Lost River confluence as suitable habitat for the mussel (Appendix A Map 18). Based on the presence of relatively recent fresh dead and live captures throughout this reach, the fat pocketbook is considered extant within the White River and East Fork White River. The nearest fresh dead record of the fat pocketbook on the East Fork White River is over 10 miles downstream of the US 231 Bridge.

12.5 Salamander Mussel (12 month PLPCH)

12.5.1 Range and Distribution

Salamander mussels have been observed in 14 states (Arkansas, Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Tennessee, West Virginia, and Wisconsin) and in Ontario, Canada (Roe 2003). In Indiana, the salamander mussel occurs in tributaries of the Wabash River, Tippecanoe River, Maumee River, and White River, particularly in Sugar Creek and Graham Creek. Historic records of salamander mussels are known from Martin, Crawford, Daviess, and Pike counties (IDNR 2020b).

Distribution of salamander mussels is directly related to the distribution of the mudpuppy host. According to the Indiana Herp Atlas (Indiana Herp Atlas 2022),

mudpuppies are known throughout the state in suitable stream habitats with rock slabs, logs, and undercut banks. Like the salamander mussel, mudpuppies are cryptic and rarely detected.

12.5.2 Population Trends

Population declines are indicated by intense searches in areas where the species has previously been documented (Clarke, 1985). The salamander mussel has been extirpated from the Mississippi River below St. Anthony Falls (Sietman 2003), portions of the Minnesota River drainage (Sietman 2003), Illinois (Cummings and Mayer 1997), and the Cedar and Detroit rivers in Canada (Metcalfe-Smith and Cudmore-Vokey, 2004). However, expansion of its range was documented in the upper Ohio River basin within western Pennsylvania (Bogan and Locy, 2009).

12.5.3 Life Cycle

Freshwater mussels have a complicated reproductive cycle and are obligatory parasites on host fishes or amphibians (Woolnough 2006, Haag 2012). Salamander mussel is a bradytictic (long-term) brooder that spawn in the summer and generally brood larvae until the next year (Barnhart et al. 1998, Watters et al. 2009). Males release sperm into the water column that are acquired by females through their siphons during feeding and respiration. Gravid females have been observed during the spring (Barnhart et al. 1998) and infested hosts in the fall (Howard 1951). Females retain fertilized eggs in their marsupium comprising the entire outer gills until larvae (glochidia) are ready to infect the host species (Utterback 1915). Upon completion of the brooding cycle, loose glochidia are broadcast (Watters et al. 2009) into the water column to infect the mudpuppy salamander (*Necturus maculosus*), the species' only known natural host (Howard 1951, Barnhart et al. 1998). The use of salamander as a host species is unlike all other North American freshwater mussels and is namesake for the species (Roe 2003, Watters et al. 2009, The Center for Biological Diversity 2010). Glochidia that escape predation latch on to the body and gills of the mudpuppy, where they remain for a short period of time as encysted parasites. Following maturation, the juvenile life stage begins when individuals detach from the host fish and settle onto/into the streambed (Watters et al. 2009). The salamander mussel has an estimated longevity of 10 years (Watters et al. 2009).

12.5.4 Habitat

The salamander mussel is found in medium to small swift current streams almost exclusively under large boulders or wedged between large rocks in the streambed. These are also the preferred hiding places of its host, the mudpuppy (Carman 2002, Center for Biological Diversity 2010, Roe 2003, Watters et al. 2009).

12.5.5 Threats

Like most mussels, the salamander mussel is threatened most by the effects of impoundments, siltation, mining, channel modifications, pollution, and non-native competition with the Asiatic clam and zebra mussel (Roe 2003). Because the salamander mussel is host-specific, any environmental threat to the mudpuppy is also a threat to the mussel.

12.5.6 USFWS and IDNR Species Records Summarization

The Indiana Natural Heritage Data Center includes three live or fresh dead records of the salamander mussel within the upper East Fork White River in Martin County. The USFWS considers a 78-mile reach from the White River confluence to the Williams Dam as potential suitable habitat for the mussel (Appendix A Map 18). The nearest live record for the salamander mussel is approximately 15 miles upstream of the US 231 bridge in Martin County. A single 1999 weathered dead mussel documented in Daviess County is the only record downstream of the US 231 bridge, approximately 15 miles.

12.6 Current Conditions within the East Fork White River

The confluence of the Driftwood and Flatrock rivers forms the East Fork White River. The East Fork White River starts in Columbus and flows a total of 192 miles (309 km) southwest before reaching the West Fork. The confluence of the East Fork and West Fork White Rivers forms the White River, which empties into the Wabash River. The majority of the mussel records within the East Fork White River occur downstream of the Williams Dam in the Lower East Fork White River watershed.

12.6.1 Water Conditions

The Total Maximum Daily Load Report for the Lower East Fork White River watershed (IDEM 2019) identifies several types of nonpoint sources located in the Lower East Fork White River watershed. These nonpoint sources include unregulated livestock operations, agricultural row crop land use, straight piped, leaking, or failing septic systems, wildlife, and erosion. Agricultural row crop land use, livestock operations, and erosion often coincide with elevated levels of *E. coli*, TSS, and total phosphorus. Approximately 48% of the land use in the Lower East Fork White River is agricultural. Portions of the Lower East Fork White River watershed possess elevated levels of *E. coli*, total suspended solids, and total phosphorus.

Total suspended solids can reduce plant matter available for mussel consumption by inhibiting the growth of submerged aquatic plants, reduce light penetration thereby reducing dissolved oxygen levels by impairing algal growth, and increase stream temperature. It can also impact host fish populations by impairing their ability to see and catch food, slowing their rate of growth, and preventing the development of fish eggs and larvae. Total phosphorus can cause increased turbidity by causing excessive plant production, decrease oxygen levels, and cause fluctuations in diurnal dissolved oxygen and pH levels.

12.6.2 Fish and Aquatic Macroinvertebrate Communities

Biological analysis of the East Fork White River was conducted in 2018 approximately 8 river miles upstream of the US 231 bridge at County Route (CR) 3, approximately 5.3 river miles downstream at CR 1100E, and approximately 26.5 river miles downstream at State Route (SR) 57. The three locations scored between 26 and 32 on the benthic aquatic macroinvertebrate community Index of Biotic Integrity, corresponding to poor and very poor ratings. Poor and very poor ratings are associated with the dominance of tolerance aquatic macroinvertebrate species and the rarity or absence of many

expected species. The upstream site at County Route 3 and the downstream site at SR 57 scored 16 on the Fish community Index of Biotic Integrity, corresponding to very poor ratings. Very poor ratings are associated with the dominance of tolerant species and the presence of few species and individuals. The downstream site at CR 1100E scored a 38 on the IBI, corresponding to a fair rating, which is associated with the absence of intolerant and sensitive species and a skewed trophic structure (IDEM 2019). Freshwater drum (fish host for fat pocketbook mussels), spotfin shiner (fish host for rough pigtoe mussels), and sauger (fish host for sheepnose mussels) were observed (IDEM 2019).

12.6.3 US 231 East Fork White River Bridge

The existing US 231 bridge over the East Fork White River is a 700-foot-long prestressed concrete continuous tee beam with a concrete cast-in-place deck. According to the National Bridge Inventory, the most recent bridge inspection rates the bridge's quality as good. The inspection notes that the banks and channel show minor amounts of drift and the river's embankment protection is slightly damaged. The existing bridge was constructed in 2007 approximately 200-feet downstream of a metal truss bridge built in 1934 and rehabilitated in 1985. The older truss bridge was subsequently removed.

12.7 Prior Mussel Surveys at US 231 East Fork White River Bridge

In 2001, prior to the replacement of the older US 231 bridge, a substrate and mussel investigation was conducted by McClane Environmental Service downstream of the older bridge. The study area overlaps the existing US 231 bridge. The existing US 231 bridge is located in a section of river where the observed substrates were primarily composed of unconsolidated sand with smaller amounts of cobble and slab concrete boulders.

The water depth observed during the 2001 mussel and substrate survey averaged six feet and the maximum depth was approximately 12 feet. The river was not turbid during the survey; underwater visibility was greater than three feet. Five substrate types were noted within the survey area and ranged from silt to boulders. Overall, the substrates were primarily composed of unconsolidated sand. The survey also documented an area comprised of silt, an area composed of broken slab concrete boulders and gravel, an area with a heterogeneous mixture of sand and gravel, and an area with cobble and gravel overlaid on sand.

The USFWS suggested that buried mussels not be disturbed during the 2001 survey, as field activities took place in November. No signs of significant mussel populations or areas of suitable habitat were observed within the vicinity of the existing bridge. Mussels that were completely exposed on top of the substrate were collected, identified, and returned. Only eight live mussels comprised of two species were observed within the survey area. The species observed live consisted of fragile papershell (*Potamilus fragilis*) and pink heelsplitter (*Potamilus alatus*).

12.8 Avoidance and Minimization Measures

If in-stream work is likely to impact freshwater mussel populations, a freshwater mussel salvage and relocation survey will be conducted prior to bridge construction to relocate all mussels outside of the impact area. A mussel recovery and relocation plan will be developed

in cooperation with the IDNR and the USFWS detailing the recovery parameters and identification of suitable habitat elsewhere in the East Fork White River for mussel relocation.

Potential avoidance measures include placing bridge piers away from mussel concentrations identified in the freshwater mussel survey and avoiding dredging or staging in areas with mussel concentrations. Potential minimization measures include using gabion baskets or mattresses rather than retaining walls and recreating river contours post-construction.

Additionally, to prevent/reduce deposition of solid debris into the channel and accidental discharge of contaminants such as fuel, oil, grease, or solvents, best management practices will be implemented during construction to avoid such impacts. The current US 231 bridge drainage system is currently fitted with bridge drains that discharge directly into the channel within the central span of the bridge. The drainage system for the new bridge shall be designed to capture all bridge runoff and convey it to the abutments to be discharged on the bridge approach embankments to better reduce road contaminants from being directly discharged into the channel. Similarly, the existing bridge shall be retrofitted with an enclosed drainage system to eliminate the existing free fall system that discharges directly into the river.

12.9 Mussel Effects Analysis

12.9.1 Direct Impacts

A super-2 facility type and an expressway facility type are currently being considered for the Preferred Alternative P corridor. A super-2 facility type would likely use the existing bridge rather than requiring the construction of a new bridge. Modifications to the deck may be needed, but in-channel work would likely not be required for the super-2 facility. An expressway facility would likely use the existing bridge as either the northbound or southbound bridge and a new bridge would be constructed proximate the existing bridge to carry traffic in the opposite direction. This option would potentially result in large-scale disturbance to the stream hydrology and substrate. An expressway facility would require the construction of permanent piers in the river and also require temporary causeways and caissons to facilitate construction activities. The following direct impacts focus on the expressway facility as the scope of work, as it has the greater potential to affect the freshwater mussel populations compared to the super-2 facility. None of the local improvements associated with Preferred Alternative P would impact the East Fork White River or directly affect the quality of habitat within the river.

12.9.1.1 Construction

Construction activities within the East Fork White River could result in direct take of individuals due to crushing or desiccation via equipment travel, temporary cofferdam construction, permanent bridge pier construction, and/or causeway installation and removal. Construction of a new bridge adjacent the existing US 231 bridge would likely require bank modification and stabilization as well as instream pier construction with access via temporary causeway. Due to freshwater mussels' sessile nature, all individuals within the direct instream impact area are subject to crushing.

Activity:	Bridge construction (expressway facility type only).
Stressor:	Crushing/shell damage and/or desiccation .
Species of Concern:	Fanshell, fat pocketbook, sheepnose, rough pigtoe, salamander mussel.
Temporal Exposure	During instream construction phase.
Spatial Exposure	Cofferdam areas for bridge pier construction and causeway footprint.
Response:	• Harm or mortality from being crushed or struck by material or equipment. • Harm or mortality from drying out.
AMMs and Conservation Measures:	• Harvest of mussels within construction limit footprint and relocation upstream to suitable habitat prior to initiation on instream construction activities.
Pathway:	Direct crushing or dewatering of individuals.

12.9.1.2 Sedimentation

A recent literature review focused on potential impact of sedimentation on freshwater mussels identified increased sedimentation has a significant impact on mussel populations and may be partially responsible for mussel declines (Goldsmith et al. 2021). Sedimentation can interfere with mussel filtration processes, impacting filter feeding, respiration, and fertilization. In addition to fertilization impacts, mussel life cycles can be further disrupted by sedimentation via the prevention of successful encystment of glochidia on a host, the prevention of mussel-host interactions, and impacts to host behavior and survivorship. Substrate embeddedness and physical smothering from increased sediment load on the riverbed can also have long-lasting impacts to mussel populations.

Although sedimentation has been shown to impact mussel populations in various ways, healthy populations of mussels are often found in turbid waterways. This may be explained by certain species and/or subpopulation-specific traits such as palp size, which affects particle sorting ability, that allow for persistence in waterways with high sediment loads. The fat pocketbook is often found in backwater or flow refugia habitats in sand or sandy silt. This suggests some level of tolerance to sedimentation (USFWS 2019c).

Activity:	Construction activities and facility operations (increased runoff from impervious surfaces, increased erosion from cleared riparian areas).
Stressor:	Sedimentation
Species of Concern:	Fanshell, fat pocketbook, sheepnose, rough pigtoe, salamander mussel
Temporal Exposure	During construction of new bridge and permanently.
Spatial Exposure	Impact areas and downstream of the new bridge.
Response:	• Decreased survivorship and recruitment.
AMMs and Conservation Measures:	• The use of sediment control devices during construction, such as silt fences, vegetated buffer strips, and erosion control mats, reduces the amount of pollutants from runoff entering the river.

	• The protection of erodible building materials with waterproof coverings during construction to reduce sedimentation from erosion. • Stabilization of disturbed areas following final grade to reduce pollutant runoff. • Seeding of cleared riparian areas to promote re-growth of the riparian corridor and filter roadway runoff prior to entering the river.
Pathway:	Mussel-host relationships can be compromised due to prevention of successful encystment of glochidia, decreased host visibility of mussel lures or conglutinates, and decreases in host populations. Respiration can be hampered via gill clogging. Decreased clearance rates can result in a reduction of fertilization success. Gill clogging can result in interference with filter feeding via decreased clearance rates (volume of water cleared of particles/unit time) increased energetic cost of sorting food vs. nonfood. Adult mussels can become smothered with sediment in backwater. Individuals can be prevented from burrowing due to increased substrate embeddedness.

12.9.1.3 Hydrologic Changes

Installation of a temporary causeway and new bridge piers will likely result in significant instream hydrologic changes that may result in harassment or take of freshwater mussels. Causeway construction will divert water flow to the undammed portion of the channel and/or through culverts in the causeway to maintain flow downstream of the project. Should the causeway employ culverts to maintain stream wide flows, the outfall associated with each culvert will likely create plunge pool type scour zones. These areas will experience increased flows with potential to scour and displace established freshwater mussels. Further, the scoured materials have potential to suffocate other freshwater mussels downstream. Bridge piers are notorious for creating scour holes due to increased flow velocities and created vortices (Laursen and Toch 1956). While modern engineering has reduced this effect through bridge pier footing shape, it remains.

Additionally, the causeway (temporary) and piers (permanent) will create eddy zones (i.e., slackwater and backwater) directly downstream of each structure. These areas will accumulate fine sediments capable of suffocating freshwater mussels. Further, changes in the daily microclimate flow by water volume reduces food availability proximate mussels in eddy zones.

Activity:	Installation of new bridge piers and a temporary causeway.
Stressor:	Hydrologic changes
Species of Concern:	Fanshell, fat pocketbook, sheepnose, rough pigtoe, salamander mussel
Temporal Exposure	New bridge piers (permanent); causeway (temporary).
Spatial Exposure	New bridge piers and causeway periphery.
Response:	• Decreased survivorship and recruitment. • Displacement. • Suffocation. • Starvation.

AMMs and Conservation Measures:	• Confine length of causeway to less than half the width of the channel and stage construction such that work is not being conducted on both banks at the same time. • Limiting instream causeway duration; using bridge pier footing shapes that reduce scouring. • Conduct mussel survey and relocation from an area large enough to accommodate hydrologic changes.
Pathway:	Scouring can result in displacement of individuals. Interference with filter feeding via decreased clearance rates (volume of water cleared of particles/unit time) can result in gill clogging and increased energetic cost of sorting food vs. nonfood. Adult mussels can become smothered with sediment in backwater. Individuals can be prevented from burrowing due to increased substrate embeddedness.

12.9.1.4 Water Quality Degradation from Hazardous Material Spills on Highway

The construction and maintenance of the new bridge has the potential to cause polluted runoff to enter the East Fork White River. Oils, heavy metals, and other toxic substances could be absorbed by the soil in the construction area during construction activities and carried via runoff into the river. The operation and maintenance of the new bridge could also result in contaminated runoff entering the river. Common contaminants in roadway runoff include heavy metals, inorganic salts, and aromatic hydrocarbons (Jongedyk and Bank 2016). Salting and sanding of the roadway may leave concentrations of chloride, sodium, and calcium on the roadway surface. Vehicles drop oil, grease, rust, heavy metals, rubber particles, and other solid materials on the roadway surface which can be washed into the river during rain or snow events.

Polycyclic aromatic hydrocarbons and several metals (copper, lead, platinum, and paladium) have been observed in higher concentrations in mussels downstream from road crossings (Levine et al. 2005). Elevated chloride, which is present in salt-laden winter roadway runoff, can be acutely toxic to glochidia. Potassium, ammonia, and zinc have also been observed in roadway runoff at levels that can be toxic to glochidia (Gillis et al. 2022). In high enough concentrations, contaminants in construction and/or roadway runoff can contribute to the decreased survivorship and recruitment of freshwater mussels.

Activity:	Runoff from construction activities and facility operations
Stressor:	Pollutants entering the river
Species of Concern:	Fanshell, fat pocketbook, sheepnose, rough pigtoe, salamander mussel
Temporal Exposure	During construction of new bridge and permanent operation post-construction.
Spatial Exposure	Impact areas and downstream of the new bridge.
Response:	• Decreased survivorship and recruitment.

AMMs and Conservation Measures:	• The use of sediment control devices during construction, such as silt fences, vegetated buffer strips, and erosion control mats, reduces the amount of pollutants from runoff entering the river. • Stabilization of disturbed areas following final grade to reduce pollutant runoff. • Seeding of cleared riparian areas to promote re-growth of the riparian corridor and filter roadway runoff prior to entering the river. • Bridge drainage systems will be designed to prevent runoff from being deposited directly into streams crossed from deck drains. All roadway runoff will be captured and discharged onto the floodplain to allow for filtering of roadway contaminants.
Pathway:	Intake of pollutants from contaminated runoff during filtering processes can disrupt feeding and respiration.

12.9.2 Indirect and Cumulative Impacts

Indirect effects are effects that will result from the proposed action later in time that are reasonably certain to occur. The proposed project will provide improved access within the project area, including the landscape surrounding the East Fork White River, which may eventually result in a change in land use. Increased urbanization results in more impervious surfaces, leading to increased sedimentation and contamination from runoff into nearby waterways. These developments could potentially have similar effects to those described for construction and operation of the highway but would occur elsewhere beyond the US 231 crossing. Nonetheless, there are no anticipated induced growth areas associated with the Preferred Alternative P corridor or the US 231 local improvement segments that are expected to result in notable land use changes within the immediate vicinity of the East Fork White River.

An increase in bridge traffic also increases the potential for contaminated runoff into the river. Such degradation of water quality could indirectly and negatively impact freshwater mussel populations.

13 Lake Sturgeon (12 month PLPCH)

13.1 Range and Distribution

The lake sturgeon range includes the Laurentian Great Lakes (Lake Michigan, Huron, Erie, Superior, and Ontario), Hudson Bay drainage, and the Mississippi River drainage (specifically the Upper and Lower Mississippi River, Missouri River, Ohio River, Arkansas-White River, and Coosa River basins) (Houston 1987). Within the Ohio River basin, the species once occurred within the Ohio, Allegheny, Scioto, Wabash, White, Cumberland, and Tennessee rivers. Although stocking of lake sturgeon in the Cumberland and Tennessee rivers has been attempted, currently the only naturally reproducing population in the entire Ohio River basin is within the East Fork White River in Martin and Lawrence counties of Indiana, within the Mid-States Corridor study area.

The IDNR (Natural Heritage Data Center GIS data) identifies approximately 41 miles of the East Fork White River downstream of Williams Dam in Lawrence County as the known habitat range of the lake sturgeon. Although the downstream extent of this reach is approximately 8

miles upstream of the existing US 231 bridge, IDNR have on occasion tracked tagged individuals as far downstream as the US 231 bridge (Brant Fisher personal communication).

Genetic studies conducted by Purdue University on the East Fork White River lake sturgeon fish revealed that this population is distinct from all other extant populations in the Great Lakes region and the Mississippi River basin (IDNR 2009, Center for Biological Diversity 2018).

13.2 Population Trends

As a result of various pressures for the lake sturgeon, most notably commercial harvest, populations are thought to be approximately 1 percent of the numbers from the mid-1800's (Tody 1974). Minimum requirements for a self-sustaining spawning population are undefined and likely vary between different river and lake systems (Galarowicz 2003).

Population estimates for the East Fork White River are not available; however, since the IDNR Wildlife Diversity Section first began monitoring the lake sturgeon population in the East Fork White River in 1996, over 100 fish have been captured and PIT (passive integrated transponders) tagged (IDNR 2011). Lake sturgeon captured through this continuous annual monitoring program have yielded fish with weights ranging from four to more than 100 pounds, suggesting that a sustainable population consisting of new recruits and older adults is present. In 2013, the IDNR documented the capture of a lake sturgeon that was first captured and tagged 17 years earlier (IDNR 2013).

13.3 Life Cycle

The lake sturgeon is a long lived, late maturing, potamodromous (freshwater migratory) fish that exhibits spawning migrations and has strong natal site affinity (Boiko 1993, Ontario Ministry of Natural Resources 2011). Spawning migrations in excess of 270 miles have been documented (Auer 1999). However, for the East Fork White River population, spawning migration distances are believed to be considerably less. Spawning sites are in the upper reaches of large river systems and feature fast currents and cobble/boulder substrates (Kerr et al. 2011). Spawning sites are often at the base of waterfalls or anthropogenic dams (a notable threat to the species) that prevent continued upstream movement (Kerr et al. 2011). Spawning takes place in rocky substrates with interstitial spaces (Bruch and Binkowski 2002) and oxygenated water. Eggs drift downstream where they adhere to rocks and various other surfaces within the flowing water in the absence of parental care (Kempinger 1988). Hatching success is considered low at less than 1 percent (Kempinger 1988). Egg predation (crayfish, mudpuppies, redhorse, common carp and other lake sturgeon), sediment cover, water level changes, and disease are largely responsible for egg mortality (Kempinger 1988).

Since 2002, the IDNR Wildlife Diversity Section have placed radio tags on several lake sturgeon to track their seasonal movements within the East Fork White River from spawning areas downstream of Williams Dam to summer and winter habitats further downstream. Lake sturgeon spawning along a rocky shoreline in the East Fork White River below Williams Dam was first documented by the IDNR in April 2005 (IDNR, 2005). They typically begin spring migration to spawning areas in mid-April when water temperatures are around 50°F. Subsequently, spawning takes place as water temperatures approach 60°F. Male maturity is from 15 to 20 years of age (Center for Biological Diversity 2018). Female sexual maturity is not typically achieved until 24 to 26 years of age and females only spawn every four to six years (Priegel and Wirth 1974). In 2014, the IDNR noted that one of six lake sturgeons with a radio

transmitter did not migrate upstream to Williams Dam, but remained downstream of Shoals that year, although it had been tracked to Williams Dam the previous year (IDNR 2014).

During the summer, following spawning, the fish move back downstream where they spend much of the time in primary deep reaches of the East Fork White River. As water temperatures drop in the winter, they move into secondary deeper reaches (IDNR 2010).

13.4 Habitat

The lake sturgeon is a large benthic (stream bottom) that occurs in large streams/rivers and lakes associated with a variety of substrates from mud and clay to sand and gravel in 16-30 feet of water (Page et al. 2011).

13.5 Diet

The lake sturgeon is an opportunistic predator specialized for benthic prey (e.g., mollusks, crayfish, dipterans, snails, ephemeropterans, tricopterans, neuropterans, nematodes, leeches, fish eggs, amphipods, decapods, and zebra mussels), but seldom other fish (Harkness 1923, Hay-Chmielewski 1987, Houston 1987, Choudhury et al. 1996, Kempinger 1996, Chiasson et al. 1997, Beamish et al. 1998, Jackson et al. 2002).The lake sturgeon is a host for glochidia parasites from many mussel species (prey items), including the endangered hickorynut mussel (*Obovaria olivaria*).

13.6 Threats

The late maturing and reproductive behavior of the lake sturgeon (i.e., adult females do not spawn every year) can hamper the species ability to maintain sustainable populations. Overharvesting of the lake sturgeon in the mid to late 1800's was primarily responsible for the large-scale decline of the species. Commercial fishing for lake sturgeon was terminated in 1977 (Hay-Chmielewski and Whelan 1997).

Today there are a number of additional stressors that also potentially affect the species ability to maintain sustainable populations range-wide. Barriers such as flood control and hydroelectric dams pose one of the more significant threats by blocking passage to potential spawning areas, increased siltation, altering flow regimes and thermal properties of the water, and water quality degradation (Auer 1996 and Auer and Baker 2002). Other detrimental effects are caused through point source and non-point source pollution/contamination, dredging/channelization, parasites (trematodes, acanthocephalan, nematodes, cestodes, and coelenterates), and predation upon eggs and larval sturgeon by crayfish, mudpuppies and fish.

The decommissioned Williams Dam hydropower structure continues to impede lake sturgeon movements further upstream in the East Fork White River for spawning. Therefore, lake sturgeon spawning is confined to the limited available habitat immediately downstream of the dam.

13.7 IDNR Species Records Summarization

As previously noted, the IDNR Natural Heritage Data Center GIS data set identifies a 41-mile reach of the East Fork White River downstream of Williams Dam as known habitat for the lake sturgeon in southern Indiana (Appendix A Map 19). Records elsewhere in Indiana are limited to 19th and early 20th century historic accounts on the Ohio and Wabash River, and from more recent accounts on Lake Michigan, Lake Wawasee, and South Pine Lake in northern Indiana.

13.8 Avoidance and Minimization Measures

Based on the Tier 1 expressway facility type assumption, the principal threat to the lake sturgeon from this action is hindrance of fish passage within the river upstream and downstream of the bridge during and after construction. To avoid such an impediment, the bridge design will include piers that allow for free passage throughout the channel upon completion. During construction, it is anticipated that temporary causeways and cofferdams will be required to install piers for a new bridge across the East Fork White River. During Tier 2, unique special provisions (USPs) and project commitments will be developed to ensure that causeways are designed to allow for unencumbered fish passage within the channel throughout construction.

Additionally, to prevent/reduce deposition of solid debris into the channel and accidental discharge of contaminants such as fuel, oil, grease, or solvents, best management practices will be implemented during construction to avoid such impacts. The current US 231 bridge drainage system is currently fitted with bridge drains that discharge directly into the channel within the central span of the bridge. The drainage system for the new bridge shall be designed to capture all bridge runoff and convey it to the abutments to be discharged on the bridge approach embankments to better reduce road contaminants from being directly discharged into the channel. Similarly, the existing bridge shall be retrofitted with an enclosed drainage system to eliminate the existing free fall system.

13.9 Lake Sturgeon Effects Analysis

13.9.1 Direct Impacts

A super-2 facility type and an expressway facility type are currently being considered for the Preferred Alternative P corridor. A super-2 facility type would likely use the existing bridge rather than requiring the construction of a new bridge. Modifications to the deck may be needed, but in-channel work would likely not be required for the super-2 facility. An expressway facility would likely use the existing bridge as either the northbound or southbound bridge and a new bridge would be constructed proximate the existing bridge to carry traffic in the opposite direction. This option would potentially result in large-scale disturbance to the stream hydrology and substrate. An expressway facility would require the construction of permanent piers in the river and also require temporary causeways and caissons to facilitate construction activities. The following direct impacts focus on the expressway facility as the scope of work, as it has the greater potential to affect the lake sturgeon compared to the super-2 facility. None of the local improvements associated with Preferred Alternative P would impact the East Fork White River or directly affect the quality of habitat within the river.

13.9.1.1 Bridge Construction

The lake sturgeon typically does not occur downstream of the US 231 bridge in the East Fork White River; however, IDNR have previously tracked tagged individuals this low in the drainage (per comm. Brant Fisher). While the lake sturgeon does experience a seasonal migration upstream to just below the Williams Dam for spawning, their presence within the entire inhabited reach of the river is possible throughout the year. In some instances, non-breeding fish do not make the migration

pilgrimage upstream to spawning grounds and can therefore be encountered anywhere within the downstream reach of the river, even during the spawning season.

Construction activities within the East Fork White River could result in direct take of individual lake sturgeons resulting from blunt force trauma during installation and removal of temporary causeways and cofferdams. Construction of a new bridge adjacent to the existing US 231 bridge would likely require bank modification and stabilization through riprap installation below the waterline, which also has the potential for direct take through impact trauma. Additionally, incidental falling debris from bridge deck construction into the channel has the potential for individual lake sturgeon take.

Activity:	Bridge construction (expressway facility type only)
Stressor:	Blunt force trauma.
Temporal Exposure	Throughout bridge construction phase.
Spatial Exposure	Causeway and cofferdam footprint area required for bridge pier and deck construction.
Response:	• Injury or death from being crushed or struck by material or equipment.
AMMs and Conservation Measures:	• No specific AMMs to exclude lake sturgeon from the new bridge construction area at existing US 231 have been developed at the Tier 1 phase of the project.
Pathway:	In-stream construction activities for permanent (piers) or temporary (causeways or cofferdams) has the potential to result in injury or death to individual fish inhabiting the site.

13.9.1.2 Fish Passage Impediment

As noted in Section 13.8.1.1, lake sturgeon typically are not as common at and downstream of the US 231 bridge, but have on occasion been observed in the lower reaches of the East Fork White River. As with permanent structures like Williams Dam, temporary causeway structures for bridge construction can prevent fish from free movement upstream and downstream of the obstacle during prolonged construction periods. While causeways are typically equipped with flow-through pipes to allow for low-flow water movement through the structure, lake sturgeon may be reluctant/hesitant to use such structures for upstream/downstream passage. A permanent low dam structure across the East Fork White River channel is not anticipated as part of the new bridge construction design.

Activity:	Bridge construction with causeway (expressway facility type only)
Stressor:	Physical barrier to fish passage upstream and downstream of US 231.
Temporal Exposure	Throughout bridge construction phase.
Spatial Exposure	Entire inhabited reach of East Fork White River
Response:	• Potential loss of individual fish access to spawning habitat. • Potential access loss to feeding habitat downstream of US 231. • Potential access loss to wintering habitat downstream of US 231.

AMMs and Conservation Measures:	• Causeways for pier construction shall be designed such that they do not span the entire channel at any given time and shall allow for sufficient low water conditions of sufficient depth along the East Fork White River for lake sturgeon passage.
Pathway:	Impediments to free passage of lake sturgeon upstream and downstream of the bridge construction area due to poorly designed causeways and lack of deep low flow channels can hamper/prevent access to stream reaches throughout the annual life cycle of the lake sturgeon.

13.9.2 Indirect and Cumulative Impacts

Indirect impacts to the lake sturgeon from the proposed construction of Preferred Alternative P and the proposed local improvements are considered to be negligible since there is no anticipated induced development resulting from the project proximal to the East Fork White River.

14 Monarch Butterfly (Candidate)

14.1 Range and Distribution

Monarch butterflies can be found from Argentina to Canada with introduced populations occurring in several other parts of the world, including Hawaii (USFWS 2020c). Three monarch butterfly populations occur in the continental United States. A non-migratory population resides in southern Florida, while two other populations (eastern and western) are separated by the Rocky Mountains and migrate annually between over-wintering and breeding habitats. Indiana is summer host to the eastern North American population of monarchs.

14.2 Population Trends

The eastern population of monarchs is the largest migratory population in the world and requires three generations to complete migration from overwintering habitat in a specific region of central Mexico to breeding habitat across the U.S. and southern Canada and back (Jepsen et al. 2015). Formal estimates of the eastern monarch population began in 1994 and are completed by measuring the size of the area occupied each winter (USFWS 2020c). Historic populations contained tens of millions of butterflies occupying up to 44.9 acres (18.2 ha) of wintering habitat (USFWS 2020c).
Annual estimates are reported by Monarch Watch (https://monarchwatch.org/blog/; accessed 6 May 2022) and eastern monarch population trends are as follows since 2018:

- 2018/2019 – 15.1 acres (6.1 ha)
- 2019/2020 – 6.9 acres (2.8 ha)
- 2020/2021 – 5.2 acres (2.1 ha)
- 2021/2022 – 2.5 acres (1.0 ha)

The western monarch population is smaller and migrates a shorter distance between summering ground along and west of the Rocky Mountains and overwintering groves along the California Coast. Population estimates have been ongoing since 1997 with historic populations estimated at more than 1.2 million butterflies (USFWS 2020c).

The western monarch population in California is estimated each year during the Thanksgiving and the New Year holidays by the Xerces Society for Invertebrate Conservation's Western Monarch Count (available at https://www.westernmonarchcount.org/data/; accessed 6 May

2022). The number of individuals has declined dramatically since counts started in 1997 (USFWS 2020c). While numbers remained relatively low over the last 15 years, the most recent survey indicated a substantial increase from the prior year (2020/2021):

- 2018/2019 – 16,063 to 25,253 individuals
- 2019/2020 – 11,970 to 21,944 individuals
- 2020/2021 – 1,039 to 1,642 individuals
- 2021/2022 – 150,423 to 241,417 individuals

Despite a general population increase for the last year suggested by western monarch population counts, interannual stochasticity likely masks overall decreases evident in the species as reported previously (Brower et al. 2012, Semmens et al. 2016, Schultz et al. 2017) and dating back as far as the mid-1970s (Zlystra et al. 2020).

14.3 Life Cycle

Female monarchs likely lay between 300 and 400 eggs over their lifetime (CEC 2008). Eggs are laid on or near leaves of their host plant, milkweed (Asclepias sp.). Larvae emerge after 3 to 5 days and subsequently undergo five instars (molts) over the course of 10 to 14 days where they feed on the leaves of milkweed (Jepsen et al. 2015). The larva then pupates into a bright light green chrysalis with black and gold ornamentation, before emerging 9 to 14 days later as an adult butterfly (Jepsen et al. 2015). Patches of milkweed throughout North America are likely to be used by breeding or migrating monarch butterflies when present. There are multiple generations of monarchs produced during the breeding season. Individuals in the summer generation live approximately 2 to 5 weeks while later generation adults migrate to an overwintering site in central Mexico, undergo reproductive diapause, and can live 7 to 9 months (CEC 2008, Jepsen et al. 2015, USFWS 2020c).

14.4 Habitat

Summer breeding habitat is associated with the range of milkweeds, the host plant monarch butterflies are dependent upon for egg incubation and as a larval food source (Jepsen et al. 2015). As an adult, monarch butterflies can forage on milkweeds and any other nectar-producing flower; making monarch butterflies both specialist (via reproductive host plant) and generalist (via foraging tendencies on many flower species) pollinators (Jepsen et al. 2015).

Monarchs are associated with open lands, including meadows, native prairie patches, roadsides, woodland clearings, early successional woody habitat, utility corridors, and grassland/shrublands, where host and nectar plants are commonly found. In support of monarchs, efforts to improve habitat include creating and maintaining forest openings, travel corridors, and pollinator plantings that contain both milkweeds and nectaring plants; management and restoration of Rights-of-Way to provide suitable habitat; and design of seed mixes containing milkweed and nectar-producing species for use in revegetating and rehabilitating disturbed areas.

A crucial conservation feature for North American populations is overwintering habitats. These habitats include coastal California conifer/eucalyptus groves for the western monarch population and high-altitude Mexican conifer forests for the eastern monarch population (Vidal and Rendón-Salinas 2014, Fisher et al. 2018). Proactive management of roadside corridors, rights-of-way, silvicultural management, prescribed fire, open grassland/shrublands,

and trails to including a seed mix and plant selection with a variety of milkweed and flowering nectar-producing plants can provide suitable habitat.

Unlisted species do not have ESA protections thus critical habitat has not been designated for the monarch butterfly, but a critical habitat designation should be expected assuming the species becomes listed.

14.5 Threats

Monarch butterflies have experienced mass declines in populations over the past two decades. Two contending hypotheses have been posited to explain substantial population declines in monarch butterflies, including (1) reduced availability of the obligate larval host (milkweed; the "milkweed limitation hypothesis") across the U.S. due to wide-spread adoption of herbicide in industrial agriculture, and (2) substantial declines in the number of individuals due to mortality during annual migrations (the "migration mortality hypothesis"). Taylor et al. (2020) conducted a study using data from tagged individuals collected 1998 to 2015 to discern which of these two hypotheses better explained decline in the species. Their study suggested a greater role of availability of milkweed and nectar resources rather than mortality during migration events. The substantial importance of the Midwest for the overwintering monarch population (Flockhart et al. 2015) coupled with the continued milkweed decline (Pleasants 2017) have played as an important contributor to declines in the species. Reduction in milkweed, is directly linked to increased usage of glyphosate-based herbicides (i.e., Roundup®) on corn and soybean crops in the Midwest over the past 25+ years (Pleasants and Oberhauser 2013, Jepsen et al. 2015). This family of herbicides is also widely used for vegetation management (including along rights-of-way) and may travel outside spray zones through aerial drift (Cederlund 2017) or as run-off (Saunders and Pezeshki 2015), thus contributing to widespread declines in floral abundance, including milkweed.

Other factors contributing to the decline of butterfly species include the use of neonicotinoid insecticides for the control of insect pests on crops (Gilburn et al. 2015). Plants grown from seeds treated with neonicotinoids maintain the toxin systemically throughout their lifespan and can poison insects feeding on plants, including monarchs (Simon-Delso et al. 2015). Conversion of grasslands to corn crops to meet an increasing demand for ethanol has also been cited as a contributing factor to the loss of monarch butterfly milkweed habitat (USFWS 2020c). Similarly, overwintering habitat in Mexico has been lost due to logging (Brower et al. 2016) despite protections in the Monarch Butterfly Biosphere Reserve (Ramírez et al. 2015) and extreme weather events (in summer and overwintering habitat) associated with climate change (USFWS 2020c).

14.6 USFWS and IDNR Species Records Summarization

The Indiana Natural Heritage Data Center does not currently track records for the monarch butterfly. Similarly, the USFWS has not provided any specific distribution or abundance data for the species since it is not yet listed under the Endangered Species Act. Because its distribution is generally synonymous with the range of the common milkweed, habitat is expected to occur throughout the Mid-States Corridor study area because milkweeds and other flowering species are ubiquitous along rights-of-way, as well as other natural and disturbed habitats. Available citizen science datasets (e.g., iNaturalist, [https://www.inaturalist.org], Monarch Larvae Monitoring Program

[https://www.monarchjointventure.org/mlmp], Journey North [https://www.journeynorth.org], etc.) indicate both monarchs and milkweeds are present throughout the Mid-States Corridor study area.

14.7 Avoidance and Minimization Measures

Construction and operation of the Mid-States Corridor will follow avoidance and minimization measures described in the INDOT Candidate Conservation Agreement with Assurances (CCAA) for the monarch butterfly. Additionally, INDOT will prepare a pollinator habitat development plan which targets specific areas along the new roadway for seeding of native nectar wildflowers, particularly milkweeds. The details of the pollinator habitat development plan will be address during Tier 2 of the consultation process.

14.8 Habitat Loss Conservation Measures

14.8.1 Habitat Restoration

Restoration of the Mid-States Corridor right-of-way can increase available foraging and host plant habitat for adults and larvae across the entire length of the corridor. Earlier work has demonstrated the value of roadsides as breeding habitat for monarch butterflies (Kasten et al. 2016), and while per-plant use is generally lower compared to other habitats, in the absence of suitable host plant habitat (e.g., proximate forests or agriculture), roadsides may provide the only host plant habitat for monarchs in some areas on the landscape. Roadsides can also serve as corridors that provide monarchs with a way to access other habitat patches. Phillips et al. (2020) reviewed 140 studies associated with pollinators and roadways and found benefits of vegetation proximate to roadways for pollinators far outweighs their costs.

Habitat restoration within the Mid-States Corridor right-of-way can increase available nectar-producing pollinator vegetation and host plant habitat (i.e., milkweed) for egg-laying adults, developing larvae, and foraging adults. In turn, this can translate into local population increases and provide a corridor linking otherwise isolated patches of suitable habitat. Depending on the extent of right-of-way restoration development for the Mid-States Corridor, restoration focusing on milkweed establishment may more than offset the loss of existing suitable habitat along the corridor and benefit future generations from increased recruitment.

14.9 Monarch Butterfly Effects Analysis

14.9.1 Directs Impacts

14.9.1.1 Facility Construction

Construction of the Mid-States Corridor right-of-way can lead to destruction of milkweed essential for egg-laying adults and dependent larvae, and of suitable foraging habitat where nectar-producing floral species are removed/destroyed. The impact would be temporary and likely affect a few generations between the time vegetation is removed/destroyed and the right-of-way is revegetated.

Activity:	Construction
Stressor:	Reduced host plant (i.e., milkweed) habitat available to egg-laying adults and developing larvae.
Temporal Exposure	Clearing of vegetation within the right-of-way precludes available host plant for adults and foraging opportunities for adults and larvae until the right-of-way is revegetated.
Spatial Exposure	Entire length of new highway facility.
Response:	• Exclusion of opportunity for egg-laying and foraging. • Death to larvae and chrysalides on milkweed cleared from right-of-way for construction.
AMMs and Conservation Measures:	• Restricting right-of-way vegetation clearing to months when individuals are not present (esp., late summer through early spring) can reduce direct impacts to larvae feeding on milkweed and chrysalides attached to milkweed within the right-of-way. • Protection of patches of milkweed observed within the workspace when monarchs are present can provide feeding and breeding habitat.
Pathway:	• Destruction of vegetation within the right-of-way can preclude availability of milkweed essential for egg-laying adults causing stress and potential mortality of those adults required to seek availability of milkweed elsewhere. • Destruction of milkweed within the right-of-way can lead to death of individuals (i.e., larvae and chrysalides) present on available milkweed.

14.9.1.2 Facility Operation and Maintenance

Operation of the Mid-States Corridor can adversely impact individuals foraging proximate the right-of-way through direct collision or turbulence from passing traffic. Extrapolating from mortality observed during a preliminary study resulted in a state-wide mortality estimate of 500,000+ monarch butterflies killed in one week in September on the roads in Illinois (McKenna et al. 2001). Even given the limited nature of the study and the difficulty collecting mortality data on active roadways, monarchs are clearly at risk of vehicle strikes.

Activity:	Highway traffic and maintenance of the road.
Stressor:	Vehicle collisions. Destruction of quality pollinator habitat established along right-of-way from routine road maintenance (mowing, herbicide application, road salting). Loss of quality pollinator habitat from future road repairs/upgrades.
Temporal Exposure	Potential for collisions and losses during maintenance throughout perpetuity.
Spatial Exposure	Entire length of new highway facility.
Response:	• Death/injury to individuals.
AMMs and Conservation Measures:	• Mowed buffer between selective/natural zones (i.e., areas maintained for native vegetation per INDOT Integrated Vegetation

	Management) and roadway edge can limit fatal collisions with traffic or injury from wake turbulence by passing vehicles. • Selective use of herbicides and mowing to maintain the type of weedy vegetation that provides high quality monarch habitat. • Schedule maintenance activities to avoid direct take of individuals during specific life stages.
Pathway:	• Right-of-way has the potential to support pollinator habitat (namely milkweeds and other nectar-producing floral species) that attract monarch butterflies to this roadside habitat. Butterfly movements back-and-forth across the highway place individuals at risk for collisions or injury from wake turbulence by passing vehicles. • Maintenance of non-paved portions of the right-of-way is likely to produce weedy habitat that is ideal for monarchs.

14.9.2 Monarch Butterfly Indirect and Cumulative Impacts

Indirect impacts to the monarch butterfly are largely unclear based on Tier 1 designs; however, in areas where the Mid-States Corridor increases traffic efficiency, potential for economic growth can lead to further decreases in potential foraging and breeding habitat as natural areas near the highway are lost to development. Cumulative effects associated with the Mid-States Corridor remain unclear at the current level of analysis.

15 Determination of Effect

A **No Effect** determination is appropriate when the action will not affect the species. A **May Effect, Not Likely to Adversely Affect** determination is appropriate when effects on the species are expected to be insignificant, discountable, or beneficial. Insignificant effects relate to the size of the impact and never reach the scale of a take. Discountable effects are those extremely unlikely to occur. Beneficial effects are contemporaneous positive effects without any adverse effects. A **May Affect, Likely to Adversely Affect** determination is appropriate if any adverse effect may occur on the listed species as a direct or indirect result of the proposed action or its interrelated or interdependent actions. The following determinations of effect focus on the scope of work associated with an expressway facility type, since this facility type is expected to have the greatest impact to listed and proposed listed species compared to the Super-2 facility.

15.1 Endangered Species Act Listed Species for Biological Opinion

15.1.1 Indiana bat

Spring, summer, and fall habitat for the Indiana bat consists largely of riparian, bottomland, and upland forested areas within which maternity colonies are found in dead trees with cavities and/or exfoliating bark or living trees with shaggy bark, and stream corridors are frequently used for foraging. However, man-made structures such as bridges and buildings are sometimes used for roosting and even as maternity colony sites.

Existing USFWS and IDNR occurrence data lack Indiana bat capture and roost records for Dubois County and much of Daviess and Martin counties, with the exception of Crane NSA and the portions of Daviess and Greene counties at the north end of the Alternative P corridor where I-69 surveys were previously conducted. However,

despite the lack of occurrence data, the Tier 1 forest analysis shows that approximately 27 to 31 percent of the Alternative P corridors is forestland. A Tier 1 review of forestland, floodplain, and wetland resources supports the conclusion that Indiana bat habitat is likely present throughout multiple watersheds traversed by the Alternative P corridor and that impacts to such habitat is unavoidable in all instances. Furthermore, the Tier 1 landscape analysis estimates that as many as ten 2.5-mile radius potential maternity colonies could be located throughout the 54 to 55 mile long Alternative P corridor. It is unlikely that each of these potential locations represent occupied Indiana bat maternity colonies, yet there are no means by which to predict the possible number and location at the Tier 1 phase of the Mid-States Corridor project. Extensive bat survey studies for the I-69 project from I-64 at Evansville to I-465 at Indianapolis ultimately yielded 16 different Indiana bat maternity colonies for approximately 142 miles of interstate through terrain and forest habitat similar to that for the Mid-States Corridor project. Assuming a similar spatial layout of one colony every 9 miles, it is predicted that the 55 miles of the Mid-States Corridor has the capacity to support as many as six maternity colonies. Maternity colony population sizes vary, but the USFWS INFO generally use an average size of 80 reproductive females per colony.

All of the known Indiana bat hibernacula in proximity to the Mid-States Corridor project area are within southern Greene County and to a lesser extent eastern Martin County, Lawrence and Orange counties. The Alternative P Corridor does not encroach upon any of the 10-mile or 5-mile fall swarming buffers for these hibernacula cave resources. Therefore, pending discovery of previously unknown hibernacula within close proximity to the Alternative P alignment during Tier 2 studies, the Tier 1 analysis concludes that adverse impacts to Indiana bat hibernacula and associated fall swarming habitat is not likely.

Based on the presumed summer presence of the Indiana bat and the prediction that as many as six maternity colonies are possible within the Mid-States Corridor project area, the Tier 1 recommended determination of effect for the Indiana bat is **May Affect, Likely to Adversely Affect**.

15.1.2 Northern long-eared bat

Spring, summer, and fall habitat for the northern long-eared bat is similar to that for the Indiana bat, forest habitat with available water resources. Similarly, northern long-eared bats may use man-made structures (buildings, barns, sheds, cabins, under eaves of buildings, behind window shutters, and bat houses) and bridges for roosting.

Existing USFWS and IDNR occurrence data lack northern long-eared bat capture and roost records for Dubois County and much of Daviess and Martin counties, with the exception of Crane NSA and the portions of Daviess and Greene counties at the north end of the Alternative P corridor where I-69 surveys were previously conducted. The Tier 1 forest analysis shows that approximately 27 to 31 percent of the Alternative P corridors is forestland, portions of which consist of habitat likely suitable for the northern long-eared bat.

The Tier 1 landscape analysis estimates that as many as fourteen 1.5-mile radius potential maternity colonies could be located throughout the 54 to 55 mile long

Alternative P corridor. It is unlikely that each of these potential locations represent occupied northern long-eared bat maternity colonies, yet in the absence of data related to colony spacing, there are no means by which to predict the possible number and location of maternity colonies at the Tier 1 phase of the Mid-States Corridor project. Northern long-eared bat declines are primarily related to WNS and wind energy mortality, and to a lesser extent habitat loss and climate change (USFWS 2022f, 2022g). Since the number of northern long-eared bat summer colonies is predicted to decrease due to the projected decline in the spatial extent of the species (USFWS 2022f, 2022g), it is anticipated that the number of potential maternity colonies within the Mid-States Corridor project area is, and will continue to be considerably fewer than pre-WNS conditions. Nationwide from 2010 – 2019, summer occupancy has declined 80 percent with Midwest declines estimated at 91 percent (USFWS 2022f, 2022g). In the Midwest, winter abundance has declined by 24 percent and the number of sites has declined by 70 percent. Finally, current condition modeling of the percent decline in occupancy for the Midwest (including Indiana) is at or approaching 100 percent, while the probability of occupancy is predicted at or a little above 0 percent (USFWS 2022f, 2022g). Based on these decline estimations, it is presumed that of the fourteen potential maternity colony locations identified for the Mid-States Corridor project, that only one or two represent probable northern long-eared bat colonies. Northern long-eared bat maternity colony population sizes have been reported to range from 30 to 60 females and young, and rarely exceed 100 (USFWS 2022f, 2022g). Using the high end of this colony range, the disruption/loss of two maternity colonies by Alternative P encroachment has the potential to affect as many as 120 bats annually.

All of the known northern long-eared bat hibernacula in proximity to the Mid-States Corridor project area are within southern Greene County and to a lesser extent eastern Martin County, and Lawrence County. The Alternative P Corridor does not encroach upon any of the 5-mile fall swarming buffers for these hibernacula cave resources. Therefore, pending discovery of previously unknown hibernacula within close proximity to the Alternative P alignment during Tier 2 studies, the Tier 1 analysis concludes that adverse impacts to northern long-eared bat hibernacula and associated fall swarming habitat is not likely.

Based on the presumed summer presence of the northern long-eared bat and the prediction that as many as two maternity colonies are possible within the Mid-States Corridor project area, the Tier 1 recommended determination of effect for the northern long-eared bat is **May affect, likely to adversely affect.**

15.1.3 Gray bat

Gray bats use caves or cave-like structures (mines, tunnels, cisterns, storm sewers) year round, although different caves are used for winter hibernation and summer roosting.

Existing USFWS and IDNR occurrence data includes only a few gray bat capture records (Spencer County) within the Mid-States Corridor project area; however, there are multiple acoustic records of the species from southern Dubois County (within the action area), southeast Greene County, and eastern Martin County. The nearest

documented cave for gray bats (historic record) is located in Lawrence County greater than 20 miles from the Alternative P Corridor. While the presence of the gray bat within the Mid-States Corridor project area is not discounted, any such occurrences are attributed to foraging activities from summer occupancy locations (caves) at greater distances from project area. Although the loss/disruption of riparian forest habitat from Alternative P has a low potential to affect gray bat foraging activities the Tier 1 recommended determination of effect for the gray bat is **May affect, not likely to adversely affect**.

15.1.4 Fanshell

The fanshell prefers habitat consisting of stable sand and gravel. Although the substrate description detailed in the previous 2001 substrate/unionid survey (McClane Environmental Service 2002) did not include significant amounts of stable sand and gravel, the project area may have changed in the two decades following the survey activities. The fanshell has been observed within East Fork White River as recently as 2007. The in-stream construction, sedimentation, hydrologic changes, and contaminated runoff likely to result from the expressway facility could negatively impact the fanshell. Based on presumed presence within the East Fork White River in the vicinity of the existing US 231 bridge, the Tier 1 recommended determination of effect for the fanshell is **May Affect, Likely to Adversely Affect**.

15.1.5 Fat pocketbook

The fat pocketbook is often found in sandy/muddy reaches, backwaters, edge habitat. Habitat for the fat pocketbook may be present at the US 231 location, according to the substrate detailed in the in the previous 2001 substrate/unionid survey (McClane Environmental Service 2002). Fat pocketbook have been observed downstream of the bridge within East Fork White River as recently as 2010. The in-stream construction, sedimentation, hydrologic changes, and contaminated runoff likely to result from the expressway facility could negatively impact the fat pocketbook. Based on presumed presence within the East Fork White River in the vicinity of the existing US 231 bridge, the Tier 1 recommended determination of effect for the fat pocketbook is **May Affect, Likely to Adversely Affect**.

15.1.6 Sheepnose

The sheepnose has not been observed within the East Fork White River for the past 30 years. The USFWS considers the sheepnose to be extirpated from the White River system (USFWS 2020d). Impacts to sheepnose populations from the proposed project are unlikely. Based on the presumed extirpated status of the sheepnose within this reach of the East Fork White River, the Tier 1 recommended determination of effect for the sheepnose is **May Affect, Not Likely to Adversely Affect**.

15.1.7 Rough Pigtoe

The rough pigtoe has not been observed within the East Fork White River for the past 29 years. The USFWS 5-year review (USFWS 2021b) still lists the East Fork White River as a river with an extant population. IDNR suspects that it may have become extirpated since its last observation in 1992 (Brant Fisher personal communication).

Impacts to rough pigtoe populations from the proposed project are unlikely. Based on the unlikely presence of the mussel within this reach of the East Fork White River, the Tier 1 recommended determination of effect for the rough pigtoe is **May Affect, Not Likely to Adversely Affect**.

15.2 Endangered Species Act Candidate and Proposed Species for Conferencing Opinion

15.2.1 Tricolored bat

Like the Indiana bat and northern long-eared bat, tricolored bats prefer forest habitats near water. Although tricolored bats primarily use clusters of live or dead leaves, lichens or patches of pine needles in trees for summer maternity colonies, they may also frequent building structures for staging assembly. Foraging habitats include forest, old field, grasslands, and agriculture, as well as transportation corridors, residential, commercial, and industrial landscapes.

Existing IDNR occurrence data lack tricolored bat capture and roost records for Dubois and Martin counties; however, there are a few within or near to the bat action area in northeast Daviess and southeast Greene counties, as well as multiple other captures to the east and west of the Alternative P Corridor associated with the I-69 corridor. The Tier 1 forest analysis shows that approximately 27 to 31 percent of the Alternative P corridors is forestland, portions of which consist of habitat likely suitable for the tricolored bat.

The Tier 1 landscape analysis estimates that as many as ten 2.5-mile radius potential maternity colonies could be located throughout the 54 to 55 mile long Alternative P corridor. It is unlikely that each of these potential locations represent occupied northern long-eared bat maternity colonies, yet in the absence of data related to colony spacing, there are no means by which to predict the possible number and location of maternity colonies at the Tier 1 phase of the Mid-States Corridor project.

Tricolored bat declines are primarily related to WNS and wind energy mortality, and to a lesser extent habitat loss and climate change (USFWS 2021c). Since the number of tricolored bat summer colonies is predicted to decrease due to the projected decline in the spatial extent of the species (USFWS 2021c), it is anticipated that the number of potential maternity colonies within the Mid-States Corridor project area is, and will continue to be considerably fewer than pre-WNS conditions. Nationwide, population declines have been reported at 28 percent (2010 – 2019) from a summer occupancy study to as much as 53 percent (2009 – 2019) from a summer mobile acoustic survey (USFWS 2021c). Declines in the Northern RPU (includes Indiana) are estimated to be as much as 86 percent based on mobile transect acoustic data (USFWS 2021c). Rangewide, tricolored bat winter abundance has declined by 52 percent, and 57 percent within the Northern Representative Unit (RPU) within which Indiana is located (USFWS 2021c). The number of winter colonies has also decreased by 24 percent within the Northern RPU. Finally, current Northern RPU condition modeling predicts abundance declines of 94 by 2030 and a 91 percent decline in extant hibernacula by 2030 (USFWS 2021c). Based on these decline estimations, it is presumed that of the ten potential maternity colony locations identified for the Mid-States Corridor project, that only one or two represent probable tricolored bat colonies. Tricolored bat

maternity colony population sizes are typically small with 1 to 8 (females and pups) at Indiana colonies (Veilleux and Veilleux 2004), although averages of 15 females (7 to 29 range) have been documented in Indiana (Whitaker 1998). However, maternity colony sizes have been decreasing over the past 20 years (USFWS 2021c). Using the high-end average of this colony range (15 females), the disruption/loss of two maternity colonies by Alternative P encroachment has the potential to affect as many as 90 bats annually (2 colonies, 15 females/colony, 2 pups/female).

All of the known tricolored bat hibernacula (i.e., caves) in proximity to the Mid-States Corridor project area are within southern Greene County and to a lesser extent eastern Martin County, and Lawrence County. The Alternative P Corridor does not encroach upon any of the 5-mile fall swarming buffers for these hibernacula cave resources. Therefore, pending discovery of previously unknown hibernacula within close proximity to the Alternative P alignment during Tier 2 studies, the Tier 1 analysis concludes that adverse impacts to tricolored bat hibernacula and associated fall swarming habitat is not likely.

Based on the presumed summer presence of the tricolored bat and the prediction that as many as two maternity colonies are possible within the Mid-States Corridor project area, the Tier 1 recommended determination of effect for the tricolored bat is **May affect, likely to adversely affect.**

15.2.2 Little brown bat

In the spring, summer and fall, little brown bats may use exfoliating bark and cavities of trees for roosting and maternity colonies, but are more apt to use man-made structures such as boxes, buildings, and bridges.

Existing IDNR occurrence data lack little brown bat capture and roost records for Dubois and Martin counties, with the exception of I-69 corridor through Daviess and Green counties. However, despite the lack of occurrence data, the Tier 1 forest analysis shows that approximately 27 to 31 percent of the Alternative P corridors is forestland. A Tier 1 review of forestland, floodplain, and wetland resources supports the conclusion that little brown bat habitat is likely present throughout multiple watersheds traversed by the Alternative P corridor and that impacts to such habitat is unavoidable in all instances. Furthermore, the Tier 1 landscape analysis estimates that as many as ten 2.5-mile radius potential little brown maternity colonies could be located throughout the 54 to 55 mile long Alternative P corridor. It is unlikely that each of these potential locations represent occupied little brown bat maternity colonies, yet there are no means by which to predict the possible number and location at the Tier 1 phase of the Mid-States Corridor project. Colony density data for the little brown bat from the I-69 project is lacking and USFWS has not yet released a Species Status Assessment for the little brown with population decline and probability of occurrence data from which to estimate the potential number of little brown colonies that might occur along the 55 miles of the Mid-States Corridor. Because WNS is generally known to have taken a heavy toll on the little brown bat populations within the eastern United States, as with all other myotid species, it is therefore inferred that potential current and future maternity colonies within the Mid-States Corridor project area is expected to be low. Based on declines experienced with the

northern long-eared bat and tricolored bat, the Tier 1 analysis concludes that a maximum of two to three colonies might be present for the Mid-States Corridor project.

All of the known little brown bat hibernacula (i.e., caves) in proximity to the Mid-States Corridor project area are within southern Greene County and to a lesser extent eastern Martin County, and Lawrence County. The Alternative P Corridor does not encroach upon any of the 5-mile fall swarming buffers for these hibernacula cave resources. Therefore, pending discovery of previously unknown hibernacula within close proximity to the Alternative P alignment during Tier 2 studies, the Tier 1 analysis concludes that adverse impacts to little brown bat hibernacula and associated fall swarming habitat is not likely.

Based on the presumed summer presence of the little brown bat and the prediction that as many as two maternity colonies are possible within the Mid-States Corridor project area, the Tier 1 recommended determination of effect for the little brown bat is **May affect, likely to adversely affect.**

15.2.3 Salamander mussel

The salamander mussel is found almost exclusively under large boulders or wedged between large rocks. The substrate detailed from the 2001 mussel survey (McClane Environmental Service 2002) for the current US 231 bridge constructed across the East Fork White River in 2007/2008, included large concrete slabs which may provide habitat for the salamander mussel. The Indiana Natural Heritage Data Center includes three live or fresh dead records of the salamander mussel within the East Fork White River in Martin County greater than 15 miles upstream of the US 231 bridge. The in-stream construction, sedimentation, hydrologic changes, and contaminated runoff likely to result from the expressway facility could negatively impact the salamander mussel. Based on presumed presence within the East Fork White River in the vicinity of the existing US 231 bridge, the Tier 1 recommended determination of effect for the salamander mussel is **May Affect, Likely to Adversely Affect**.

15.2.4 Lake sturgeon

The Tier 1 level determination of effect for the lake sturgeon is based on the expressway facility type that would require construction of an additional bridge adjacent to the existing US 231 bridge across the East Fork White River. IDNR tracking data suggests that the lake sturgeon infrequently ventures this far downstream in the winter and summer. Additionally, minimization and avoidance measures will be implemented during new bridge construction to ensure that temporary caissons and causeways required for pier installation do not obstruct or hamper fish passage upstream and downstream of the proposed crossing at the existing US 231 bridge. Furthermore, the proposed action is not anticipated to have a discernable effect to the lake sturgeon benthic food source within the East Fork White River, nor will it have a long-term effect on water quality or result in a significant change to the existing benthic habitat conditions upstream and downstream of the proposed crossing. In consideration of this Tier 1 assessment, a **May Effect, Not Likely to**

Adversely Affect determination of effect is considered warranted for the lake sturgeon.

15.2.5 Monarch butterfly

Construction of Preferred Alternative 3 (expressway or Super-2 facility type) will result in wide-spread loss of habitat and has the potential for direct and indirect impacts to monarch butterflies via both vehicle collisions and individuals lost during construction and maintenance activities. Such negative impacts are likely associated with roadways throughout Indiana. While INDOT is a participant in the CCAA for the monarch butterfly and will continue to manage its right-of-ways for pollinator habitat conservation, unavoidable impacts (loss) of pollinator habitat through the Mid-States Corrido project implementation are expected. Therefore, the Tier 1 recommended determination of effects for the monarch butterfly is **May Affect, Likely to Adversely Affect**.

16 Tier 2 Expectations

Separate Tier 2 biological assessments will be developed on each of the four segments of independent utility (SIUs) for the Alternative P alignment from I-64 to I-69 resulting from the Tier 2 design phase. While the various potential Local Improvement segments are addressed and incorporated into the proposed action of the Tier 1 biological assessment, these segments along US 231 will not be included in the Tier 2 surveys (i.e., bats and monarch butterfly). Each Local Improvement along US 231 is an independent utility project and will be handled through separate NEPA Categorical Exclusion (CE) evaluation. For bats, each Local Improvement will be evaluated through EROS IPaC to determine if it qualifies for the Range-wide Programmatic Consultation and what, if any, compensation through the in-lieu fee (ILF) program is warranted. Depending of the listing status of the monarch butterfly at the time of the individual Local Improvement project reviews, additional coordination may be required to address potential impacts to this species and suitable habitat within the action area. Since there are no Local Improvement projects that involve East Fork White River bridge work or road work in the general vicinity of the river, there are no anticipated surveys or Section 7 consultation required for mussels and/or the lake sturgeon.

16.1 Bats

Bat habitat in the form of bottomland and/or upland forest is present throughout the Alternative P corridor in all four of the SIUs; therefore, it is anticipated that impacts to the five listed/proposed listing bat species will be addressed in each of the four Tier 2 biological assessments. Presence/absence surveys will be developed in accordance with the most current version of the USFWS Range-Wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines (USFWS 2022e) (herein reference as Guidelines). It is anticipated that by the time the Mid-States Corridor Tier 2 process is initiated that the tricolored bat and/or the little brown bat may also be federally listed as endangered or threatened. As such, it is expected that these species will also likely be incorporated into the protocols within the Guidelines.

Pending additional coordination with the USFWS at the initiation of Tier 2 Section 7 consultation, it is proposed that mist net surveys be conducted in accordance with Phase 2 of the Guidelines for each of the SIUs to ascertain specific presence/absence locations proximal to the proposed Alternative P alignment. Under the current Guidelines, the level of effort (LOE) for surveying bat habitat in the Midwest Recovery Unit is 2 net nights per kilometer of

suitable habitat for the Indiana bat and 4 net nights per kilometer of suitable habitat for the northern long-eared bat. Therefore, it is expected that the 4 net night LOE will be operative for the survey. In the event that the tricolored bat and/or little brown bat are included in the Guidelines at the time Tier 2 investigations are conducted, the maximum LOE required for any of these species will be implemented. The Tier 1 biological assessment does not include an evaluation of forest habitat suitability for the Indiana bat, northern long-eared bat, little brown bat, or tricolored bat. However, a quick review of forest habitat along the Alternative P working alignment indicates there is approximately 29 kilometers (18 miles) of linear forest habitat. Assuming 100 percent of the forest along these linear segments is suitable habitat for at least one of the bat species, it is estimated that 116 net nights are expected to meet the USFWS LOE for the entire project. For a scenario under which two nets are deployed for two nights per site, an estimated total of 29 site will be required to meet the current LOE.

Additionally, in accordance with Phase 4 of the Guidelines, radio-tracking and emergence surveys will be conducted for listed/proposed listing bats to identify and characterize summer roosts and determine the extent and nature of use (maternity colony vs non-reproductive individual/small group use).

In addition to mist net surveys, radio tracking, and emergence surveys, bridge inspections for evidence of bat use (bat presence, guano deposits, staining) will be conducted at all bridges that will be affected (demolished/replaced) or in close proximity to the proposed right-of-way for the proposed Tier 2 preferred alternative. As deemed appropriate, guano samples will be collected in accordance with INDOT guidelines and submitted to an approved DNA analysis for species identification.

As the project progresses into the Tier 2 phase, additional coordination with the USFWS INFO will be conducted to develop a detailed survey plan that meets the active USFWS Guidelines at the time the study is conducted. Additionally, details on bat specific AMMs for construction and development of a mitigation framework as a conservation measure to compensate for habitat loss will be addressed during the Tier 2 phase.

16.2 Mussels

The Tier 2 biological assessment will involve a presence/absence survey for mussels based on the Guidelines for Sampling Freshwater Mussels in Indiana (IDNR 2014). Survey protocols such as the Survey Protocol for Assessment of Endangered Freshwater Mussels in the Allegheny River, Pennsylvania (Smith et al. 2001), Ohio Mussel Survey Protocol (ODNR 2022), Michigan Freshwater Mussel Survey Protocols and Relocation Procedures for Rivers and Streams (Hanshue et al. 2021), West Virginia Mussel Survey Protocol (WVDNR 2022), and others will be reviewed through coordination with USFWS and the IDNR Division of Fish and Wildlife and modified as needed for the Mid-States Corridor Tier 2 survey. A study plan detailing the quantitative and qualitative survey methods using quadrats, survey limits, and disposition of mussels shall be submitted to the USFWS for approval prior to initiation of the survey. The survey will be conducted between May 1 and October 15 when acceptable air temperatures and water flow/depth conditions are present. The East Fork White River represents the break between SIU2 and SIU3; therefore, it is currently undetermined as to which SIU the East Fork White River crossing will be included. Once this has been determined in Tier 2, mussel investigation will be conducted and included in the appropriate SIU Tier 2 biological assessment. Since there are no known federally listed mussel species known from any other

stream systems, mussel investigations would not be required in the Tier 2 biological assessments for SIU 3 and SIU 4.

16.3 Lake Sturgeon

Since the IDNR continues to conduct annual capture, tagging, and radio tracking of migrating lake sturgeon to spawning grounds downstream of the Williams Dam, the need for Tier 2 field surveys on the East Fork White River in the vicinity of the proposed Preferred Alternative P crossing is not warranted. Tier 2 biological assessment efforts will continue to focus on coordination with IDNR personnel concerning recent findings from the annual surveys. It is not anticipated that any capture survey efforts will be warranted to establish presence/absence of the lake sturgeon within the East Fork White River in the vicinity of the existing US 231 Bridge. As with the mussels, the lake sturgeon will be addressed in either the Tier 2 biological assessment for SIU 2 or SIU 3, whichever ultimately includes the East Fork White River.

16.4 Monarch butterfly

It is anticipated that for the Tier 2 phase of the project, field studies will be undertaken to better identify suitable monarch butterfly habitat and direct observations of the species within and adjacent to the proposed right-of-way. A specific habitat assessment and survey protocol for the Mid-States project has not yet been determined for this purpose, but will be based on previously drafted procedures or modified versions of such protocols.

The Pollinator Scorecard protocol was developed by the Rights-of-Way Habitat Working Group (ROWHWG 2019) as a tool to manage and monitor pollinator habitat on energy and transportation properties or easements and has been adopted as the methodology for organizations participating in the Candidate Conservation Agreement with Assurances for the monarch butterfly. This methodology uses 1500 square foot “plots” within a designated “site” to evaluate pollinator habitat potential based on various scoring and non-scoring metrics, including direct observations of pollinator groups.

The Integrated Monarch Monitoring Program protocol through Monarch Joint Venture (Monarch Joint Venture 2022) establishes a framework to conduct four targeted surveys: 1) milkweed and blooming plant survey, 2) monarch egg and larva survey, 3) adult monarch survey, and 4) monarch survival and parasitism. This methodology allows for random and non-random site selection using 1-hectare plots to survey five site types: 1) protected grassland, 2), unclassified grassland, 30 agriculture, 4) rights-of-way, and 5) developed.

Field studies for the monarch butterfly are anticipated to be required for all four of the Tier 2 SIU segments.

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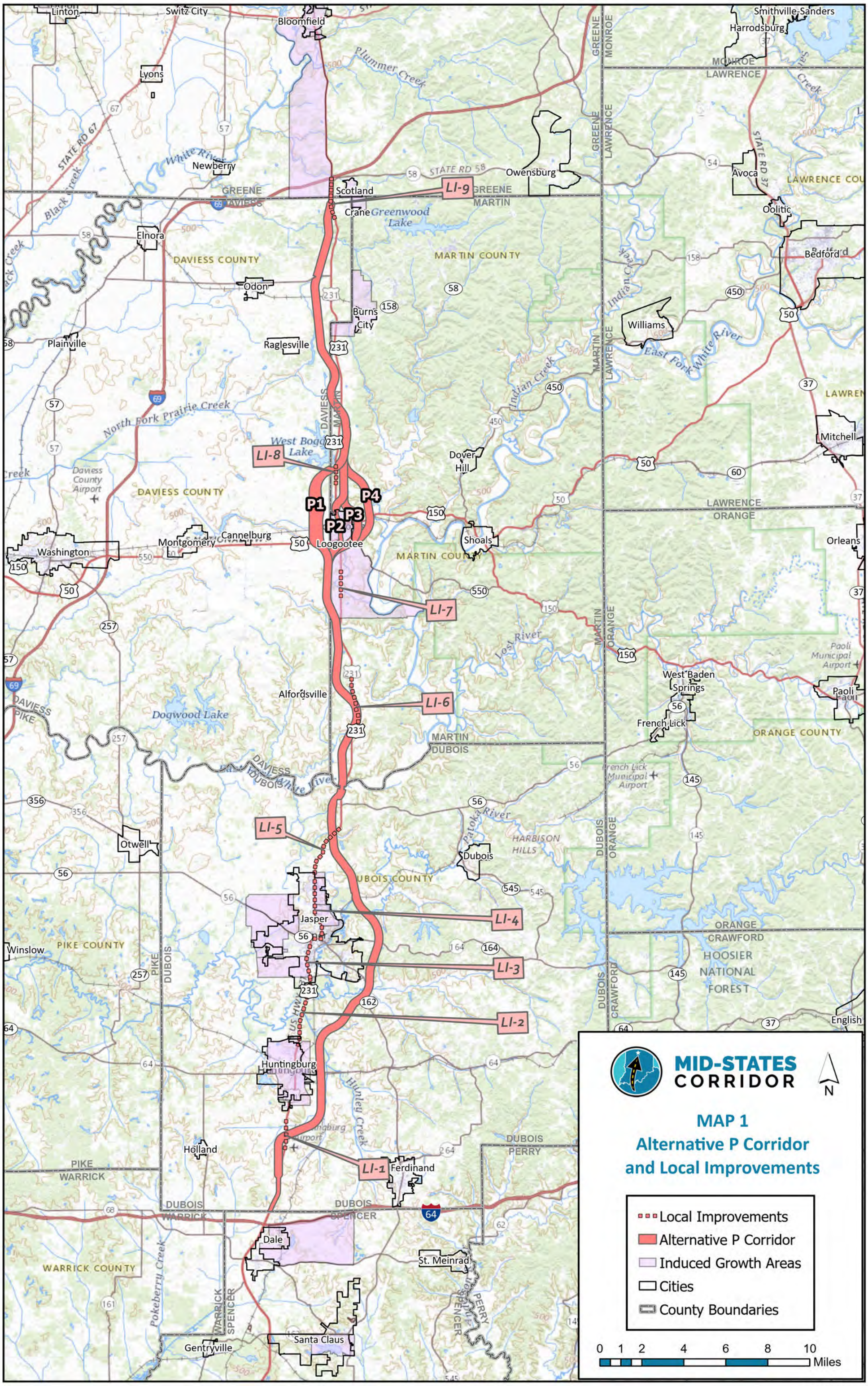
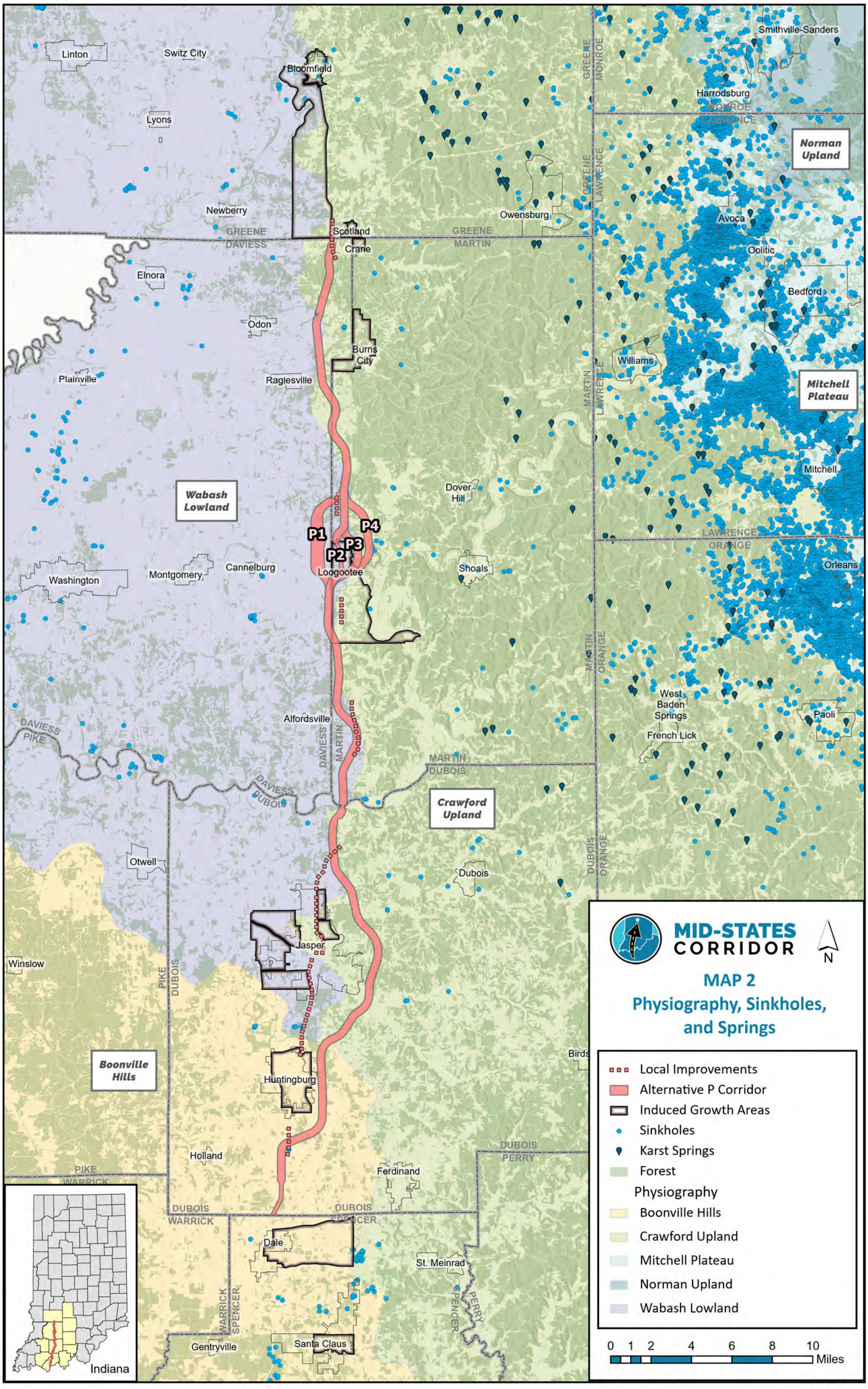
Appendix A
Maps


LI-9
LI-8
LI-7
LI-6
LI-5
LI-4
LI-3
LI-2
LI-1
P1
P2
P3
P4
Linton
Switz City
Bloomfield
Lyons
Newberry
Scotland
Crane
Greenwood Lake
Owensburg
Smithville-Sanders
Harrodsburg
Avoca
Oolitic
Bedford
Elnora
Odon
Burns City
Plainville
Raglesville
Williams
Dover Hill
Shoals
Orleans
Mitchell
Washington
Montgomery
Cannelburg
Loogootee
Alfordsville
Dogwood Lake
Lost River
Paoli Municipal Airport
West Baden Springs
Paoli
French Lick
French Lick Municipal Airport
Otwell
Dubois
Jasper
Winslow
Huntingburg
Holland
Ferdinand
Dale
St. Meinrad
Gentryville
Santa Claus
English
Daviess County Airport
DAVIESS COUNTY
MARTIN COUNTY
LAWRENCE
ORANGE
ORANGE COUNTY
DUBOIS COUNTY
PIKE COUNTY
WARRICK COUNTY
HARBISON HILLS
HOOSIER NATIONAL FOREST
Plummer Creek
White River
Black Creek
North Fork Prairie Creek
West Boggs Lake
Indian Creek
East Fork White River
Lost River
Patoka River
Hunley Creek
Pokeberry Creek
MID-STATES CORRIDOR
N
MAP 1
Alternative P Corridor and Local Improvements
Local Improvements
Alternative P Corridor
Induced Growth Areas
Cities
County Boundaries
0 1 2 4 6 8 10
Miles

12/2/2022 cjb


Linton
Switz City
Bloomfield
Lyons
Newberry
GREENE
DAVIESS
Scotland
Crane
GREENE
MARTIN
Owensburg
GREENE
MONROE
Smithville-Sanders
Harrodsburg
MONROE
LAWRENCE
GREENE
LAWRENCE
Norman Upland
Avoca
Oolitic
Bedford
Elnora
Odon
Burns City
Plainville
Raglesville
Williams
MARTIN
LAWRENCE
Mitchell Plateau
Mitchell
Wabash Lowland
Dover Hill
P1
P2
P3
P4
Loogootee
Shoals
LAWRENCE
ORANGE
Orleans
Washington
Montgomery
Cannelburg
MARTIN
ORANGE
West Baden Springs
French Lick
Paoli
DAVIESS
PIKE
Alfordsville
DAVIESS
MARTIN
MARTIN
DUBOIS
DAVIESS
DUBOIS
Crawford Upland
Otwell
Dubois
DUBOIS
ORANGE
Jasper
Winslow
PIKE
DUBOIS
Boonville Hills
Huntingburg
Holland
PIKE
WARRICK
Ferdinand
DUBOIS
PERRY
DUBOIS
WARRICK
DUBOIS
SPENCER
Dale
St. Meinrad
WARRICK
SPENCER
PERRY
SPENCER
Gentryville
Santa Claus
Indiana
MID-STATES CORRIDOR
N
MAP 2
Physiography, Sinkholes, and Springs
Local Improvements
Alternative P Corridor
Induced Growth Areas
Sinkholes
Karst Springs
Forest
Physiography
Boonville Hills
Crawford Upland
Mitchell Plateau
Norman Upland
Wabash Lowland
0 1 2 4 6 8 10
Miles

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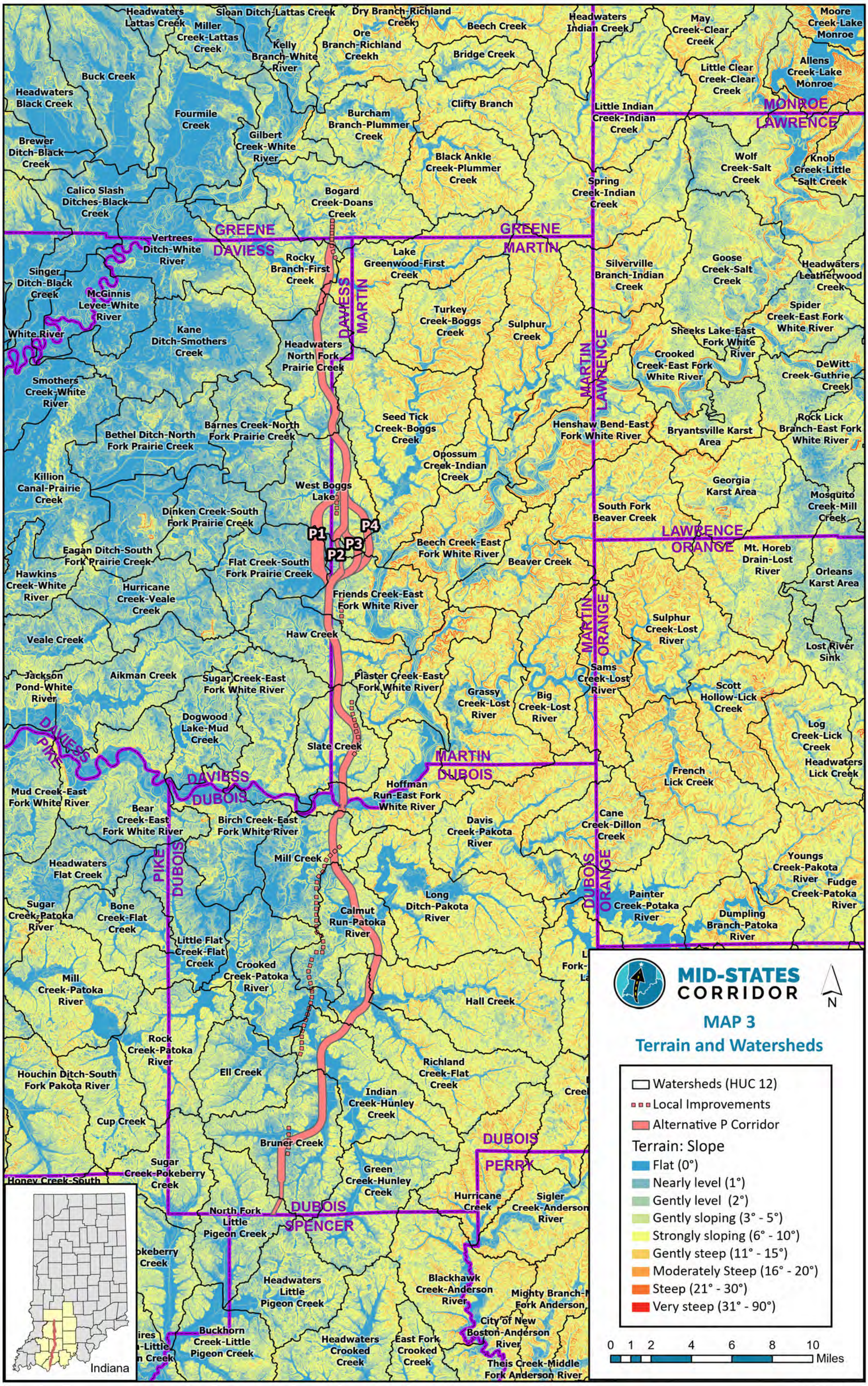
Headwaters Lattas Creek
Sloan Ditch-Lattas Creek
Miller Creek-Lattas Creek
Dry Branch-Richland Creek
Ore Branch-Richland Creekh
Beech Creek
Kelly Branch-White River
Bridge Creek
Headwaters Indian Creek
May Creek-Clear Creek
Moore Creek-Lake Monroe
Allens Creek-Lake Monroe
Little Clear Creek-Clear Creek
Buck Creek
Headwaters Black Creek
Fourmile Creek
Clifty Branch
Burcham Branch-Plummer Creek
Little Indian Creek-Indian Creek
MONROE
LAWRENCE
Brewer Ditch-Black Creek
Gilbert Creek-White River
Black Ankle Creek-Plummer Creek
Wolf Creek-Salt Creek
Knob Creek-Little Salt Creek
Calico Slash Ditches-Black Creek
Bogard Creek-Doans Creek
Spring Creek-Indian Creek
GREENE
DAVIESS
GREENE
MARTIN
Vertrees Ditch-White River
Rocky Branch-First Creek
Lake Greenwood-First Creek
Silverville Branch-Indian Creek
Goose Creek-Salt Creek
Headwaters Leatherwood Creek
Singer Ditch-Black Creek
McGinnis Levee-White River
DAVIESS
MARTIN
Spider Creek-East Fork White River
Turkey Creek-Boggs Creek
Sulphur Creek
White River
Kane Ditch-Smothers Creek
Headwaters North Fork Prairie Creek
Sheeks Lake-East Fork White River
MARTIN
LAWRENCE
Crooked Creek-East Fork White River
DeWitt Creek-Guthrie Creek
Smothers Creek-White River
Seed Tick Creek-Boggs Creek
Henshaw Bend-East Fork White River
Bryantsville Karst Area
Rock Lick Branch-East Fork White River
Barnes Creek-North Fork Prairie Creek
Bethel Ditch-North Fork Prairie Creek
Opossum Creek-Indian Creek
Killion Canal-Prairie Creek
West Boggs Lake
Georgia Karst Area
Mosquito Creek-Mill Creek
South Fork Beaver Creek
Dinken Creek-South Fork Prairie Creek
P1
P2
P3
P4
LAWRENCE
ORANGE
Eagan Ditch-South Fork Prairie Creek
Beech Creek-East Fork White River
Mt. Horeb Drain-Lost River
Flat Creek-South Fork Prairie Creek
Beaver Creek
Orleans Karst Area
Hawkins Creek-White River
Hurricane Creek-Veale Creek
Friends Creek-East Fork White River
MARTIN
ORANGE
Sulphur Creek-Lost River
Haw Creek
Veale Creek
Lost River Sink
Jackson Pond-White River
Aikman Creek
Sugar Creek-East Fork White River
Plaster Creek-East Fork White River
Sams Creek-Lost River
Grassy Creek-Lost River
Big Creek-Lost River
Scott Hollow-Lick Creek
DAVIESS
PIKE
Dogwood Lake-Mud Creek
Log Creek-Lick Creek
Slate Creek
MARTIN
DUBOIS
Headwaters Lick Creek
French Lick Creek
DAVIESS
DUBOIS
Hoffman Run-East Fork White River
Mud Creek-East Fork White River
Bear Creek-East Fork White River
Birch Creek-East Fork White River
Davis Creek-Pakota River
Cane Creek-Dillon Creek
Mill Creek
Headwaters Flat Creek
PIKE
DUBOIS
DUBOIS
ORANGE
Youngs Creek-Pakota River
Fudge Creek-Patoka River
Sugar Creek-Patoka River
Bone Creek-Flat Creek
Long Ditch-Pakota River
Painter Creek-Potaka River
Calmut Run-Patoka River
Dumpling Branch-Patoka River
Little Flat Creek-Flat Creek
Crooked Creek-Patoka River
Mill Creek-Patoka River
Hall Creek
Rock Creek-Patoka River
Richland Creek-Flat Creek
Houchin Ditch-South Fork Pakota River
Ell Creek
Indian Creek-Hunley Creek
Cup Creek
Bruner Creek
DUBOIS
PERRY
Sugar Creek-Pokeberry Creek
Green Creek-Hunley Creek
Honey Creek-South
Hurricane Creek
Sigler Creek-Anderson River
North Fork Little Pigeon Creek
DUBOIS
SPENCER
Headwaters Little Pigeon Creek
Blackhawk Creek-Anderson River
Mighty Branch-Fork Anderson
City of New Boston-Anderson River
Buckhorn Creek-Little Pigeon Creek
Headwaters Crooked Creek
East Fork Crooked Creek
Theis Creek-Middle Fork Anderson River
Indiana
MID-STATES CORRIDOR
N
MAP 3
Terrain and Watersheds
Watersheds (HUC 12)
Local Improvements
Alternative P Corridor
Terrain: Slope
Flat (0°)
Nearly level (1°)
Gently level (2°)
Gently sloping (3° - 5°)
Strongly sloping (6° - 10°)
Gently steep (11° - 15°)
Moderately Steep (16° - 20°)
Steep (21° - 30°)
Very steep (31° - 90°)
0 1 2 4 6 8 10
Miles

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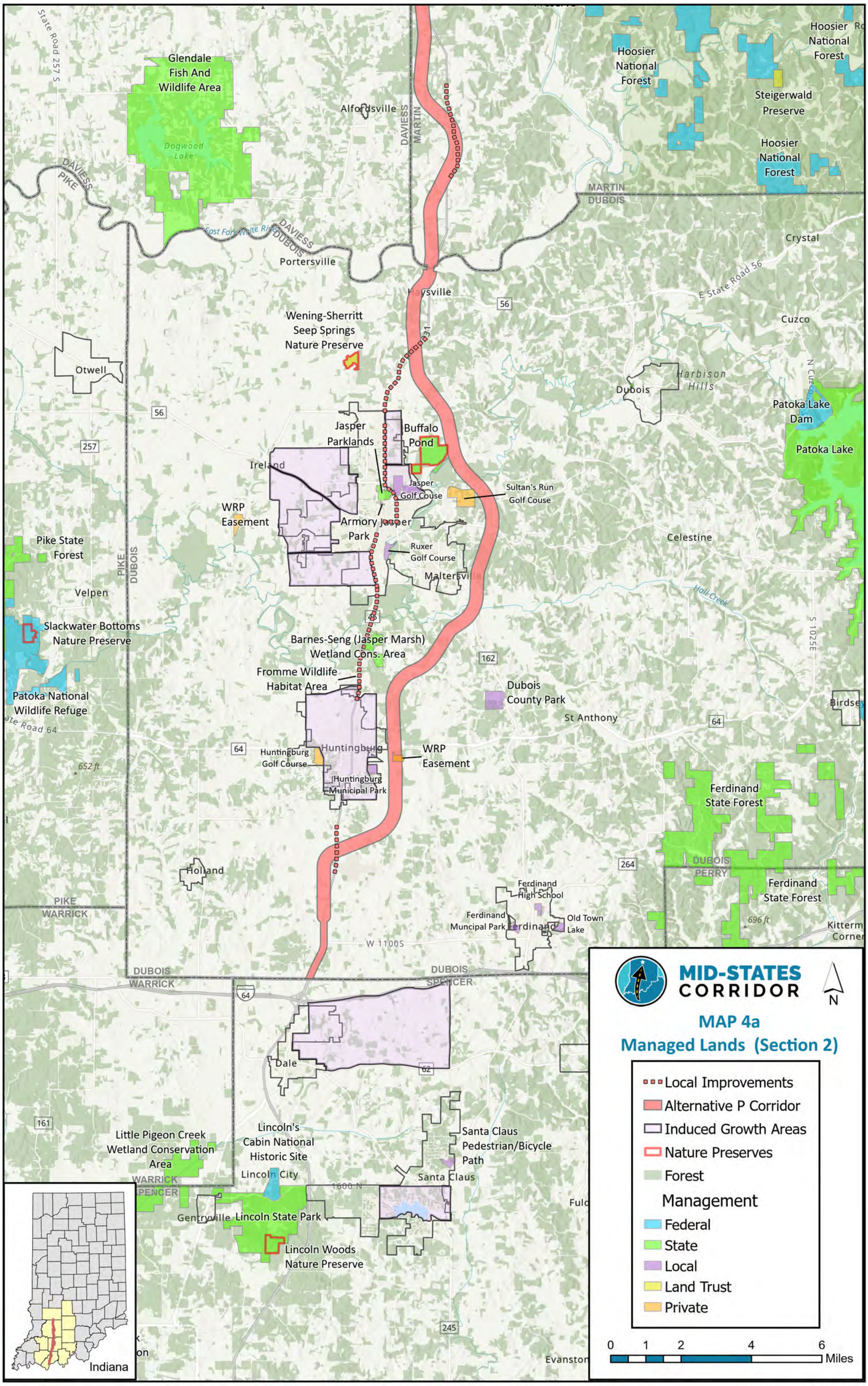
Glendale Fish And Wildlife Area
Dogwood Lake
Alfordsville
DAVIESS
MARTIN
Hoosier National Forest
Steigerwald Preserve
Hoosier National Forest
Hoosier National Forest
MARTIN
DUBOIS
DAVIESS PIKE
East Fork White River
DAVIESS
DUBOIS
Portersville
Crystal
E State Road 56
Haysville
56
Wening-Sherritt Seep Springs Nature Preserve
Cuzco
Otwell
Harbison Hills
Dubois
Patoka Lake Dam
Patoka Lake
Jasper Parklands
Buffalo Pond
257
Ireland
Jasper Golf Couse
Sultan's Run Golf Couse
WRP Easement
Armory Jasper Park
Ruxer Golf Course
Celestine
Pike State Forest
PIKE
DUBOIS
Velpen
Maltersville
Hall Creek
S 1025E
Slackwater Bottoms Nature Preserve
Barnes-Seng (Jasper Marsh) Wetland Cons. Area
162
Fromme Wildlife Habitat Area
Dubois County Park
Patoka National Wildlife Refuge
St Anthony
64
Huntingburg
Huntingburg Golf Course
WRP Easement
Huntingburg Municipal Park
652 ft
Ferdinand State Forest
Holland
264
DUBOIS
PERRY
Ferdinand High School
Ferdinand Muncipal Park
Ferdinand
Old Town Lake
Ferdinand State Forest
696 ft
PIKE
WARRICK
W 1100S
DUBOIS
WARRICK
DUBOIS
SPENCER
64
Dale
62
161
Little Pigeon Creek Wetland Conservation Area
Lincoln's Cabin National Historic Site
Lincoln City
Santa Claus Pedestrian/Bicycle Path
Santa Claus
WARRICK
SPENCER
1600 N
Gentryville
Lincoln State Park
Lincoln Woods Nature Preserve
245
Evanston
Indiana
MID-STATES CORRIDOR
N
MAP 4a
Managed Lands (Section 2)
Local Improvements
Alternative P Corridor
Induced Growth Areas
Nature Preserves
Forest
Management
Federal
State
Local
Land Trust
Private
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Miles

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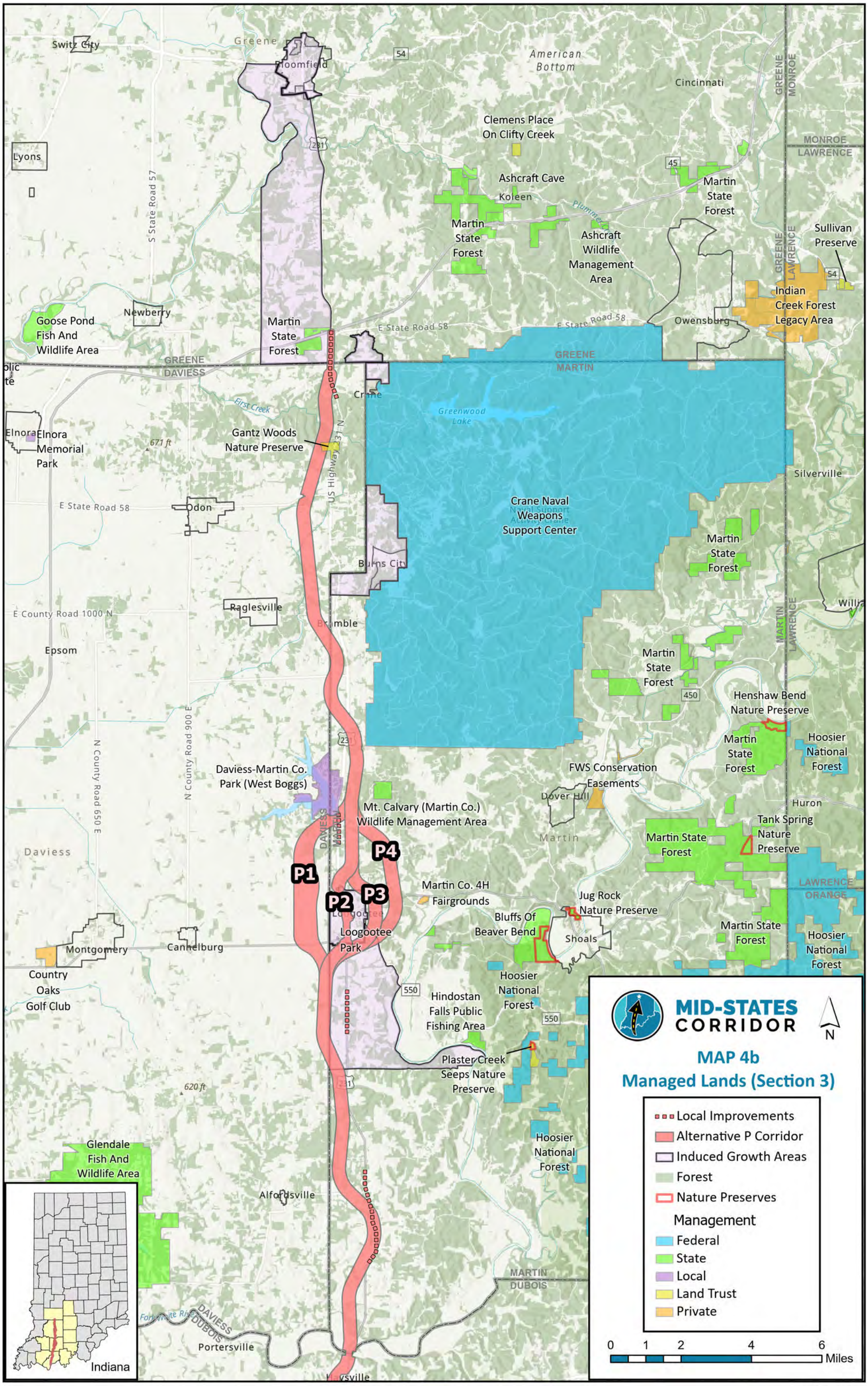
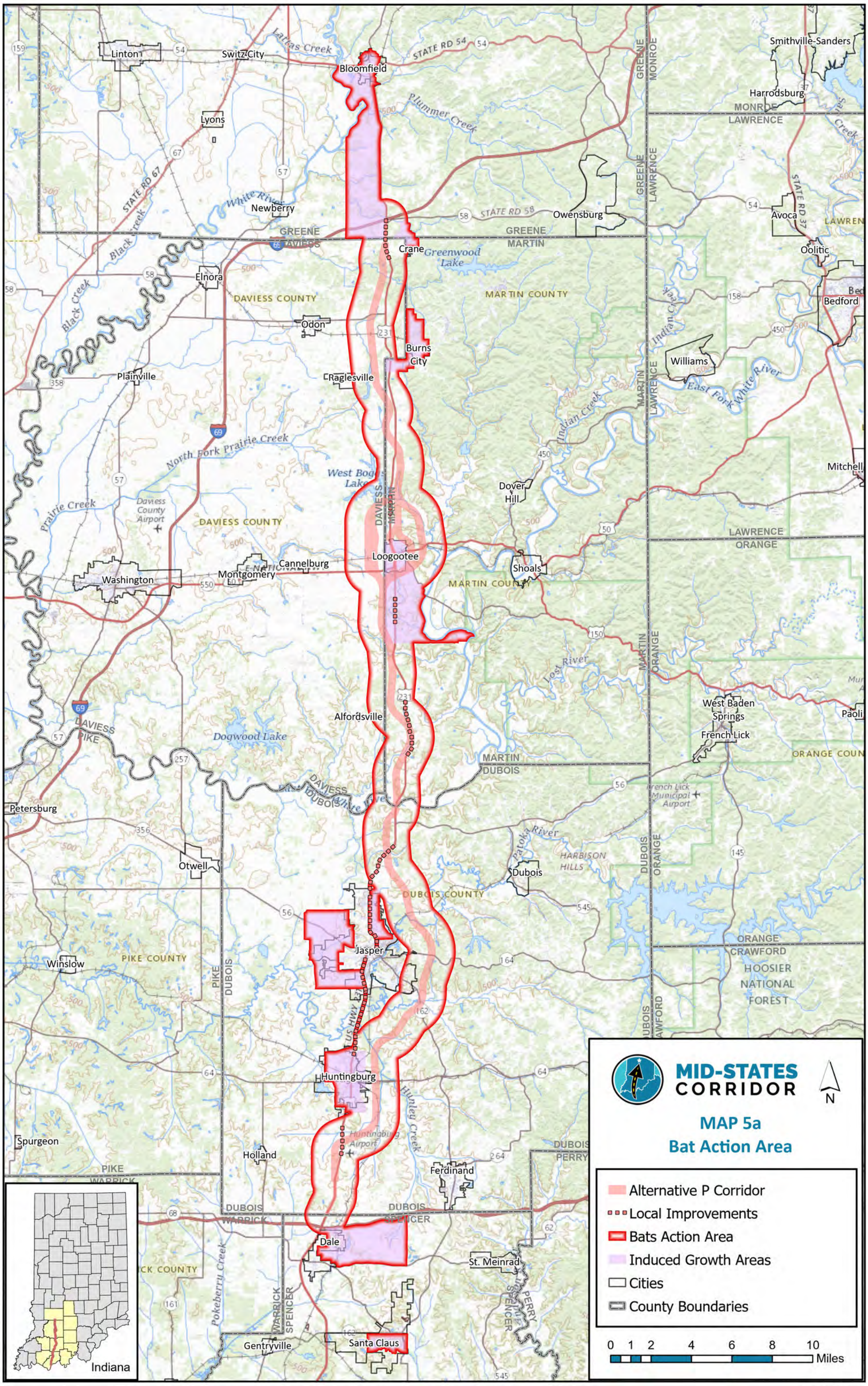

Switz City
Bloomfield
54
American Bottom
Cincinnati
GREENE
MONROE
Clemens Place On Clifty Creek
MONROE
LAWRENCE
Lyons
231
S State Road 57
Ashcraft Cave
Koleen
45
Martin State Forest
Plummer
Martin State Forest
Ashcraft Wildlife Management Area
GREENE
LAWRENCE
Sullivan Preserve
54
Indian Creek Forest Legacy Area
Newberry
Goose Pond Fish And Wildlife Area
Martin State Forest
E State Road 58
E State Road 58
Owensburg
GREENE
DAVIESS
GREENE
MARTIN
First Creek
Greenwood Lake
Elnora
Elnora Memorial Park
671 ft
Gantz Woods Nature Preserve
US Highway 231 N
Silverville
E State Road 58
Odon
Crane Naval Weapons Support Center
Burns City
Martin State Forest
E County Road 1000 N
Raglesville
Bramble
Epsom
MARTIN
LAWRENCE
Martin State Forest
450
Henshaw Bend Nature Preserve
N County Road 900 E
231
Martin State Forest
Hoosier National Forest
Daviess-Martin Co. Park (West Boggs)
FWS Conservation Easements
Dover Hill
Mt. Calvary (Martin Co.) Wildlife Management Area
Huron
Tank Spring Nature Preserve
N County Road 650 E
DAVIESS
MARTIN
Martin
Martin State Forest
P4
P1
P3
P2
Martin Co. 4H Fairgrounds
Jug Rock Nature Preserve
LAWRENCE
ORANGE
Loogootee
Bluffs Of Beaver Bend
Shoals
Martin State Forest
Loogootee Park
Montgomery
Cannelburg
Hoosier National Forest
Country Oaks Golf Club
550
Hindostan Falls Public Fishing Area
550
Hoosier National Forest
Plaster Creek Seeps Nature Preserve
231
620 ft
Glendale Fish And Wildlife Area
Alfordsville
Hoosier National Forest
MARTIN
DUBOIS
DAVIESS
DUBOIS
Fork White River
Portersville
Indiana
MID-STATES CORRIDOR
N
MAP 4b
Managed Lands (Section 3)
Local Improvements
Alternative P Corridor
Induced Growth Areas
Forest
Nature Preserves
Management
Federal
State
Local
Land Trust
Private
0 1 2 4 6
Miles

12/2/2022 cjb


Linton
Switz City
Bloomfield
Lyons
Newberry
Owensburg
Smithville-Sanders
Harrodsburg
Avoca
Oolitic
Bedford
Crane
Greenwood Lake
Elnora
DAVIESS COUNTY
MARTIN COUNTY
Odon
Burns City
Williams
Plainville
Raglesville
Mitchell
Dover Hill
Loogootee
Shoals
Washington
Montgomery
Cannelburg
Alfordsville
Dogwood Lake
West Baden Springs
French Lick
Paoli
Petersburg
Otwell
Dubois
Jasper
Winslow
PIKE COUNTY
Huntingburg
Holland
Ferdinand
Spurgeon
Dale
St. Meinrad
Santa Claus
Gentryville
Indiana
MID-STATES CORRIDOR
MAP 5a
Bat Action Area
Alternative P Corridor
Local Improvements
Bats Action Area
Induced Growth Areas
Cities
County Boundaries
0 1 2 4 6 8 10
Miles
N

12/6/2022 cjb

East Fork White River
US Highway 231
East Fork White River
East Fork White River
N In-231
N Old US Highway 231
DAVIESS
DUBOIS
East Fork White River
US Highway 231
231
Turkey Branch
East Fork White River
White Hollow
Little Creek
N In-231
Little Creek
W Haysville Rd
Haysville
W State Road 56
W STATE RD 56
N PARK ST
Indiana

MID-STATES CORRIDOR

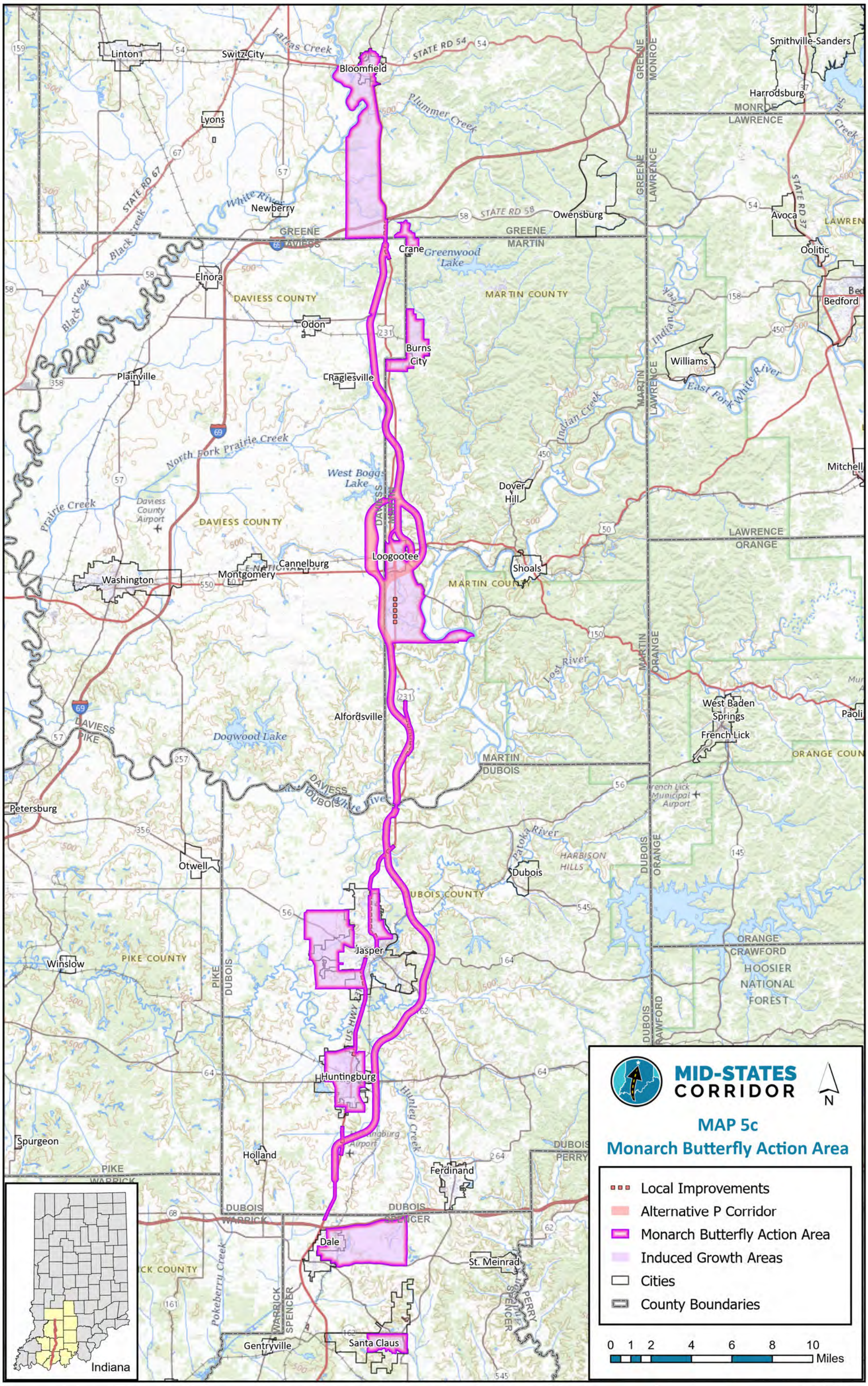
MAP 5b: Mussels and Lake Sturgeon Action Area

- Mussels and Lake Sturgeon Action Area
- Alternative P Corridor
- County Boundaries

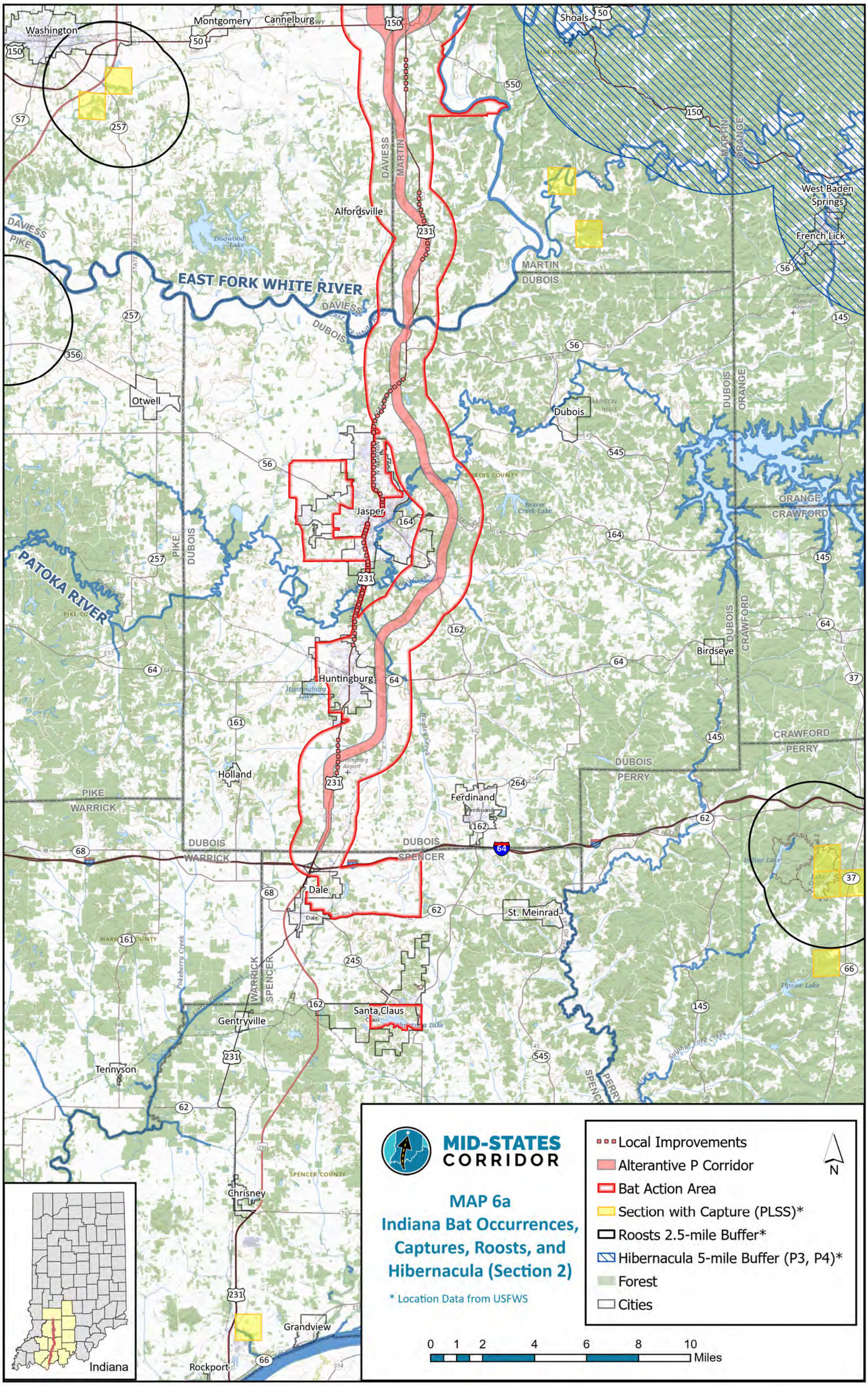
0 250 500 1,000 Feet

N

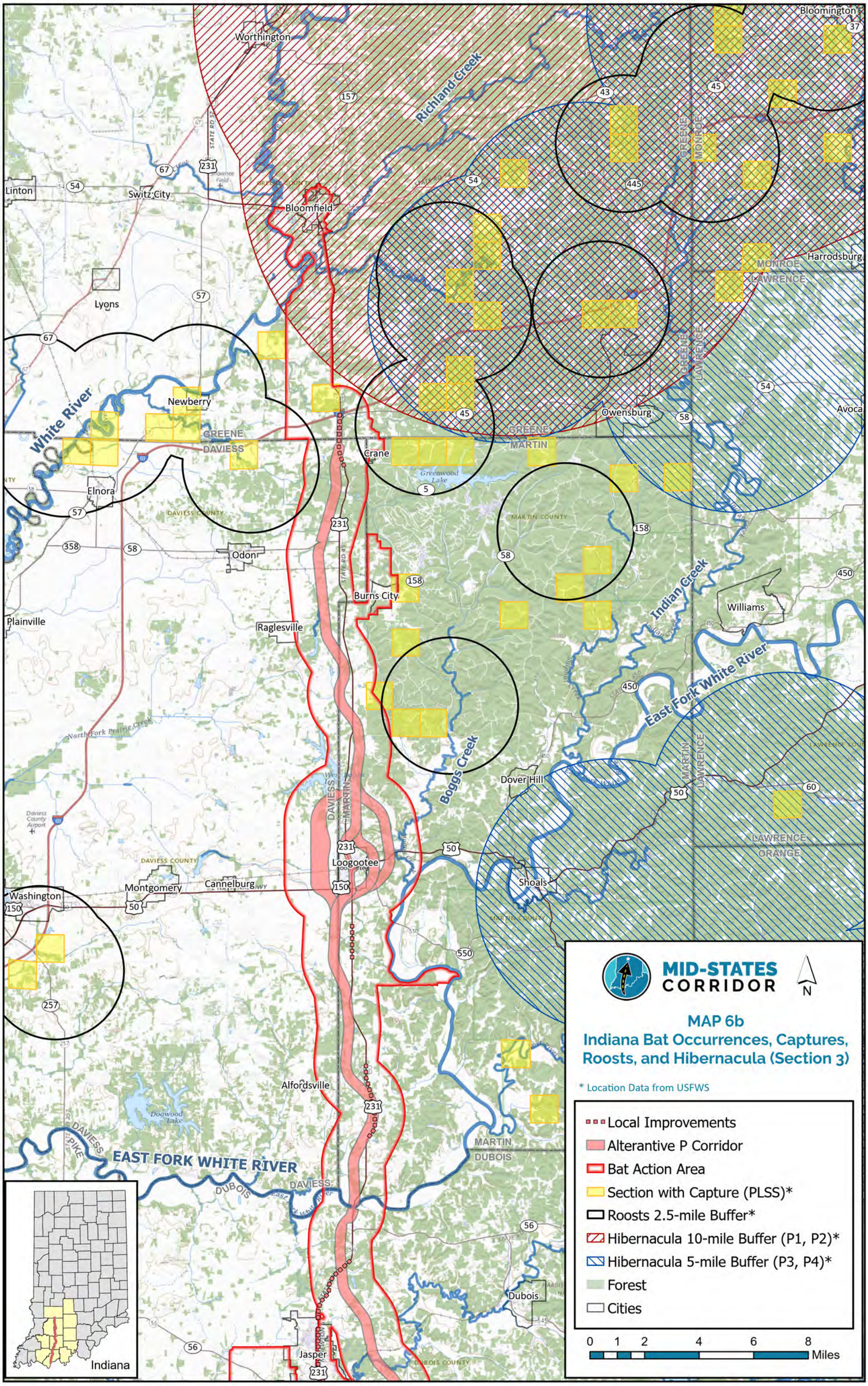
12/6/2022 cjb


Linton
Switz City
Bloomfield
Lattas Creek
STATE RD 54
Smithville-Sanders
Harrodsburg
MONROE
LAWRENCE
Lyons
STATE RD 67
Plummer Creek
White River
Newberry
Owensburg
GREENE
MONROE
LAWRENCE
Avoca
STATE RD 37
Oolitic
Bedford
Crane
Greenwood Lake
GREENE
MARTIN
DAVIESS
Elnora
Black Creek
DAVIESS COUNTY
MARTIN COUNTY
Odon
Burns City
Williams
Indian Creek
East Fork White River
Plainville
Raglesville
North Fork Prairie Creek
West Boggs Lake
Dover Hill
Mitchell
Prairie Creek
Daviess County Airport
Loogootee
Cannelburg
Montgomery
Washington
Shoals
LAWRENCE
ORANGE
Lost River
West Baden Springs
French Lick
Paoli
Alfordsville
Dogwood Lake
DAVIESS
PIKE
MARTIN
DUBOIS
Petersburg
French Lick Municipal Airport
Patoka River
HARBISON HILLS
Otwell
Dubois
UBOIS COUNTY
ORANGE
CRAWFORD
HOOSIER NATIONAL FOREST
Jasper
Winslow
PIKE COUNTY
PIKE
DUBOIS
US HWY 231
Huntingburg
Huntingburg Airport
Hunley Creek
Spurgeon
Holland
Ferdinand
PERRY
WARRICK
SPENCER
Dale
St. Meinrad
Pokeberry Creek
Gentryville
Santa Claus
Indiana
MID-STATES CORRIDOR
N
MAP 5c
Monarch Butterfly Action Area
Local Improvements
Alternative P Corridor
Monarch Butterfly Action Area
Induced Growth Areas
Cities
County Boundaries
0 1 2 4 6 8 10
Miles

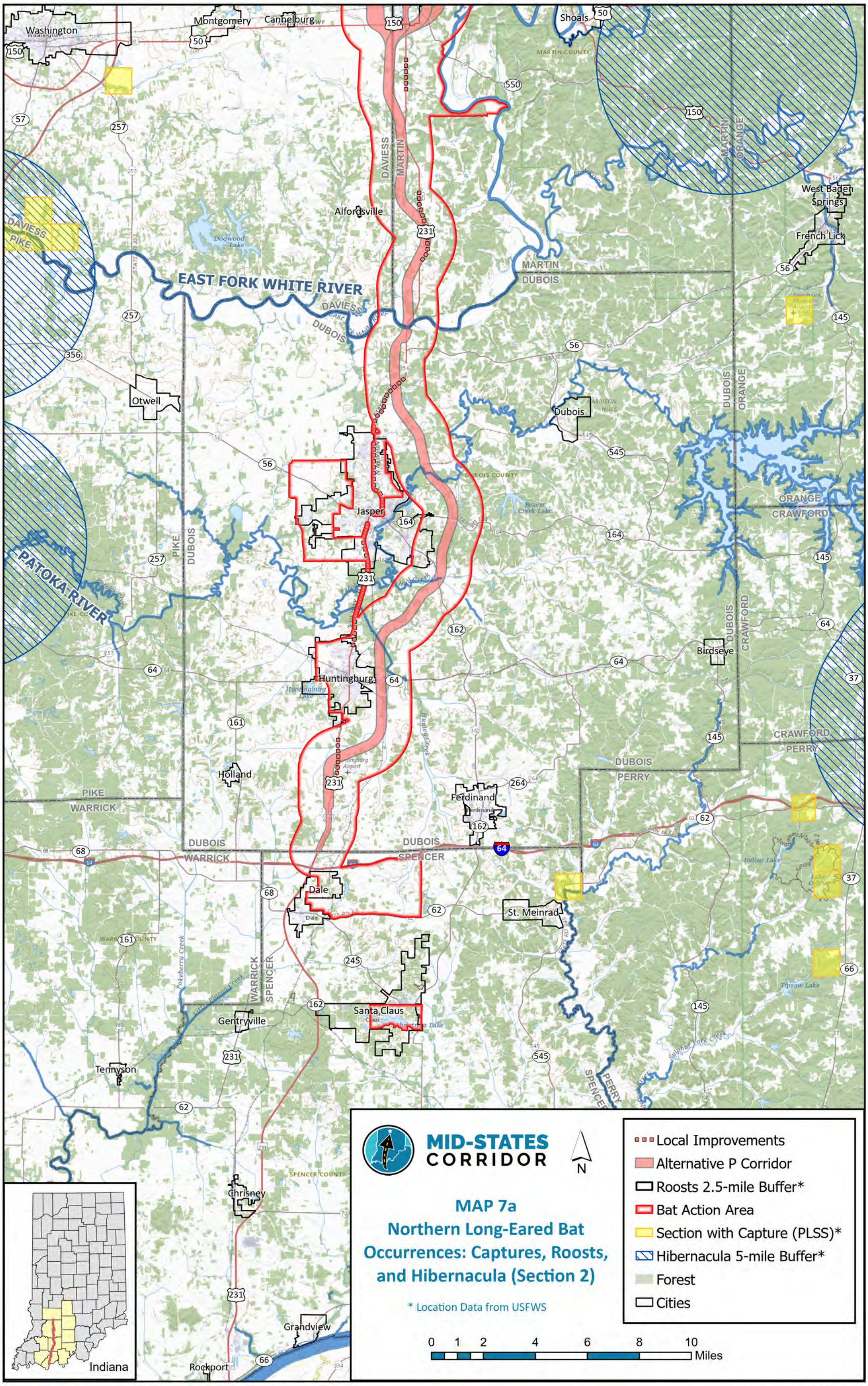
12/6/2022 cjb

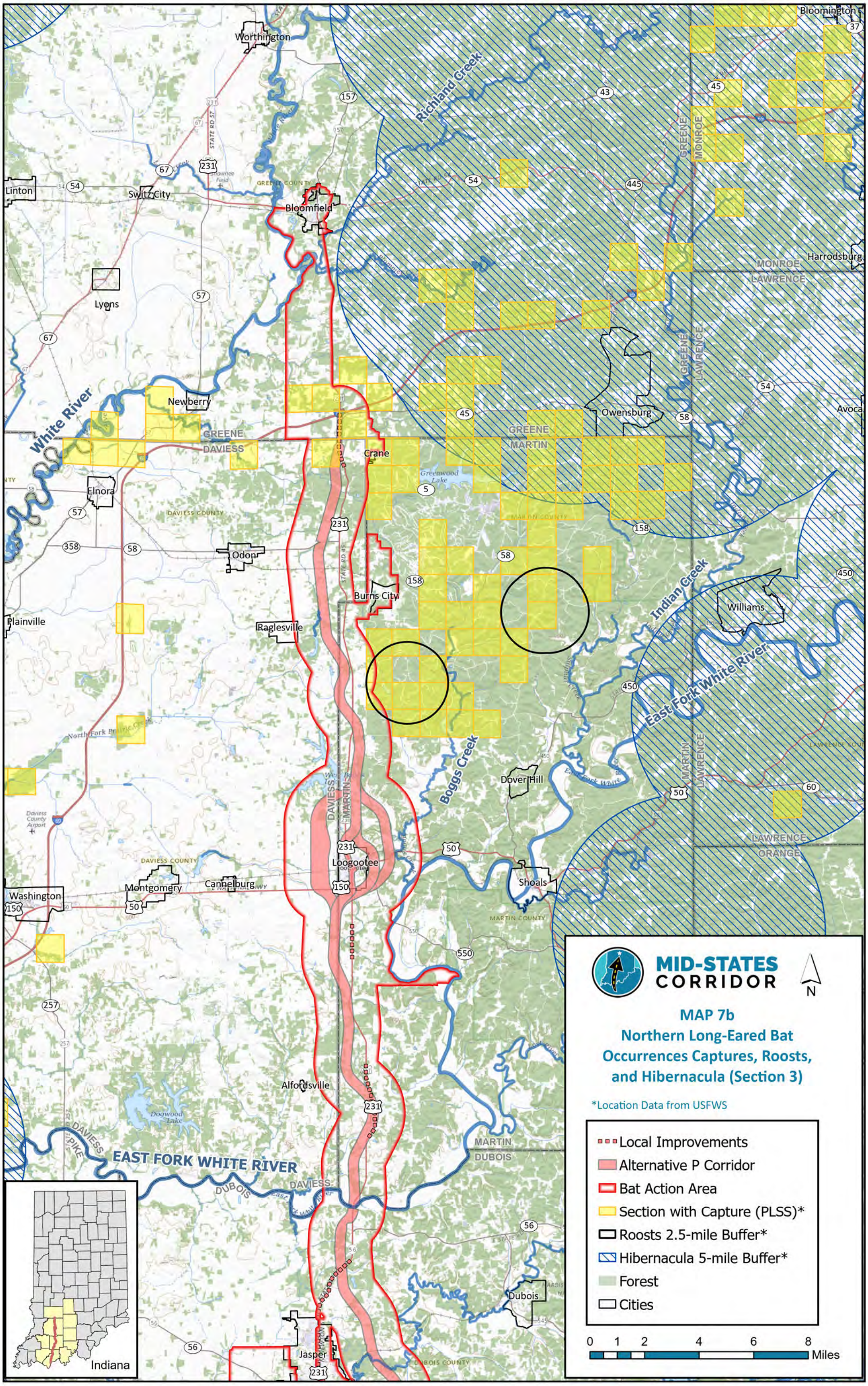

Washington
Montgomery
Cannelburg
Shoals
Alfordsville
DAVIESS
MARTIN
ORANGE
West Baden Springs
French Lick
DAVIESS PIKE
EAST FORK WHITE RIVER
DAVIESS
DUBOIS
MARTIN
DUBOIS
Dogwood Lake
Otwell
Dubois
Jasper
PATOKA RIVER
PIKE
DUBOIS
ORANGE
CRAWFORD
Beaver Creek Lake
Huntingburg
Huntingburg Lake
Birdseye
Holland
PIKE
WARRICK
DUBOIS
PERRY
Ferdinand
DUBOIS
WARRICK
DUBOIS
SPENCER
Dale
St. Meinrad
Indian Lake
Lake Celina
Tipsaw Lake
Gentryville
Santa Claus
Tennyson
Chrisney
SPENCER COUNTY
Grandview
Rockport
Indiana
MID-STATES CORRIDOR
MAP 6a
Indiana Bat Occurrences, Captures, Roosts, and Hibernacula (Section 2)
* Location Data from USFWS
Local Improvements
Alterantive P Corridor
Bat Action Area
Section with Capture (PLSS)*
Roosts 2.5-mile Buffer*
Hibernacula 5-mile Buffer (P3, P4)*
Forest
Cities
N
0 1 2 4 6 8 10
Miles

12/6/2022 cjb

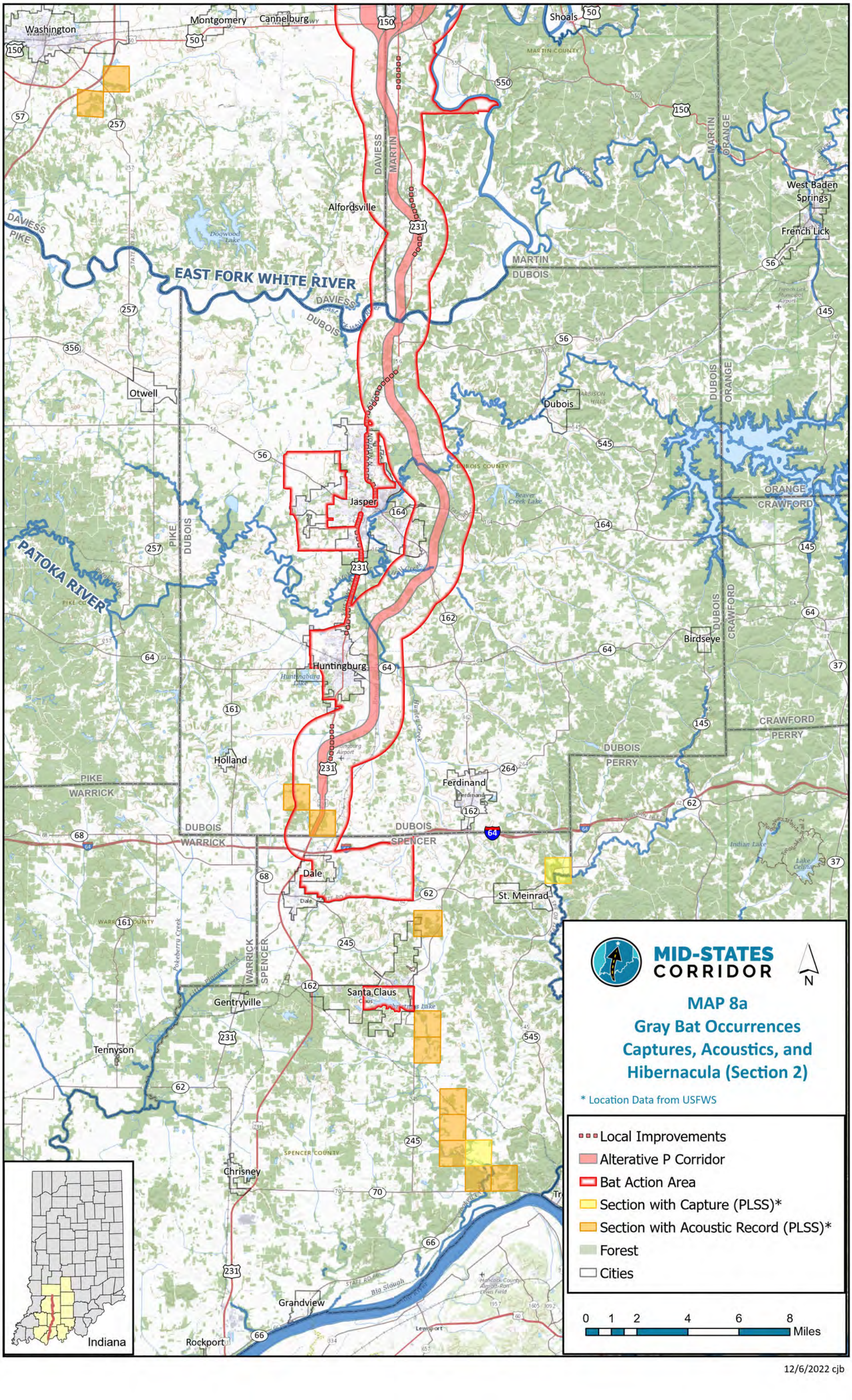

Bloomington
Worthington
Richland Creek
Linton
Switz City
Bloomfield
Harrodsburg
Lyons
Newberry
White River
Owensburg
Avoca
Crane
Greenwood Lake
Elnora
Odon
Burns City
Plainville
Raglesville
Williams
Indian Creek
East Fork White River
Boggs Creek
Dover Hill
North Fork Prairie Creek
Daviess County Airport
Loogootee
Montgomery
Cannelburg
Washington
Shoals
Alfordsville
Dogwood Lake
Dubois
Jasper
EAST FORK WHITE RIVER
GREENE
MONROE
LAWRENCE
DAVIESS
MARTIN
ORANGE
DUBOIS
PIKE
DAVIESS COUNTY
MARTIN COUNTY
DUBOIS COUNTY
Indiana
MID-STATES CORRIDOR
N
MAP 6b
Indiana Bat Occurrences, Captures, Roosts, and Hibernacula (Section 3)
* Location Data from USFWS
Local Improvements
Alterantive P Corridor
Bat Action Area
Section with Capture (PLSS)*
Roosts 2.5-mile Buffer*
Hibernacula 10-mile Buffer (P1, P2)*
Hibernacula 5-mile Buffer (P3, P4)*
Forest
Cities
0 1 2 4 6 8
Miles

12/6/2022 cjb

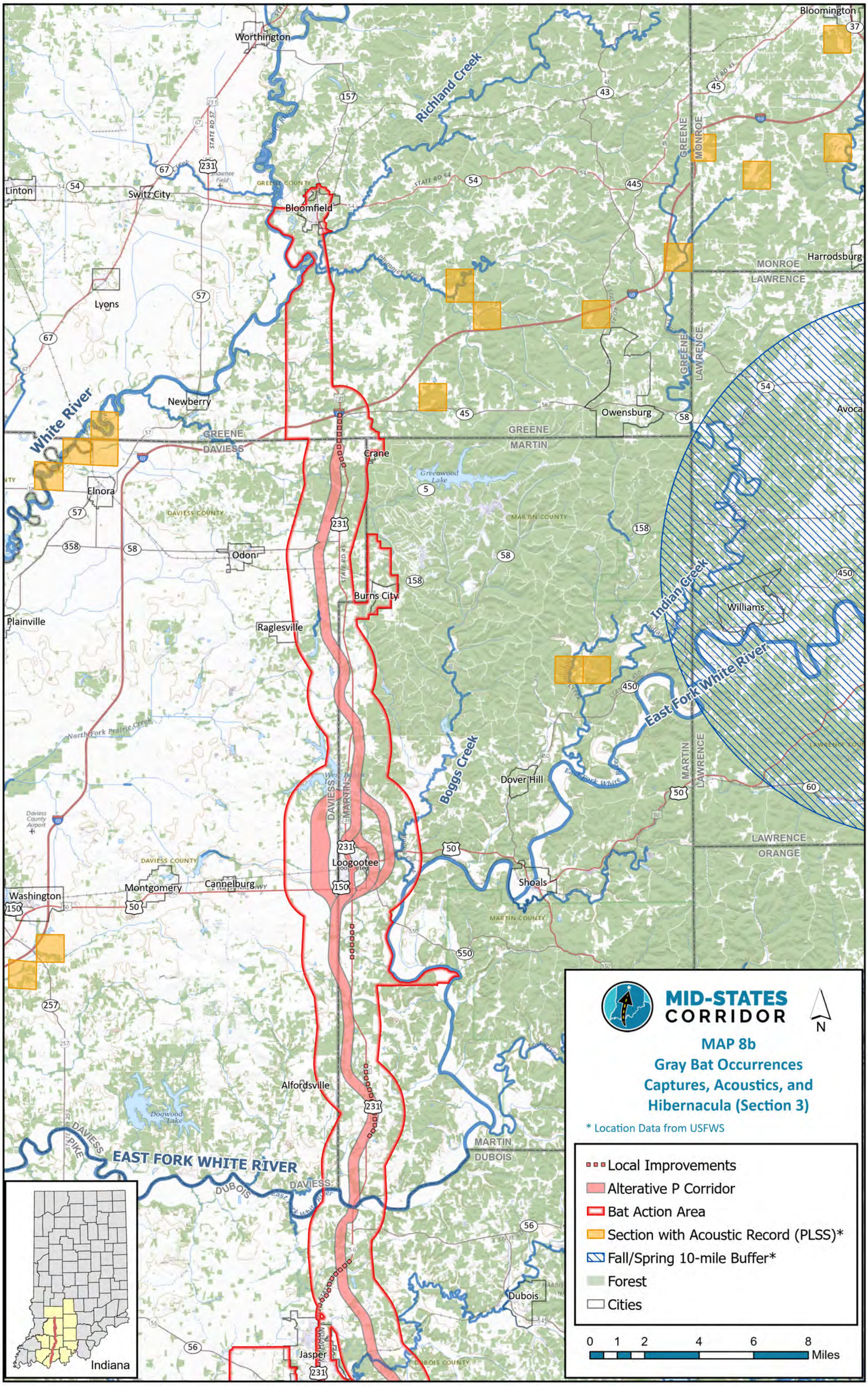

Washington
Montgomery
Cannelburg
Shoals
MARTIN COUNTY
DAVIESS
MARTIN
ORANGE
Alfordsville
West Baden Springs
French Lick
DAVIESS PIKE
Dogwood Lake
EAST FORK WHITE RIVER
DAVIESS
DUBOIS
MARTIN
DUBOIS
Otwell
Dubois
DUBOIS COUNTY
Beaver Creek Lake
ORANGE
CRAWFORD
Jasper
PIKE
DUBOIS
PATOKA RIVER
Huntingburg
Huntingburg Lake
Birdseye
DUBOIS
CRAWFORD
CRAWFORD
PERRY
Holland
DUBOIS
PERRY
PIKE
WARRICK
Ferdinand
DUBOIS
WARRICK
DUBOIS
SPENCER
Indian Lake
Dale
St. Meinrad
Pokeberry Creek
Little Pigeon Creek
WARRICK
SPENCER
Santa Claus
Gentryville
Tipsaw Lake
Tennyson
Sulphur Fork Creek
SPENCER
PERRY
SPENCER COUNTY
Chrisney
Grandview
Rockport
Indiana
MID-STATES CORRIDOR
N
MAP 7a
Northern Long-Eared Bat Occurrences: Captures, Roosts, and Hibernacula (Section 2)
* Location Data from USFWS
Local Improvements
Alternative P Corridor
Roosts 2.5-mile Buffer*
Bat Action Area
Section with Capture (PLSS)*
Hibernacula 5-mile Buffer*
Forest
Cities
0 1 2 4 6 8 10
Miles
12/6/2022 cjb


Worthington
Richland Creek
Bloomington
Linton
Switz City
Bloomfield
GREENE COUNTY
Harrodsburg
MONROE
LAWRENCE
Lyons
Newberry
White River
GREENE
DAVIESS
Crane
Greenwood Lake
Owensburg
GREENE
MARTIN
Avoca
Elnora
DAVIESS COUNTY
Odon
Burns City
Plainville
Raglesville
Williams
Indian Creek
East Fork White River
Boggs Creek
Dover Hill
Daviess County Airport
Loogootee
Shoals
Washington
Montgomery
Cannelburg
MARTIN COUNTY
LAWRENCE
ORANGE
Alfordsville
Dogwood Lake
EAST FORK WHITE RIVER
DUBOIS
DAVIESS
MARTIN
Dubois
Jasper
DUBOIS COUNTY
Indiana
MID-STATES CORRIDOR
N
MAP 7b
Northern Long-Eared Bat
Occurrences Captures, Roosts,
and Hibernacula (Section 3)
*Location Data from USFWS
Local Improvements
Alternative P Corridor
Bat Action Area
Section with Capture (PLSS)*
Roosts 2.5-mile Buffer*
Hibernacula 5-mile Buffer*
Forest
Cities
0 1 2 4 6 8
Miles

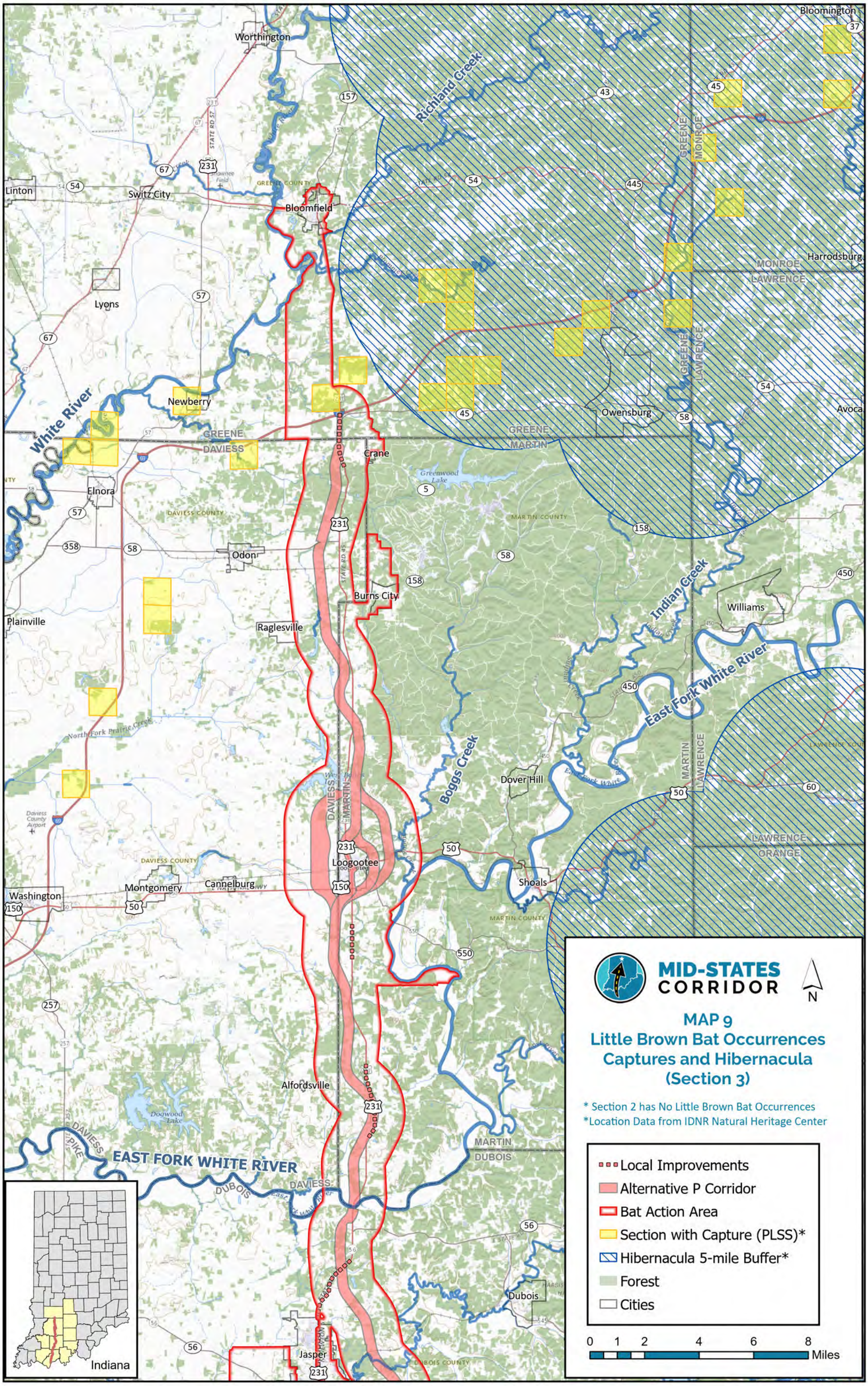
12/6/2022 cjb


Washington
Montgomery
Cannelburg
Shoals
MARTIN COUNTY
DAVIESS
MARTIN
ORANGE
West Baden Springs
French Lick
Alfordsville
DAVIESS PIKE
Dogwood Lake
EAST FORK WHITE RIVER
DAVIESS
DUBOIS
MARTIN
DUBOIS
Otwell
Dubois
DUBOIS COUNTY
Beaver Creek Lake
ORANGE
CRAWFORD
Jasper
PIKE
DUBOIS
PATOKA RIVER
Birdseye
DUBOIS
CRAWFORD
Huntingburg
Huntingburg Lake
Holland
CRAWFORD
PERRY
DUBOIS
PERRY
PIKE
WARRICK
Ferdinand
DUBOIS
WARRICK
DUBOIS
SPENCER
Indian Lake
Dale
St. Meinrad
Pokeberry Creek
WARRICK
SPENCER
Santa Claus
Gentryville
Tennyson
SPENCER COUNTY
Chrisney
Big Slough
Grandview
Rockport
Lewisport
Indiana
MID-STATES CORRIDOR
N
MAP 8a
Gray Bat Occurrences
Captures, Acoustics, and
Hibernacula (Section 2)
* Location Data from USFWS
Local Improvements
Alterative P Corridor
Bat Action Area
Section with Capture (PLSS)*
Section with Acoustic Record (PLSS)*
Forest
Cities
0 1 2 4 6 8
Miles

12/6/2022 cjb


Worthington
Richland Creek
Bloomington
Linton
Switz City
Bloomfield
GREENE COUNTY
Lyons
Harrodsburg
MONROE
LAWRENCE
Newberry
White River
Owensburg
GREENE
DAVIESS
MARTIN
Crane
Greenwood Lake
Avoca
Elnora
DAVIESS COUNTY
MARTIN COUNTY
Odon
Burns City
Plainville
Raglesville
Williams
Indian Creek
East Fork White River
Boggs Creek
Dover Hill
LAWRENCE
ORANGE
North Fork Prairie Creek
Daviess County Airport
Loogootee
Montgomery
Cannelburg
Washington
Shoals
Alfordsville
Dogwood Lake
EAST FORK WHITE RIVER
DUBOIS
Jasper
Dubois
Indiana
MID-STATES CORRIDOR
N
MAP 8b
Gray Bat Occurrences
Captures, Acoustics, and
Hibernacula (Section 3)
* Location Data from USFWS
Local Improvements
Alterative P Corridor
Bat Action Area
Section with Acoustic Record (PLSS)*
Fall/Spring 10-mile Buffer*
Forest
Cities
0 1 2 4 6 8
Miles

12/6/2022 cjb


Worthington
Bloomington
Richland Creek
Linton
Switz City
Bloomfield
GREENE COUNTY
Lyons
Harrodsburg
MONROE
LAWRENCE
Newberry
White River
Owensburg
Avoca
GREENE
DAVIESS
GREENE
MARTIN
Crane
Greenwood Lake
Elnora
DAVIESS COUNTY
Odon
MARTIN COUNTY
Burns City
Plainville
Raglesville
Indian Creek
Williams
East Fork White River
Boggs Creek
North Fork Prairie Creek
Dover Hill
Daviess County Airport
Loogootee
Shoals
Washington
Montgomery
Cannelburg
Dogwood Lake
Alfordsville
EAST FORK WHITE RIVER
Dubois
Jasper
Indiana
MID-STATES CORRIDOR
N
MAP 9
Little Brown Bat Occurrences
Captures and Hibernacula
(Section 3)
* Section 2 has No Little Brown Bat Occurrences
*Location Data from IDNR Natural Heritage Center
Local Improvements
Alternative P Corridor
Bat Action Area
Section with Capture (PLSS)*
Hibernacula 5-mile Buffer*
Forest
Cities
0 1 2 4 6 8
Miles

12/6/2022 cjb

Worthington
Bloomington
Richland Creek
Linton
Switz City
Bloomfield
GREENE COUNTY
Lyons
Harrodsburg
MONROE
LAWRENCE
Newberry
White River
Owensburg
Avoca
GREENE
DAVIESS
GREENE
MARTIN
Crane
Greenwood Lake
Elnora
DAVIESS COUNTY
MARTIN COUNTY
Odon
Burns City
Plainville
Raglesville
Williams
Indian Creek
East Fork White River
North Fork Prairie Creek
Boggs Creek
Dover Hill
Daviess County Airport
DAVIESS
MARTIN
MARTIN
LAWRENCE
LAWRENCE
ORANGE
Loogootee
DAVIESS COUNTY
Washington
Montgomery
Cannelburg
Shoals
MARTIN COUNTY
Alfordsville
Dogwood Lake
DAVIESS
PIKE
EAST FORK WHITE RIVER
DUBOIS
DAVIESS
MARTIN
DUBOIS
Dubois
Jasper
DUBOIS COUNTY
Indiana

MID-STATES CORRIDOR

N

MAP 10
Tricolored Bat Occurrences Captures and Hibernacula (Section 3)

* Section 2 has No Tricolored Bat Occurrences
*Location Data from IDNR Natural Heritage Database

- Local Improvements
- Alternative P Corridor
- Bat Action Area
- Section with Capture (PLSS)*
- Hibernacula 5-mile Buffer*
- Forest
- Cities

0 1 2 4 6 8 Miles

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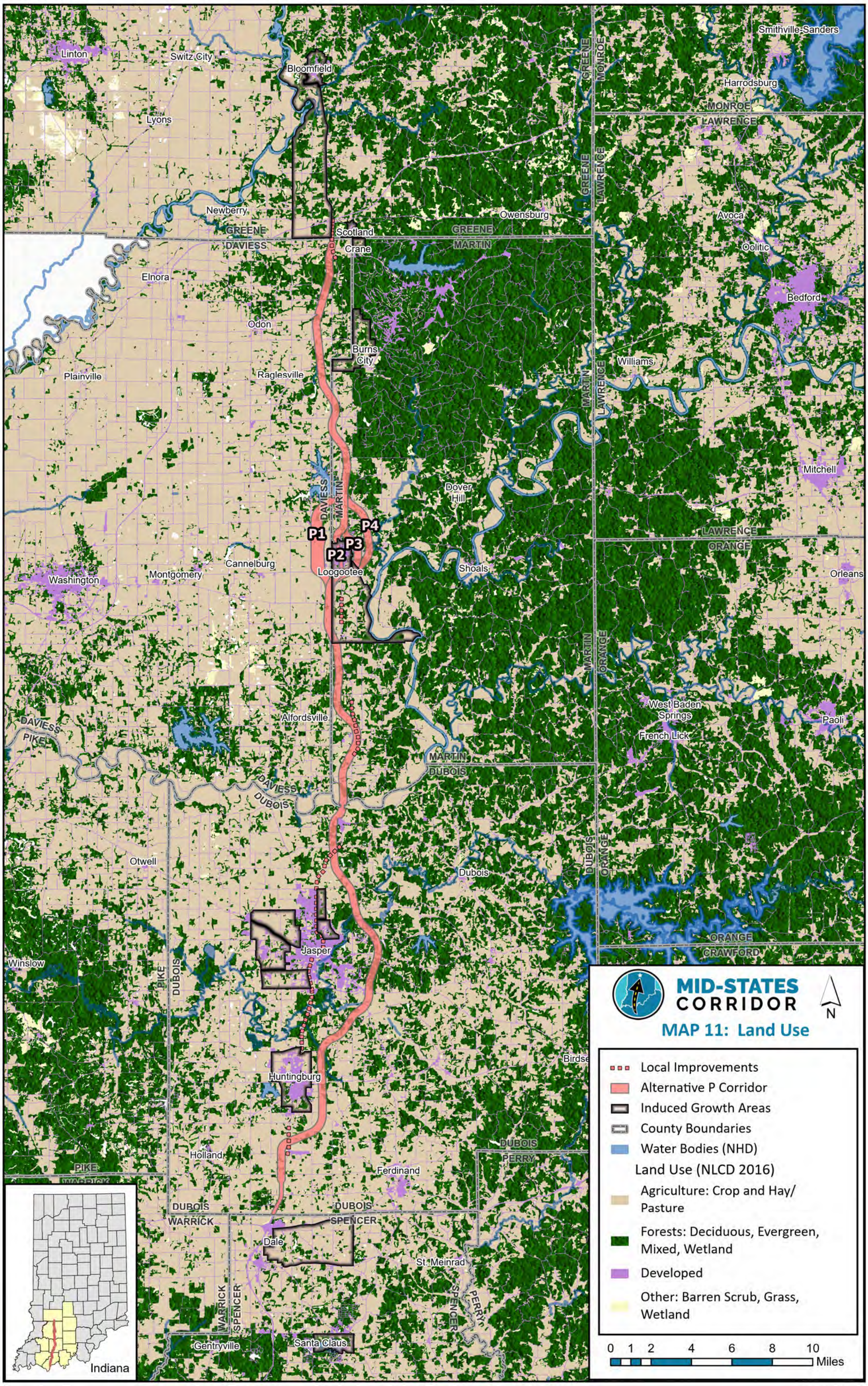
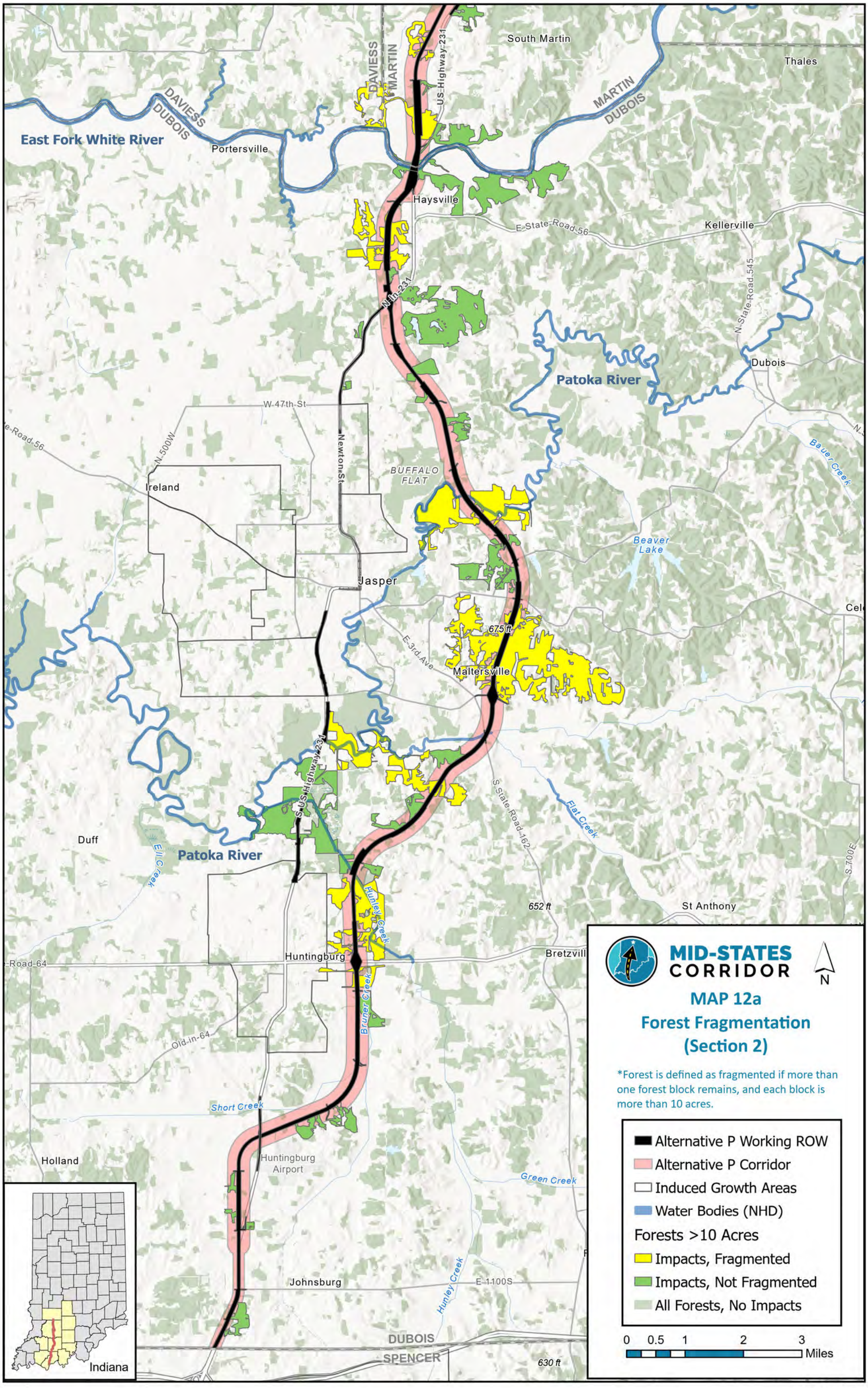

Linton
Switz City
Bloomfield
Lyons
Newberry
GREENE
DAVIESS
Scotland
Crane
Owensburg
GREENE
MARTIN
Elnora
Odon
Burns City
Plainville
Raglesville
Smithville-Sanders
MONROE
GREENE
Harrodsburg
MONROE
LAWRENCE
LAWRENCE
GREENE
Avoca
Oolitic
Bedford
Williams
MARTIN
LAWRENCE
Mitchell
DAVIESS
MARTIN
Dover Hill
P1
P2
P3
P4
LAWRENCE
ORANGE
Orleans
Cannelburg
Loogootee
Shoals
Washington
Montgomery
MARTIN
ORANGE
West Baden Springs
Paoli
French Lick
Alfordsville
DAVIESS
PIKE
MARTIN
DUBOIS
DAVIESS
DUBOIS
Otwell
Dubois
DUBOIS
ORANGE
ORANGE
CRAWFORD
Jasper
Winslow
PIKE
DUBOIS
Huntingburg
Birdse
Holland
PIKE
Ferdinand
DUBOIS
PERRY
DUBOIS
WARRICK
SPENCER
Dale
St. Meinrad
WARRICK
SPENCER
SPENCER
PERRY
Gentryville
Santa Claus
Indiana
MID-STATES CORRIDOR
N
MAP 11: Land Use
Local Improvements
Alternative P Corridor
Induced Growth Areas
County Boundaries
Water Bodies (NHD)
Land Use (NLCD 2016)
Agriculture: Crop and Hay/ Pasture
Forests: Deciduous, Evergreen, Mixed, Wetland
Developed
Other: Barren Scrub, Grass, Wetland
0 1 2 4 6 8 10
Miles

12/6/2022 cjb


East Fork White River
DAVIESS
DUBOIS
Portersville
DAVIESS
MARTIN
US-Highway-231
South Martin
Thales
MARTIN
DUBOIS
Haysville
E-State-Road-56
Kellerville
N-In-231
N-State-Road-545
Dubois
Patoka River
W-47th-St
N-500W
Newtons-St
BUFFALO FLAT
Ireland
Bauer Creek
Beaver Lake
Jasper
675 ft
E-3rd-Ave
Maltersville
S-US-Highway-231
S-State-Road-162
Flat Creek
S-700E
Duff
Patoka River
Ell Creek
652 ft
St Anthony
Huntingburg
Bretzville
Bruner Creek
Old-in-64
Short Creek
Holland
Huntingburg Airport
Green Creek
Johnsburg
E-1100S
Hunley Creek
DUBOIS
SPENCER
630 ft
Indiana
MID-STATES CORRIDOR
N
MAP 12a
Forest Fragmentation
(Section 2)
*Forest is defined as fragmented if more than one forest block remains, and each block is more than 10 acres.
Alternative P Working ROW
Alternative P Corridor
Induced Growth Areas
Water Bodies (NHD)
Forests >10 Acres
Impacts, Fragmented
Impacts, Not Fragmented
All Forests, No Impacts
0 0.5 1 2 3
Miles
12/6/2022 cjb

Newberry
BREWER HILL
GREENE
DAVIESS
650 ft
671 ft
N County Road 900 E
Doans Creek
231
Doans
E State Road 58
891 ft
Owensburg
GREENE
MARTIN
First Creek
Crane
Lake Greenwood
748 ft
847 ft
760 ft
First Creek
Farlen
Odon
E State Road 58
E State Road 58
Burns City
Raglesville
Bramble
Epsom
E County Road 800 N
N County Road 650 E
N County Road 900 E
PEGEON RIDGE
Trinity Springs
640 ft
West Boggs Lake
DAVIESS
MARTIN
Dover Hill
East Fork White River
N State Road 450
Willow V
US Highway 50
US Highway 50
Shoals
Loogootee
Flat Creek
Montgomery
Cannelburg
Mt Pleasant
Pleasant Valley
Lacy
572 ft
Whitfield
620 ft
US Highway 231
Alfordsville
South Martin
East Fork White River
Portersville
Haysville
E State Road 56
Indiana

MID-STATES CORRIDOR

N

MAP 12a
Forest Fragmentation (Section 3)

*Forest is defined as fragmented if more than one forest block remains, and each block is more than 10 acres.

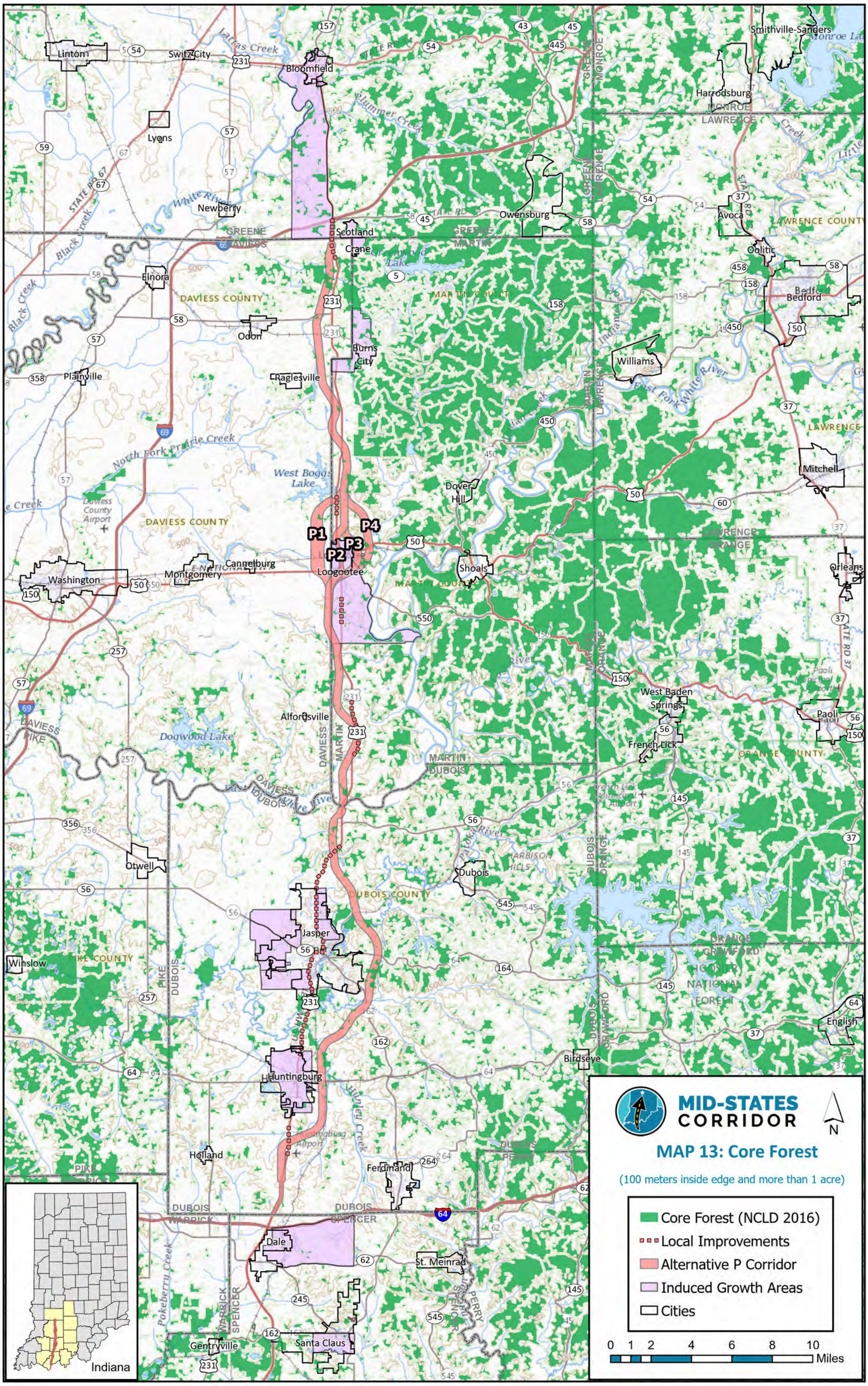
- Alternative P Working ROW
- Alternative P Corridor
- Induced Growth Areas
- Water Bodies (NHD)

Forests >10 Acres

- Impacts, Fragmented
- Impacts, Not Fragmented
- All Forests, No Impacts

0 0.5 1 2 3 4 Miles

12/6/2022 cjb


Linton
Switz City
Bloomfield
Lyons
Newberry
Scotland
Crane
Elnora
Odon
Burns City
Plainville
Raglesville
Owensburg
Harrodsburg
Smithville-Sanders
Avoca
Oolitic
Bedford
Williams
Mitchell
Dover Hill
Shoals
Orleans
Washington
Montgomery
Cannelburg
Loogootee
Alfordsville
West Baden Springs
French Lick
Paoli
Otwell
Dubois
Jasper
Winslow
Huntingburg
Holland
Ferdinand
Dale
St. Meinrad
Gentryville
Santa Claus
Birdseye
English
P1
P2
P3
P4
GREENE
DAVIESS
DAVIESS COUNTY
MARTIN
MARTIN COUNTY
LAWRENCE
LAWRENCE COUNTY
MONROE
ORANGE
ORANGE COUNTY
DUBOIS
DUBOIS COUNTY
PIKE
PIKE COUNTY
WARRICK
SPENCER
PERRY
CRAWFORD
HOOSIER NATIONAL FOREST
Lattas Creek
Plummer Creek
White River
Black Creek
North Fork Prairie Creek
West Boggs Lake
Dogwood Lake
Patoka River
Huntingburg Airport
Daviess County Airport
French Lick Municipal Airport
Paoli Municipal Airport
Indiana
MID-STATES CORRIDOR
N
MAP 13: Core Forest
(100 meters inside edge and more than 1 acre)
Core Forest (NCLD 2016)
Local Improvements
Alternative P Corridor
Induced Growth Areas
Cities
0 1 2 4 6 8 10
Miles

12/5/2022 cjb

East Fork White River South Colony

Wening-Sherritt Seep Springs Colony

Patoka River Colony

Hunley Creek Colony

Buffalo Pond Colony

Dogwood Lake

South Martin

Thales

US Highway 231

Portersville

Haysville

56

Kellerville

N In-231

231

Dubois

545

Newton St

Ireland

Beaver Lake

Jasper

164

Celestine

Maltersville

Dubois

S US Highway 231

162

Duff

Huntingburg

64

Bretzville

161

Huntingburg Airport

Holland

Ferdin

Johnsburg

Indiana

MID-STATES CORRIDOR

N

MAP 14a - Section 2
Indiana Bat, Little Brown Bat, and Tricolored Bat Colonies

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Corridor
- Water Bodies (NHD)

Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

- Agriculture: Crop and Hay/ Pasture
- Forests: Deciduous, Evergreen, Mixed, Wetland
- Developed
- Other: Barren Scrub, Grass, Wetland

0 1 2 4 Miles

12/5/2022 cjb

MID-STATES CORRIDOR

N

MAP 14b - Section 3
Indiana Bat, Little Brown Bat, and Tricolored Bat Colonies

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Corridor
- Water Bodies (NHD)

Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

- Agriculture: Crop and Hay/ Pasture
- Forests: Deciduous, Evergreen, Mixed, Wetland
- Developed
- Other: Barren Scrub, Grass, Wetland

0 1 2 4 Miles

First Creek Colony

North Fork Prairie Creek Colony

West Boggs Creek Colony

East Fork White River North Colony

Haw Creek Colony

Newberry
Doans
Crane
Lake Greenwood
Farlen
Odon
Burns City
Raglesville
Bramble
Trinity Springs
Dover Hill
West Boggs Lake
Martin
Willow Va
Loogootee
US Highway 50
Shoals
Cannelburg
Mt Pleasant
Pleasant Valley
Lacy
Whitfield
Windom
Rusk
Alfordsville
US Highway 231
Indiana

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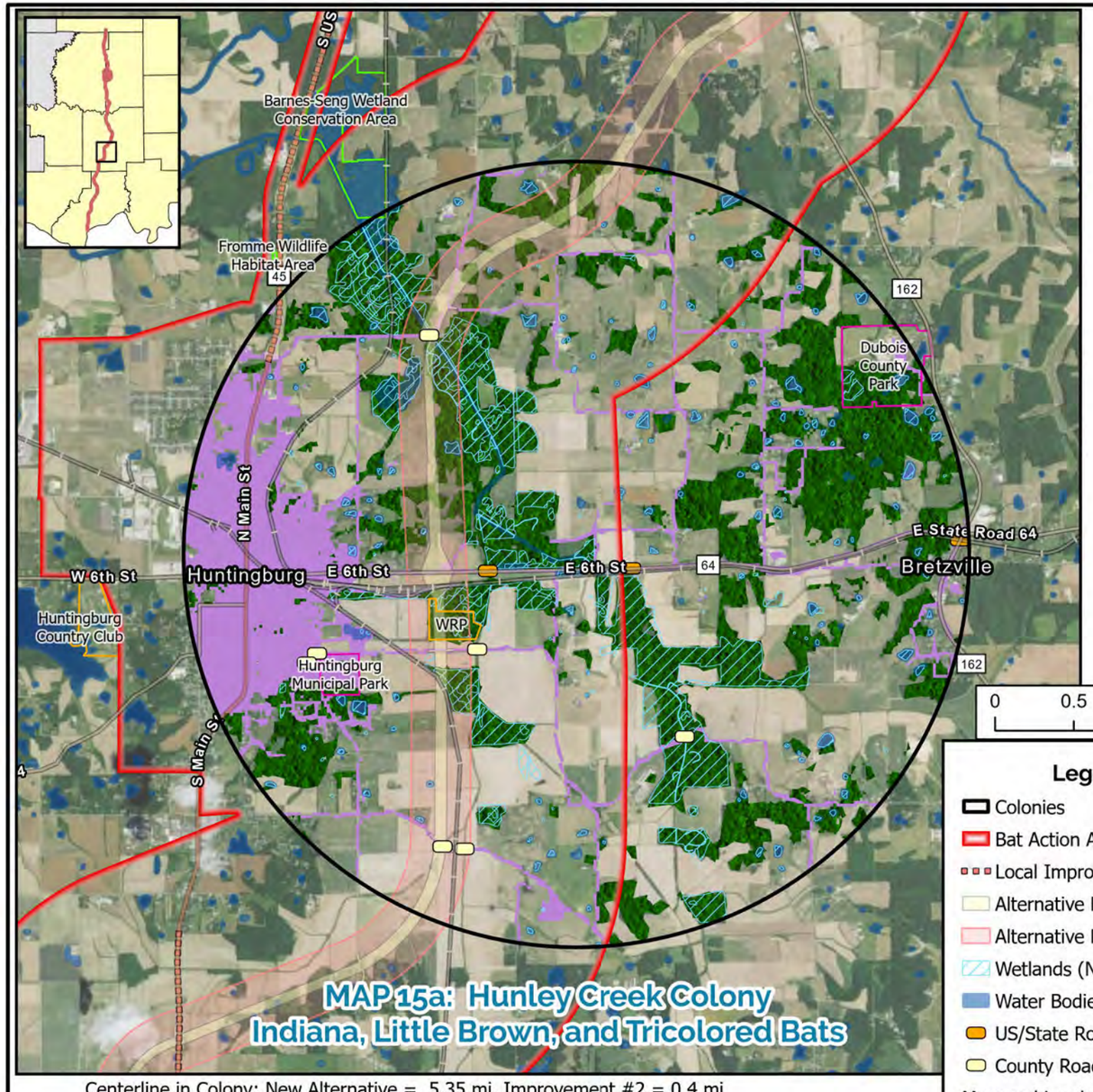


Centerline in Colony: New Alternative = 5.35 mi, Improvement #2 = 0.4 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	12566	100.0%	7864	100.0%	1296	100.0%	305	100.0%
Agriculture	7478	59.5%	4723	60.1%	852	65.8%	202	66.2%
Forest	3317	26.4%	1709	21.7%	389	30.0%	68	22.2%
Developed	1534	12.2%	1320	16.8%	39	3.0%	26	8.7%
Other	236	1.9%	112	1.4%	15	1.2%	9	3.0%
NWI Wetlands	1235	9.8%	792	10.1%	145	11.2%	18	5.9%

0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

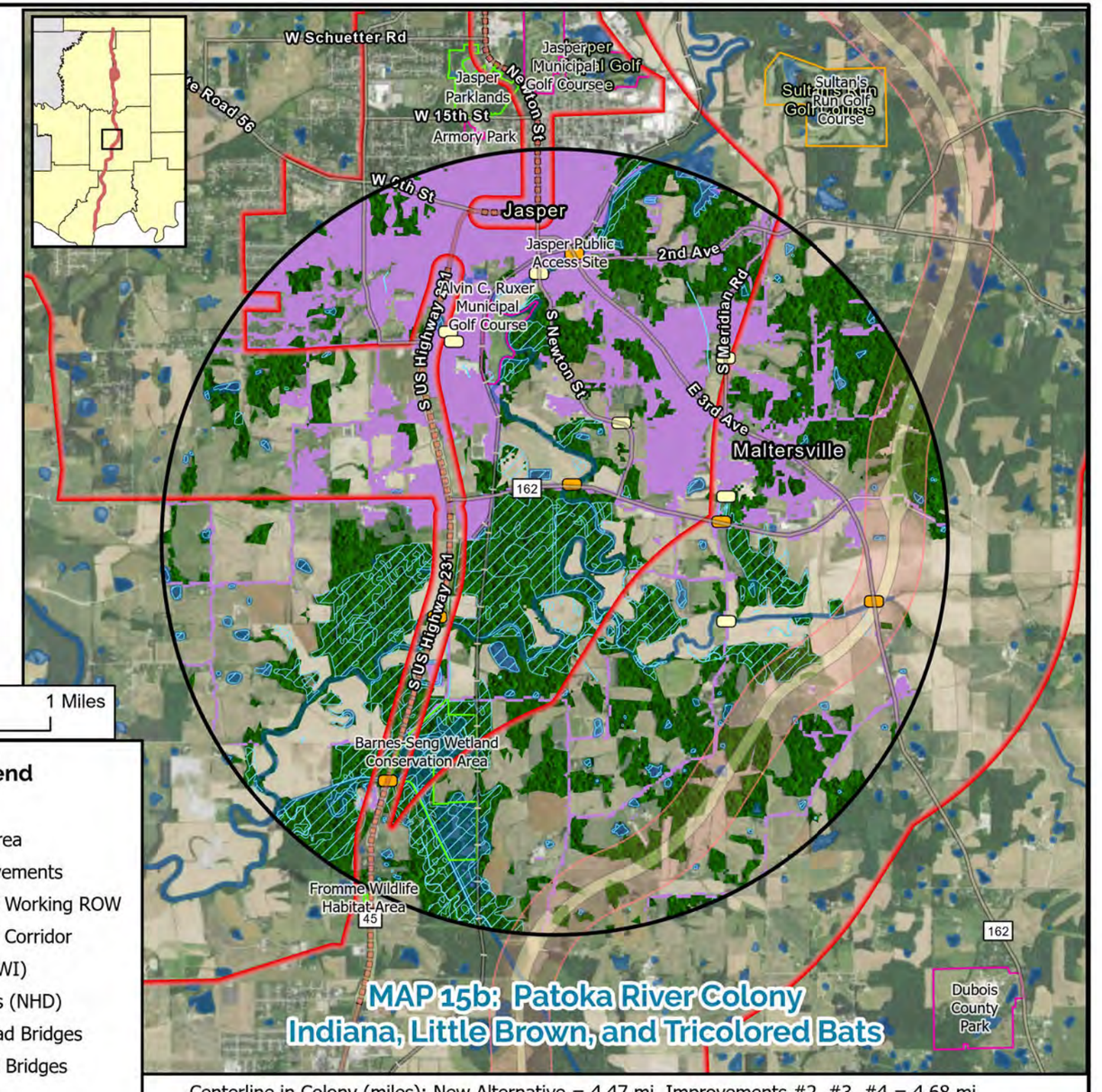
Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

- Forests
- Developed

N



Centerline in Colony (miles): New Alternative = 4.47 mi, Improvements #2, #3, #4 = 4.68 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	12566	100.0%	6754	100.0%	1079	100.0%	390	100.0%
Agriculture	5454	43.4%	3392	50.2%	667	61.8%	159	40.8%
Forest	4281	34.1%	2250	33.3%	376	34.8%	103	26.4%
Developed	2598	20.7%	960	14.2%	31	2.8%	75	19.2%
Other	234	1.9%	152	2.3%	6	0.5%	53	13.6%
NWI Wetlands	1789	14.2%	662	9.8%	41	3.8%	15	3.9%

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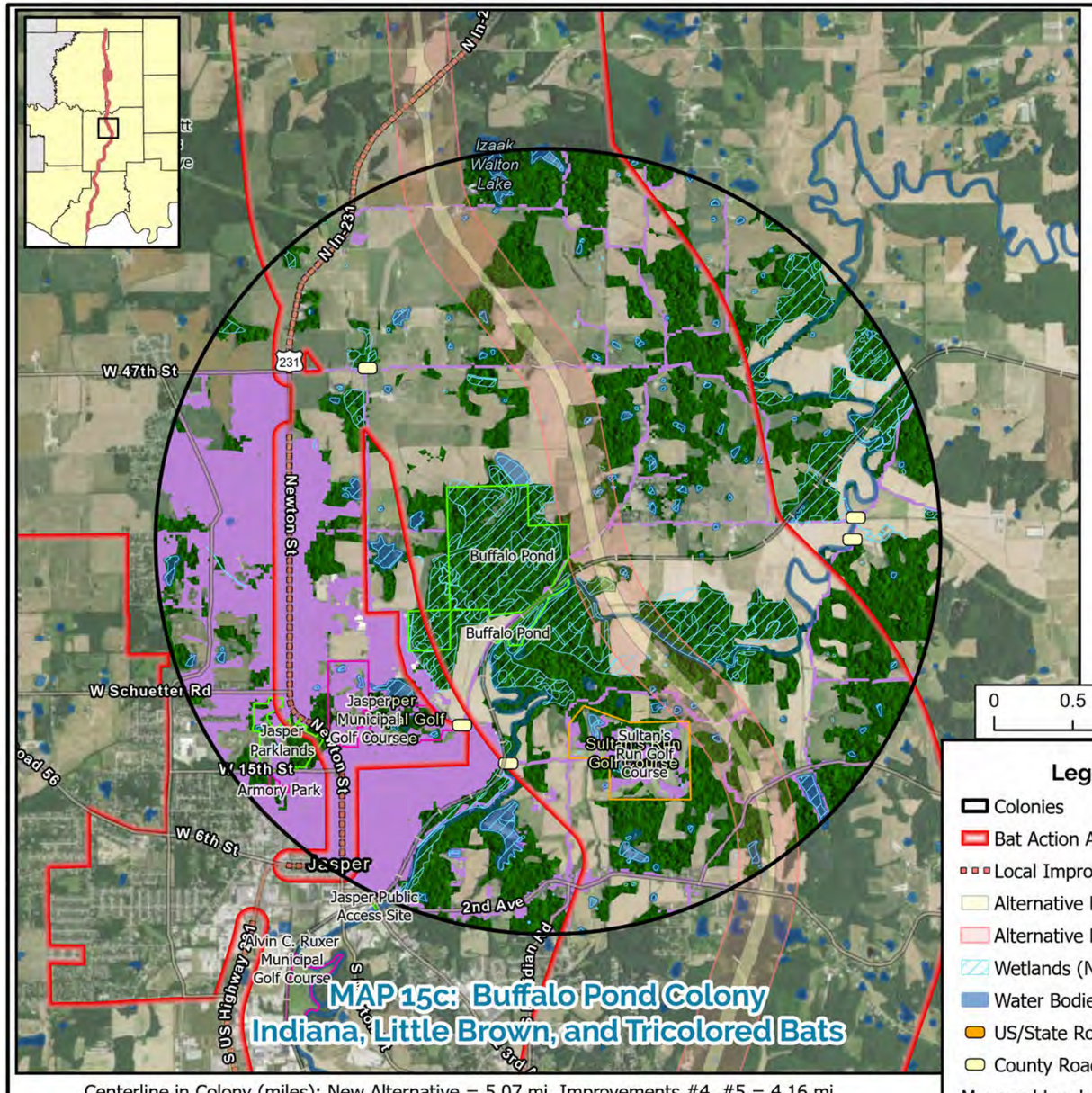
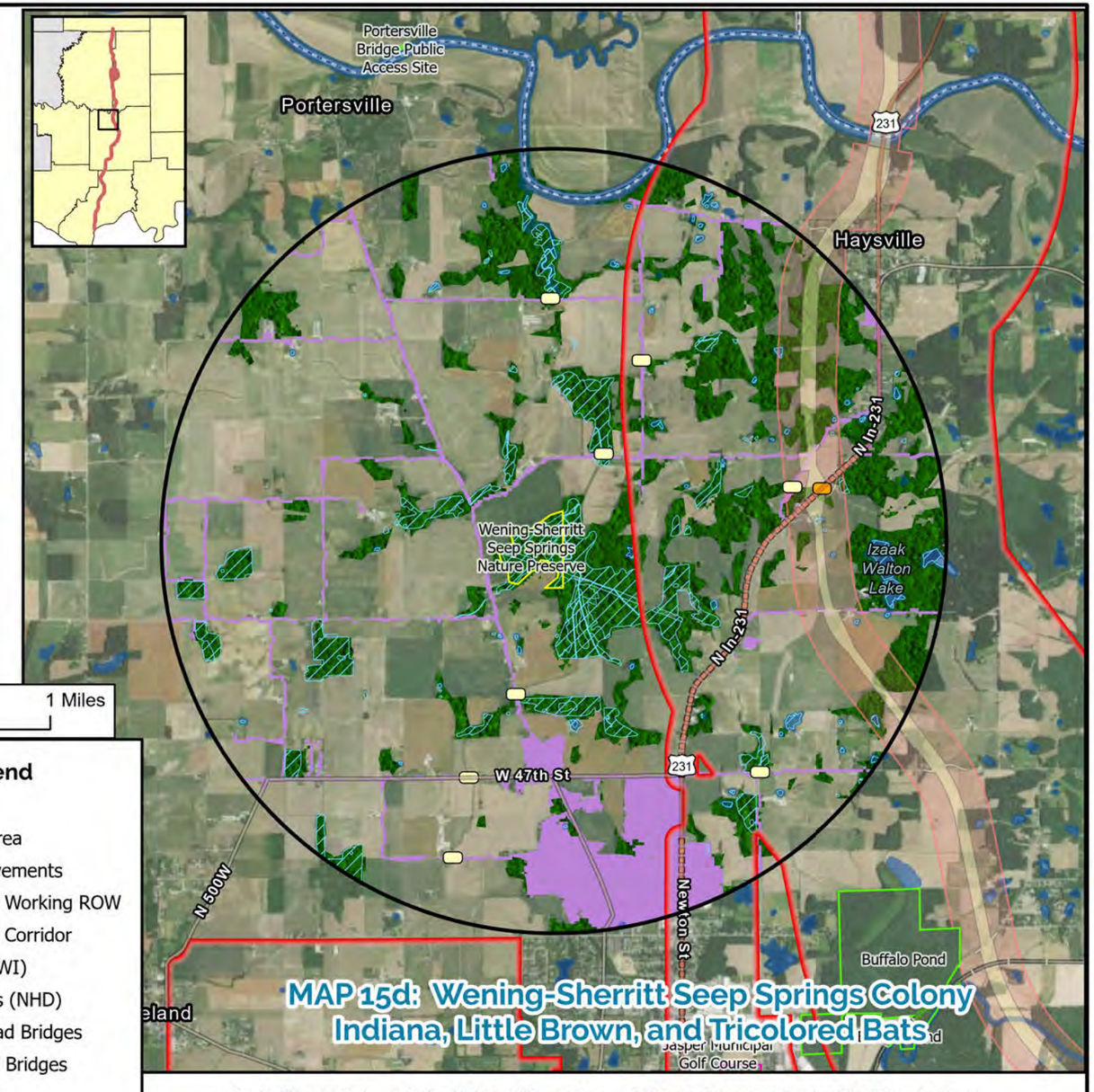


MAP 15c: Buffalo Pond Colony
Indiana, Little Brown, and Tricolored Bats



MAP 15d: Wening-Sherritt Seep Springs Colony
Indiana, Little Brown, and Tricolored Bats

0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

Managed Lands
- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)
- Forests
- Developed

N

Centerline in Colony (miles): New Alternative = 5.07 mi, Improvements #4, #5 = 4.16 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	12566	100.00%	8646	100.00%	1225	100.00%	327	100.00%
Agriculture	5475	43.6%	4097	47.4%	797	65.0%	188	57.4%
Forest	4413	35.1%	3176	36.7%	362	29.5%	73	22.2%
Developed	2432	19.4%	1200	13.9%	41	3.3%	57	17.5%
Other	246	2.0%	172	2.0%	26	2.1%	10	2.9%
NWI Wetlands	1440	11.5%	963	11.1%	62	5.1%	5	1.5%

Centerline in Colony (miles): New Alternative = 3.14 mi, Improvements #4, #5 = 2.91 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	12566	100.00%	4481	100.00%	759	100.00%	228	100.00%
Agriculture	8705	69.3%	2647	59.1%	473	62.3%	98	43.0%
Forest	2745	21.8%	1467	32.7%	250	32.9%	71	31.0%
Developed	976	7.8%	281	6.3%	24	3.1%	46	20.1%
Other	140	1.1%	86	1.9%	13	1.8%	13	5.8%
NWI Wetlands	736	5.9%	173	3.9%	6	0.8%	1	0.3%

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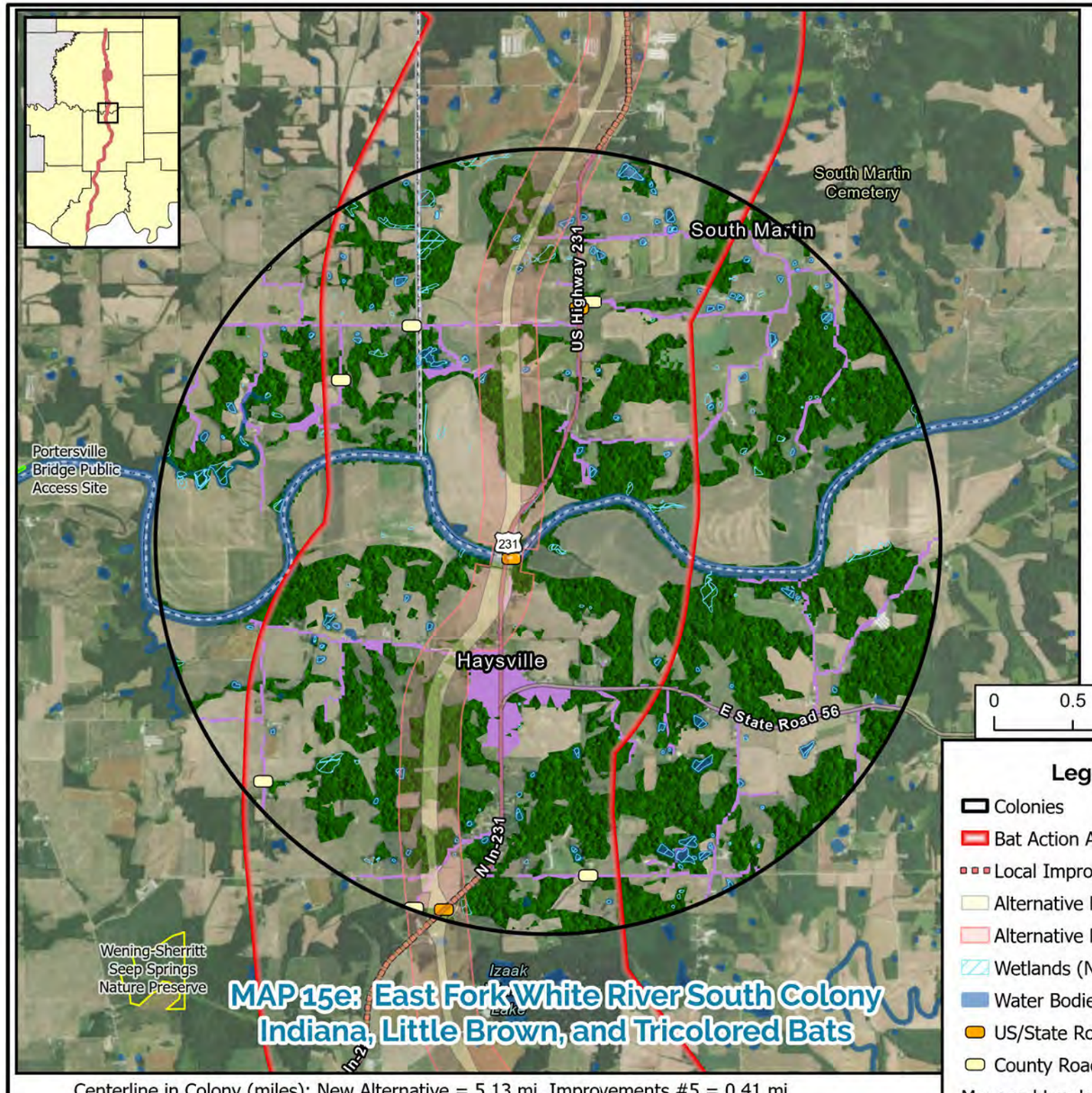


MAP 15e: East Fork White River South Colony
Indiana, Little Brown, and Tricolored Bats

Centerline in Colony (miles): New Alternative = 5.13 mi, Improvements #5 = 0.41 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	12566	100.00%	7405	100.0%	1210	100.00%	336	100.00%
Agriculture	7102	56.5%	4234	57.2%	699	57.8%	152	45.3%
Forest	4481	35.7%	2586	34.9%	435	36.0%	145	43.0%
Developed	611	4.9%	394	5.3%	54	4.4%	30	9.0%
Other	372	3.0%	191	2.6%	22	1.8%	9	2.7%
NWI Wetlands	201	1.6%	114	1.5%	15	1.2%	1	0.3%

0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

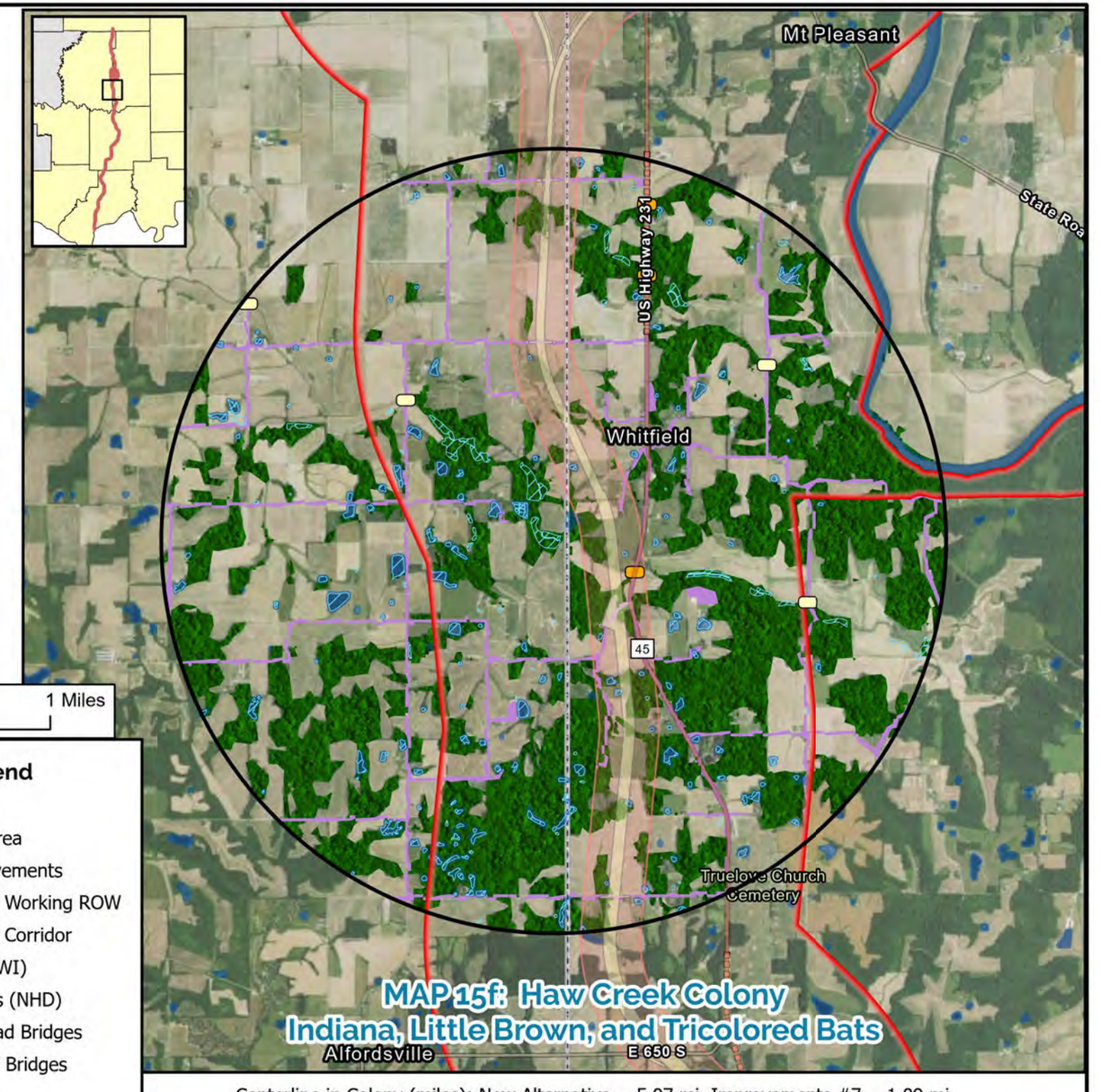
Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

- Forests
- Developed

N



MAP 15f: Haw Creek Colony
Indiana, Little Brown, and Tricolored Bats

Centerline in Colony (miles): New Alternative = 5.07 mi, Improvements #7 = 1.09 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	12566	100.00%	8286	100.00%	1228	100.00%	261	100.00%
Agriculture	7425	59.1%	4750	57.3%	854	69.5%	194	74.3%
Forest	4395	35.0%	3027	36.5%	299	24.4%	41	15.7%
Developed	584	4.6%	413	5.0%	64	5.2%	21	8.2%
Other	162	1.3%	96	1.2%	12	1.0%	5	1.8%
NWI Wetlands	229	1.8%	172	2.1%	7	0.5%	0	0.2%

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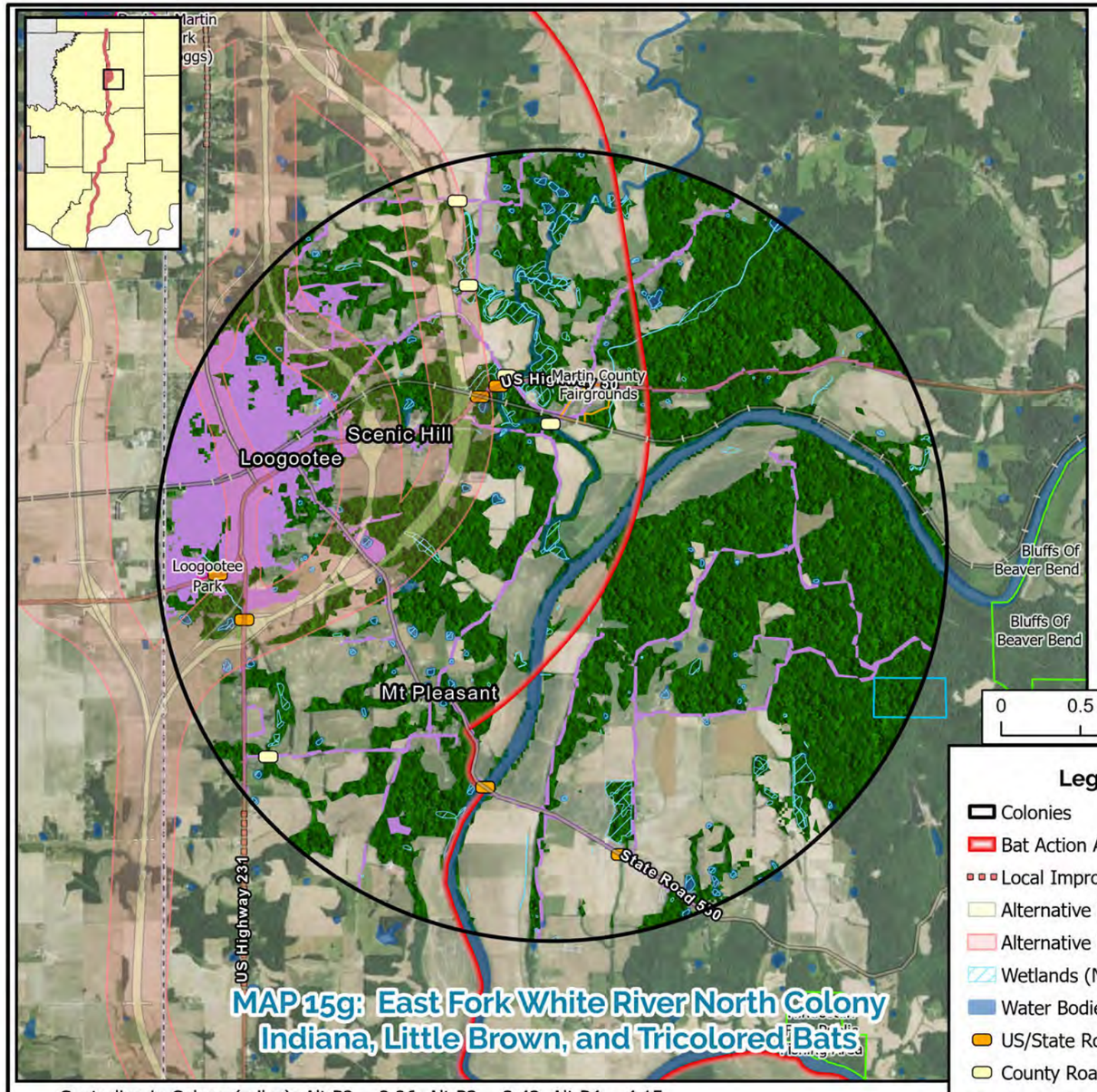


MAP 15g: East Fork White River North Colony
Indiana, Little Brown, and Tricolored Bats

Centerline in Colony (miles): Alt P2 = 2.26, Alt P3 = 3.42, Alt P4 = 4.15

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	12566	100.00%	6727	100.00%	1005	100.00%	230	100.00%
Agriculture	5238	41.7%	2960	44.0%	483	48.1%	107	46.6%
Forest	5695	45.3%	2536	37.7%	431	42.9%	108	46.7%
Developed	1285	10.2%	1087	16.2%	74	7.4%	13	5.6%
Other	347	2.8%	144	2.1%	17	1.7%	3	1.1%
NWI Wetlands	310	2.5%	203	3.0%	31	3.1%	3	1.5%

0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

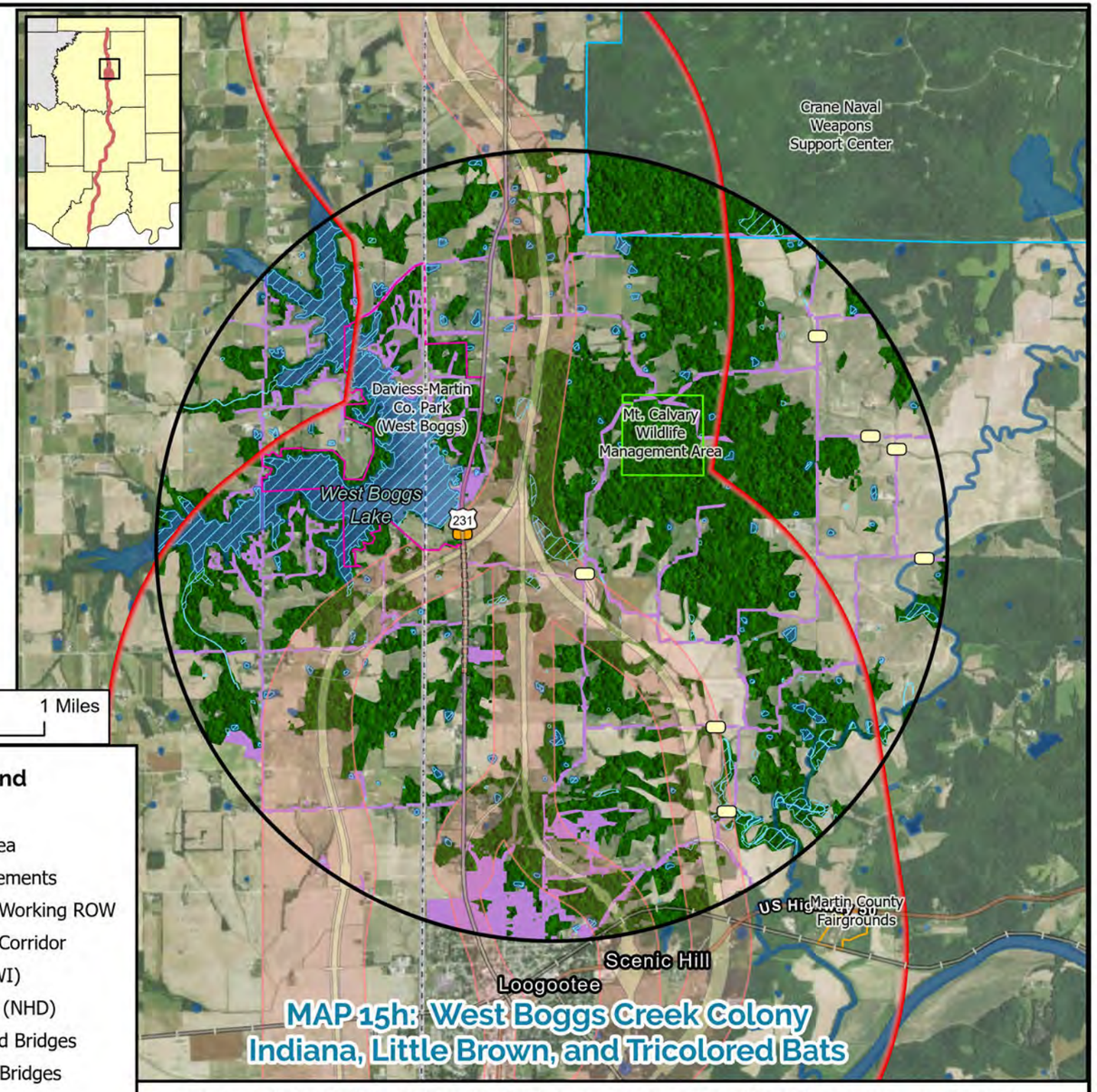
Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

- Forests
- Developed

N

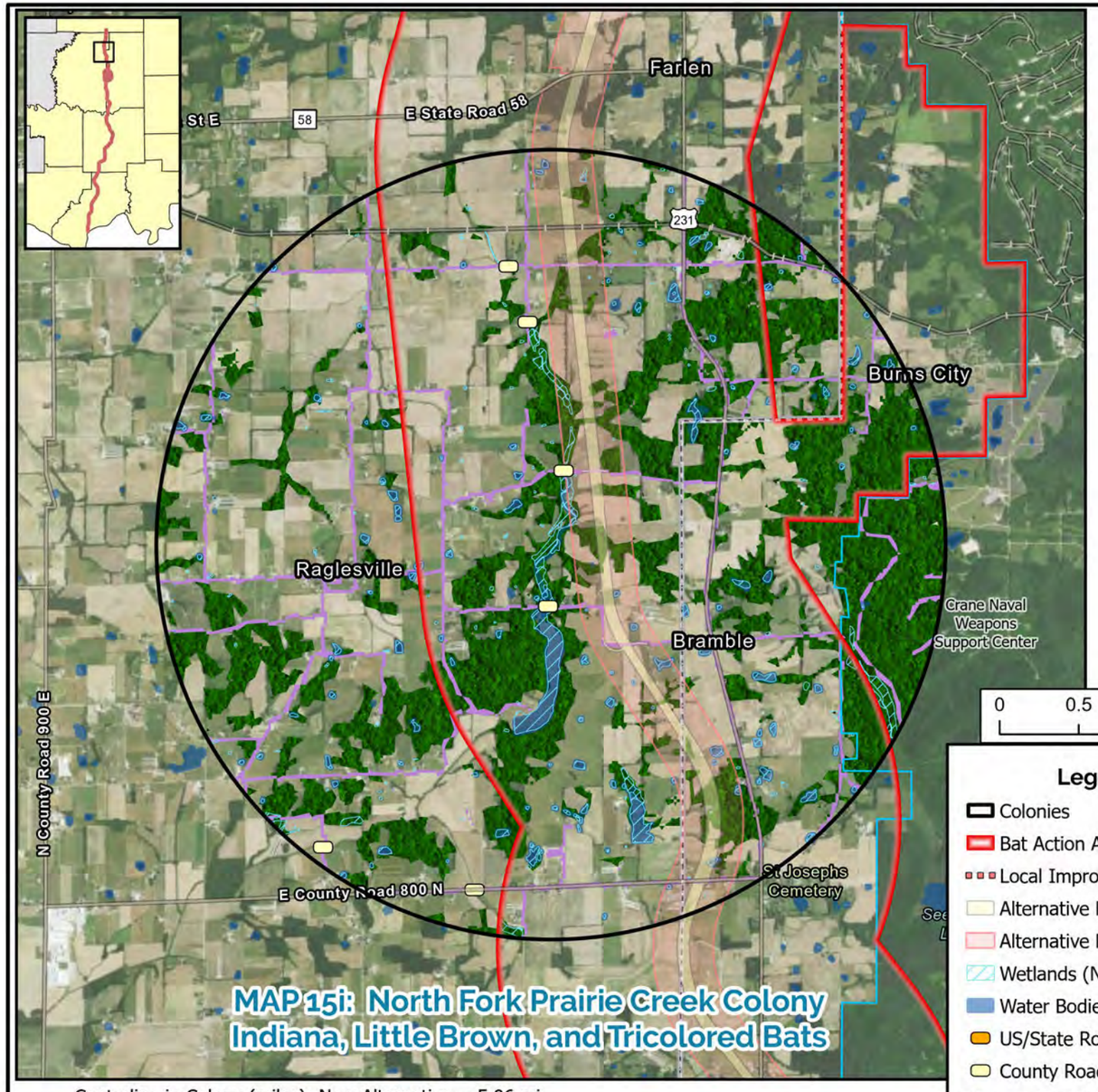


MAP 15h: West Boggs Creek Colony
Indiana, Little Brown, and Tricolored Bats

Centerline in Colony (miles): Alt P1 - 5.24, Alt P2 = 5.11, Alt P3 = 5.24, Alt P4 = 5.21; Improvement #8 = 0.78

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	12566	100.00%	10029	100.00%	1261	100.00%	244	100.00%
Agriculture	5950	47.4%	4437	44.2%	727	57.7%	153	62.7%
Forest	4906	39.0%	4168	41.6%	463	36.7%	73	29.8%
Developed	943	7.5%	803	8.0%	51	4.1%	16	6.5%
Other	767	6.1%	621	6.2%	19	1.5%	3	1.0%
NWI Wetlands	857	6.8%	673	6.7%	46	3.6%	1	0.4%

12/5/2022 cjb



MAP 15i: North Fork Prairie Creek Colony
Indiana, Little Brown, and Tricolored Bats

Centerline in Colony (miles): New Alternative = 5.06 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	12566	100.00%	7761	100.00%	1224	100.00%	257	100.00%
Agriculture	7987	63.6%	4945	63.7%	898	73.3%	202	78.5%
Forest	3738	29.7%	2260	29.1%	270	22.1%	41	16.0%
Developed	600	4.8%	344	4.4%	42	3.4%	11	4.4%
Other	241	1.9%	211	2.7%	14	1.1%	3	1.1%
NWI Wetlands	298	2.4%	234	3.0%	29	2.3%	1	0.4%

0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

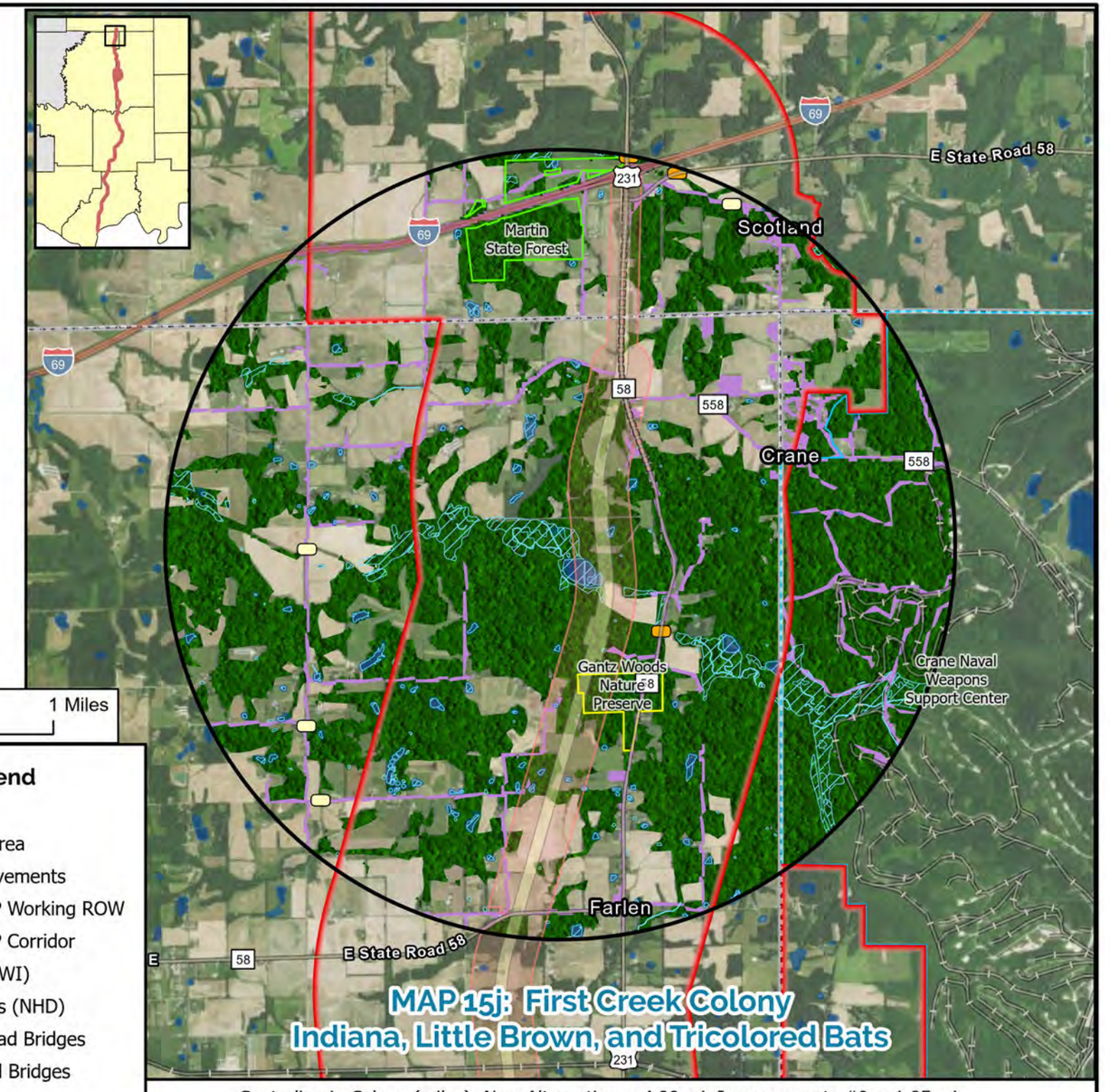
Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

- Forests
- Developed

N



MAP 15j: First Creek Colony
Indiana, Little Brown, and Tricolored Bats

Centerline in Colony (miles): New Alternative = 4.90 mi, Improvements #9 = 1.85 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	12566	100.00%	8014	100.00%	1056	100.00%	274	100.00%
Agriculture	4693	37.3%	3240	40.4%	478	45.2%	119	43.4%
Forest	6761	53.8%	4013	50.1%	478	45.3%	108	39.6%
Developed	799	6.4%	512	6.4%	60	5.7%	27	9.8%
Other	313	2.5%	249	3.1%	40	3.8%	20	7.2%
NWI Wetlands	503	4.0%	268	3.3%	27	2.6%	3	1.2%

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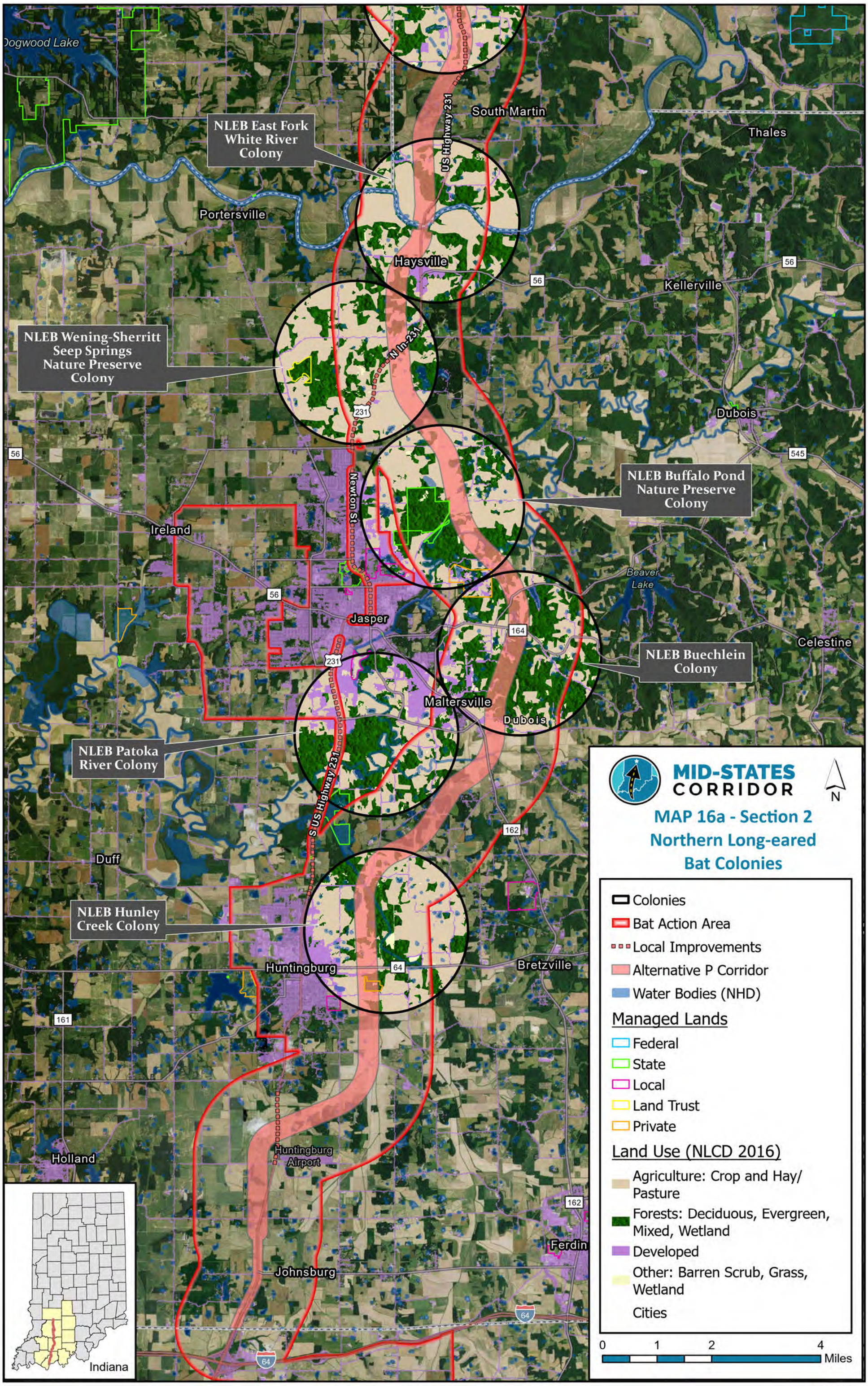

NLEB East Fork White River Colony
NLEB Wening-Sherritt Seep Springs Nature Preserve Colony
NLEB Buffalo Pond Nature Preserve Colony
NLEB Buechlein Colony
NLEB Patoka River Colony
NLEB Hunley Creek Colony
Dogwood Lake
South Martin
Thales
US Highway 231
Portersville
Haysville
56
Kellerville
N In-231
231
Dubois
545
Newton St
Ireland
Beaver Lake
Jasper
164
Celestine
Maltersville
S US Highway 231
162
Duff
Huntingburg
64
Bretzville
161
Huntingburg Airport
Holland
Ferdin
Johnsburg
Indiana
MID-STATES CORRIDOR
N
MAP 16a - Section 2
Northern Long-eared Bat Colonies
Colonies
Bat Action Area
Local Improvements
Alternative P Corridor
Water Bodies (NHD)
Managed Lands
Federal
State
Local
Land Trust
Private
Land Use (NLCD 2016)
Agriculture: Crop and Hay/ Pasture
Forests: Deciduous, Evergreen, Mixed, Wetland
Developed
Other: Barren Scrub, Grass, Wetland
Cities
0
1
2
4
Miles

12/6/2022 cjb

MID-STATES CORRIDOR

MAP 16b - Section 3
Northern Long-eared Bat Colonies

N

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Corridor
- Water Bodies (NHD)

Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

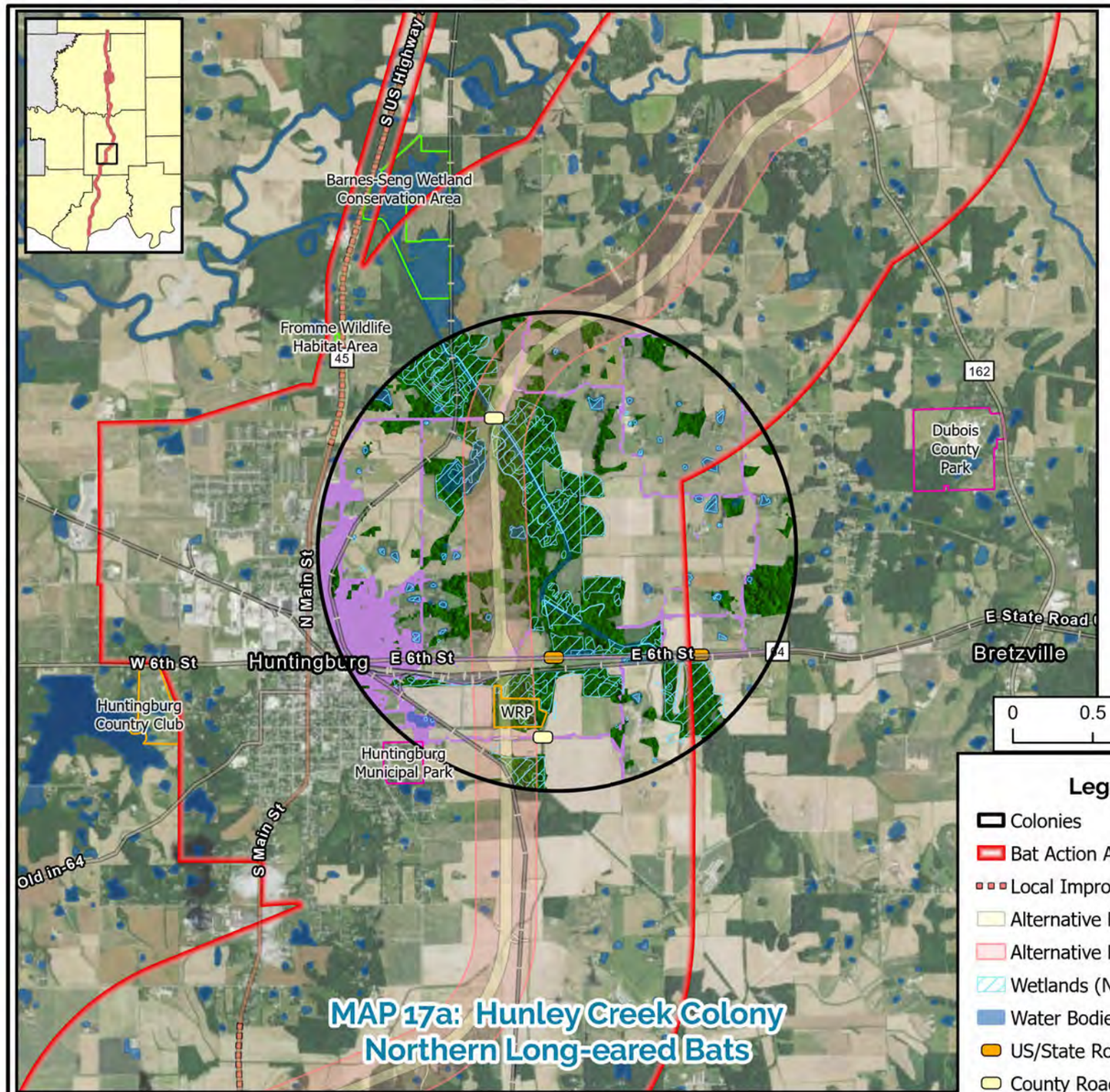
- Agriculture: Crop and Hay/ Pasture
- Forests: Deciduous, Evergreen, Mixed, Wetland
- Developed
- Other: Barren Scrub, Grass, Wetland

0 1 2 4 Miles

NLEB First Creek Colony
NLEB North Fork Prairie Creek Colony
NLEB Seed Tick Creek Colony
NLEB West Boggs Creek Colony
NLEB Boggs Creek Colony
NLEB Friends Creek Colony
NLEB Haw Creek Colony
NLEB Slate Creek Colony

Newberry
Doans
Crane
Lake Greenwood
Farlen
Odon
Burns City
Raglesville
Bramble
West Boggs Lake
Dover Hill
Martin
Willow Va
US Highway 50
Loogootee
Shoals
Cannelburg
Mt Pleasant
Pleasant Valley
Lacy
Whitfield
Windom
Rusk
Alfordsville
US Highway 231
Indiana

12/5/2022 cjb



MAP 17a: Hunley Creek Colony Northern Long-eared Bats

Centerline in Colony (miles): New Alternative = 3.22 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.0%	3909	100.0%	775	100.0%	176	100.0%
Agriculture	2705	59.8%	2252	57.6%	424	54.8%	112	63.4%
Forest	1273	28.1%	1151	29.4%	312	40.3%	48	27.5%
Developed	472	10.4%	439	11.2%	32	4.2%	15	8.5%
Other	75	1.6%	67	1.7%	6	0.8%	1	0.6%
NWI Wetlands	689	15.2%	636	16.3%	138	17.8%	18	10.1%

0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

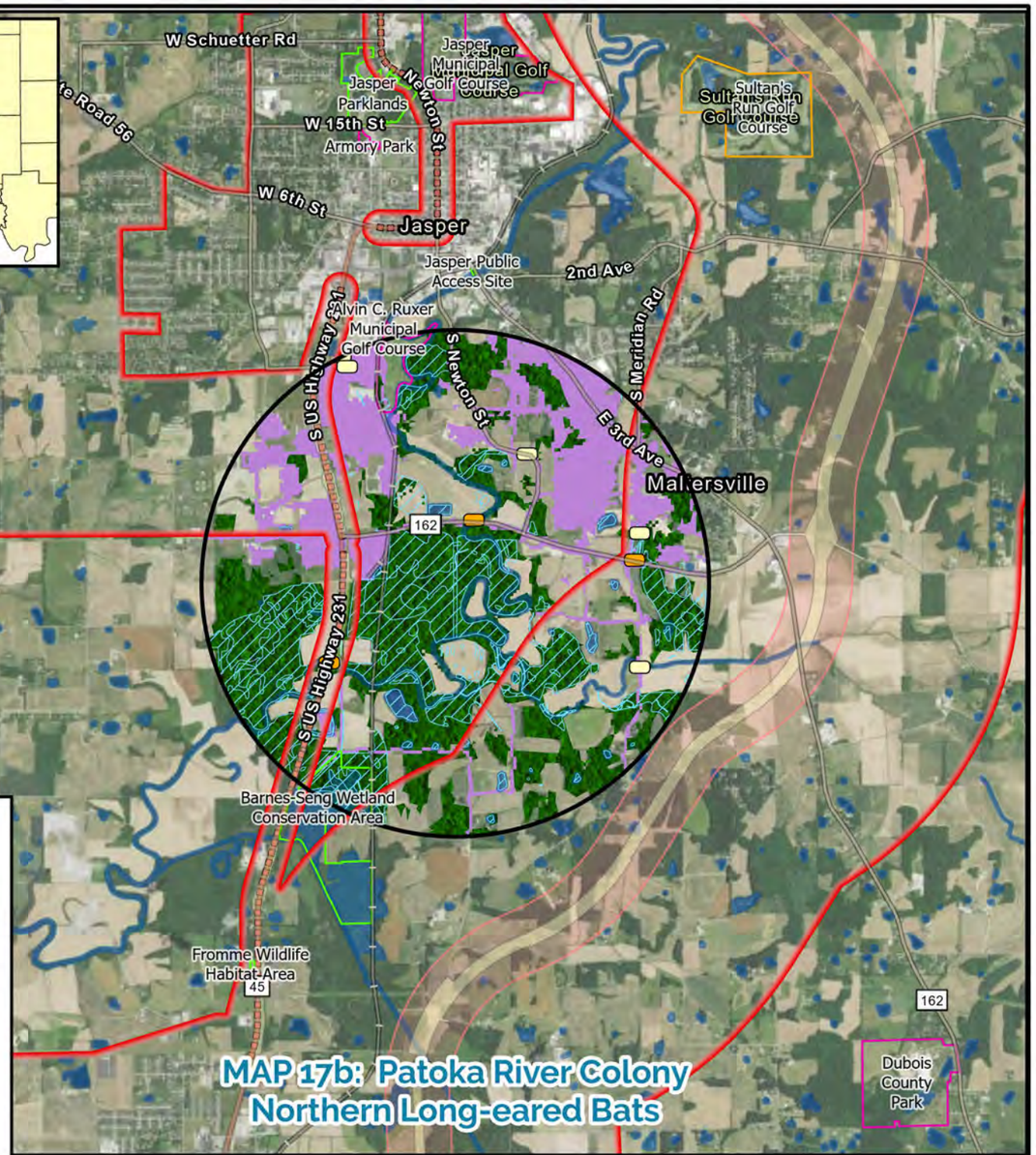
Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

- Forests
- Developed

N



MAP 17b: Patoka River Colony Northern Long-eared Bats

Centerline in Colony (miles): New Alternative = none; Improvements #2, #3 = 2.36 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.0%	1887	100.0%	0	100.0%	84	100.0%
Agriculture	1700	37.6%	904	47.9%	0	0.0%	5	6.4%
Forest	1820	40.2%	582	30.9%	0	0.0%	14	16.7%
Developed	904	20.0%	342	18.1%	0	0.0%	35	41.8%
Other	101	2.2%	60	3.2%	0	0.0%	30	35.1%
NWI Wetlands	1060	23.4%	258	13.7%	0	0.0%	7	7.7%

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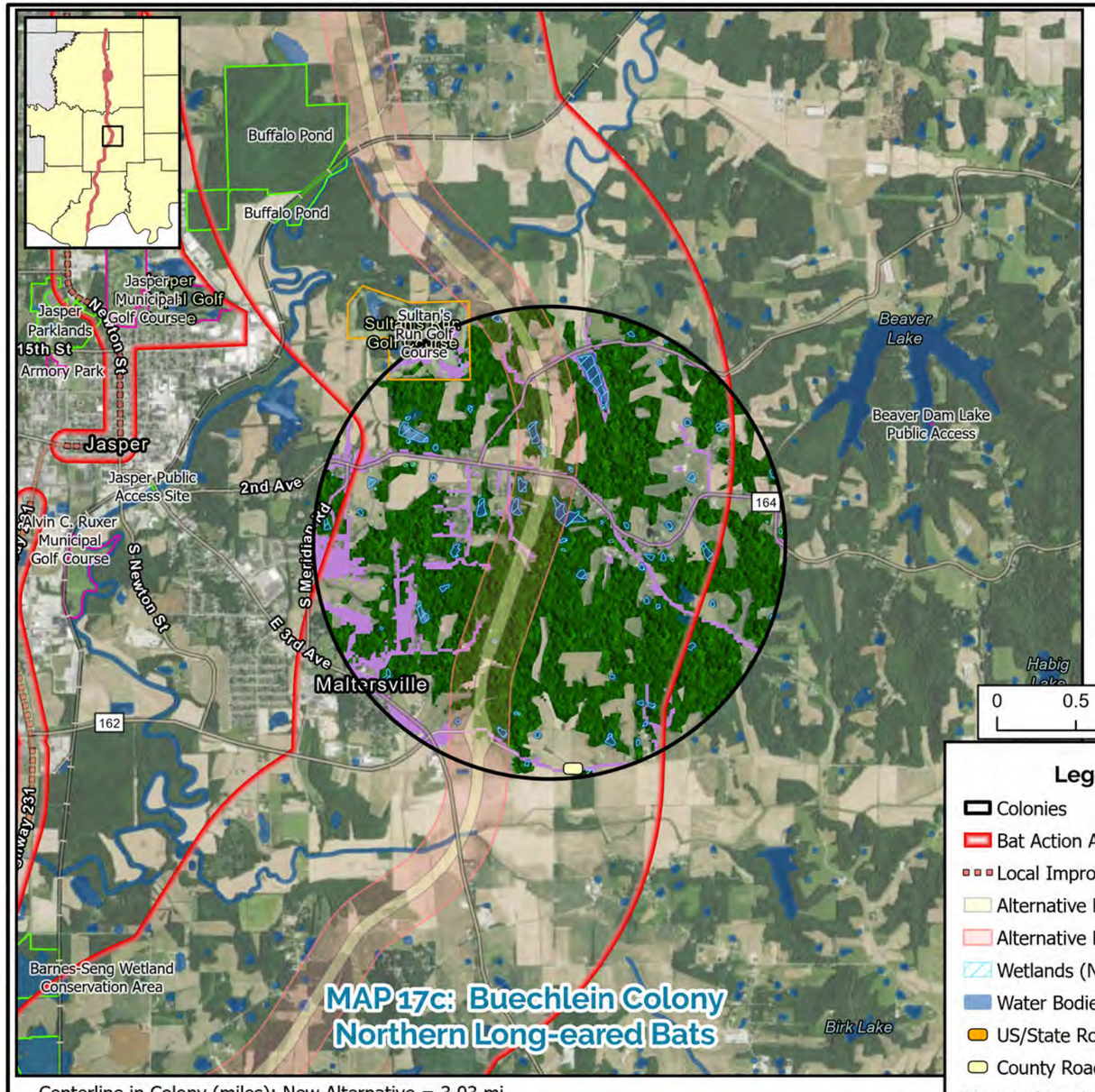
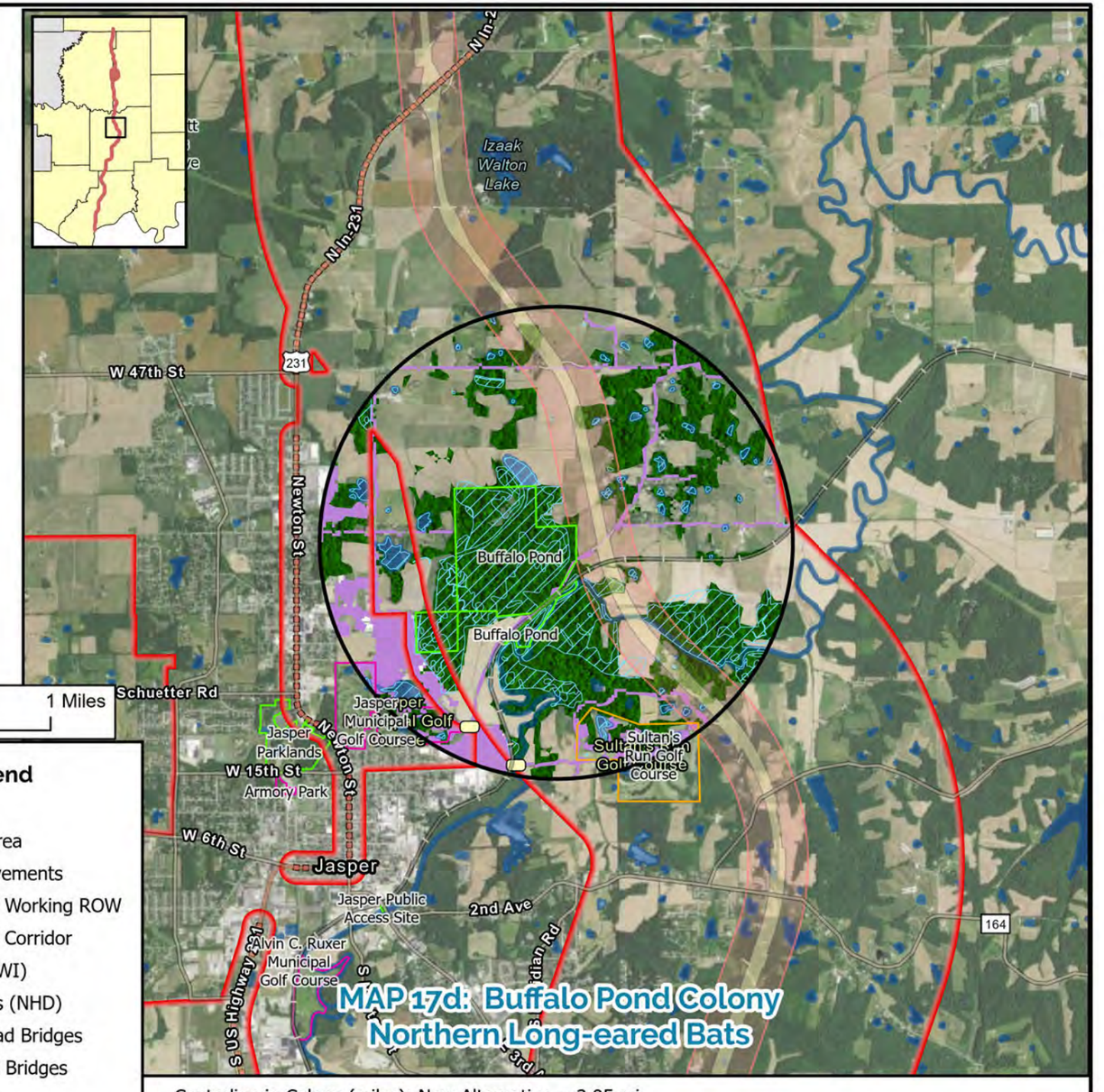




0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

Managed Lands
- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)
- Forests
- Developed

N

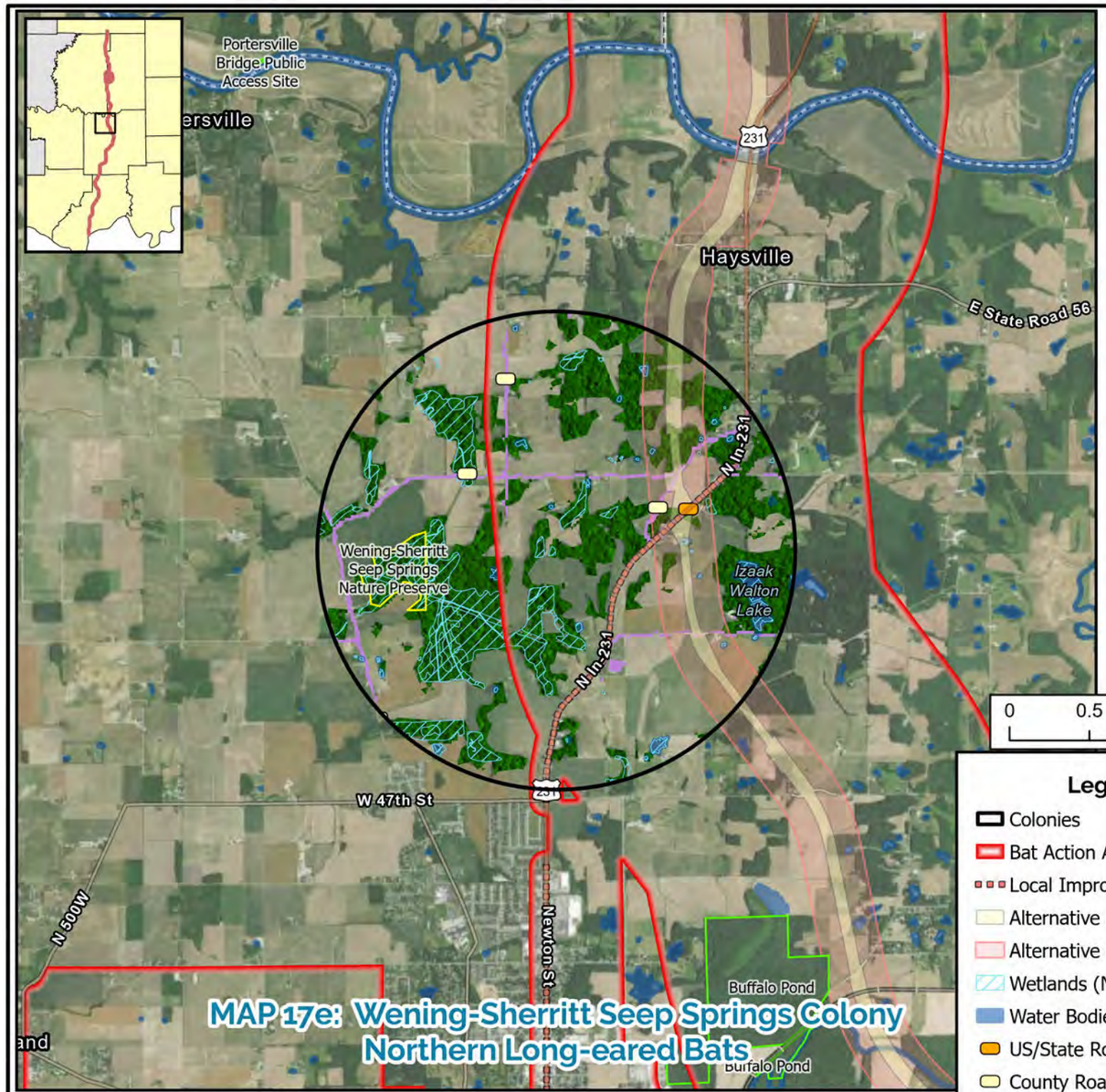
Centerline in Colony (miles): New Alternative = 3.03 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	3980	100.00%	731	100.00%	185	100.00%
Agriculture	1473	32.6%	1324	33.3%	216	29.5%	55	29.8%
Forest	2522	55.8%	2180	54.8%	448	61.3%	111	60.1%
Developed	423	9.3%	373	9.4%	39	5.3%	14	7.7%
Other	110	2.4%	103	2.6%	29	3.9%	5	2.4%
NWI Wetlands	87	1.9%	82	2.1%	18	2.4%	1	0.6%

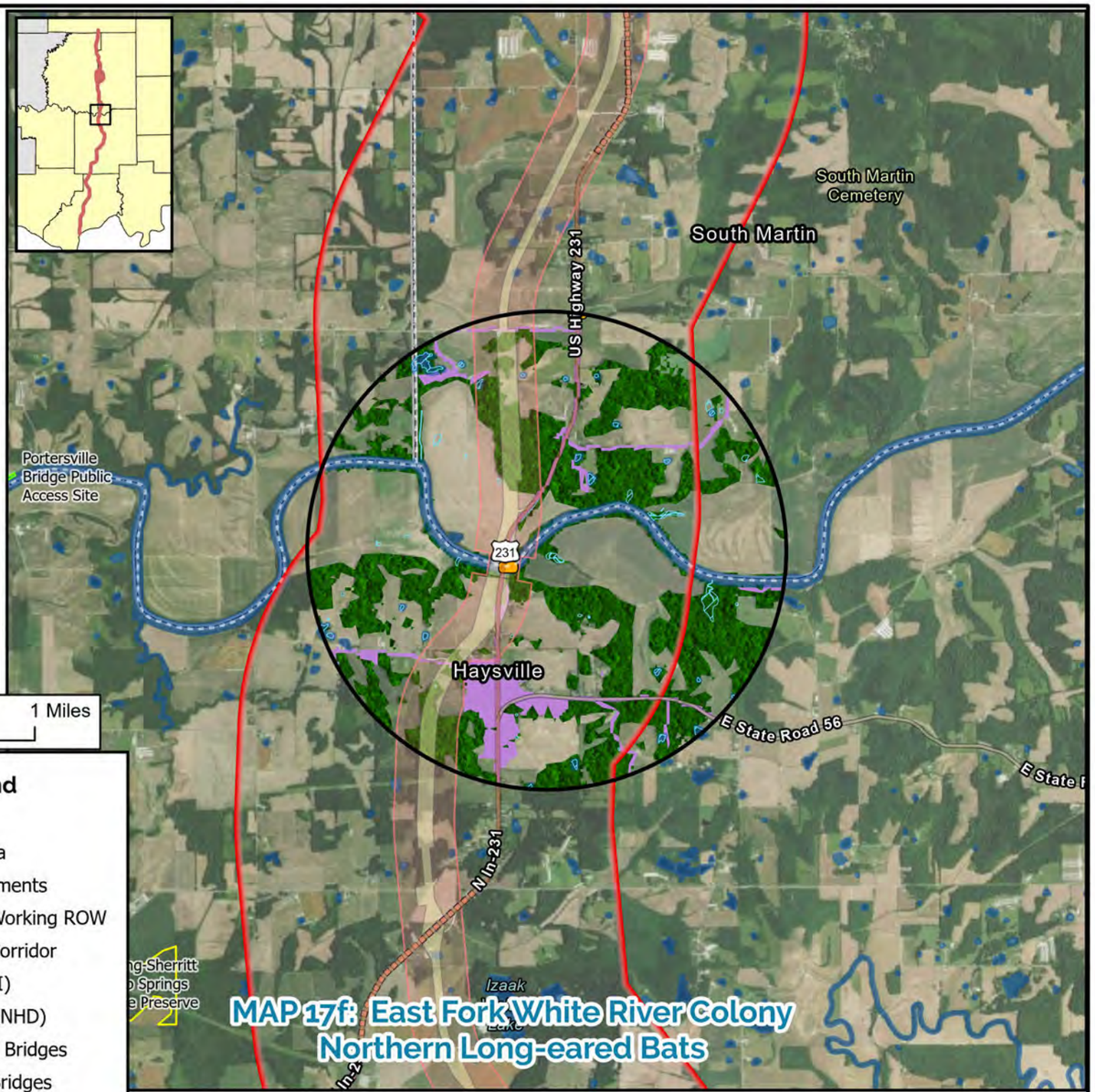
Centerline in Colony (miles): New Alternative = 2.95 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	4260	100.00%	709	100.00%	167	100.00%
Agriculture	2153	47.6%	2031	47.7%	471	66.5%	119	71.0%
Forest	1826	40.4%	1772	41.6%	203	28.7%	41	24.6%
Developed	441	9.8%	371	8.7%	18	2.5%	3	1.9%
Other	104	2.3%	86	2.0%	16	2.3%	4	2.5%
NWI Wetlands	888	19.6%	838	19.7%	56	7.9%	5	2.7%

12/5/2022 cjb



MAP 17e: Wening-Sherritt Seep Springs Colony
Northern Long-eared Bats



MAP 17f: East Fork White River Colony
Northern Long-eared Bats

0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

- Forests
- Developed

N

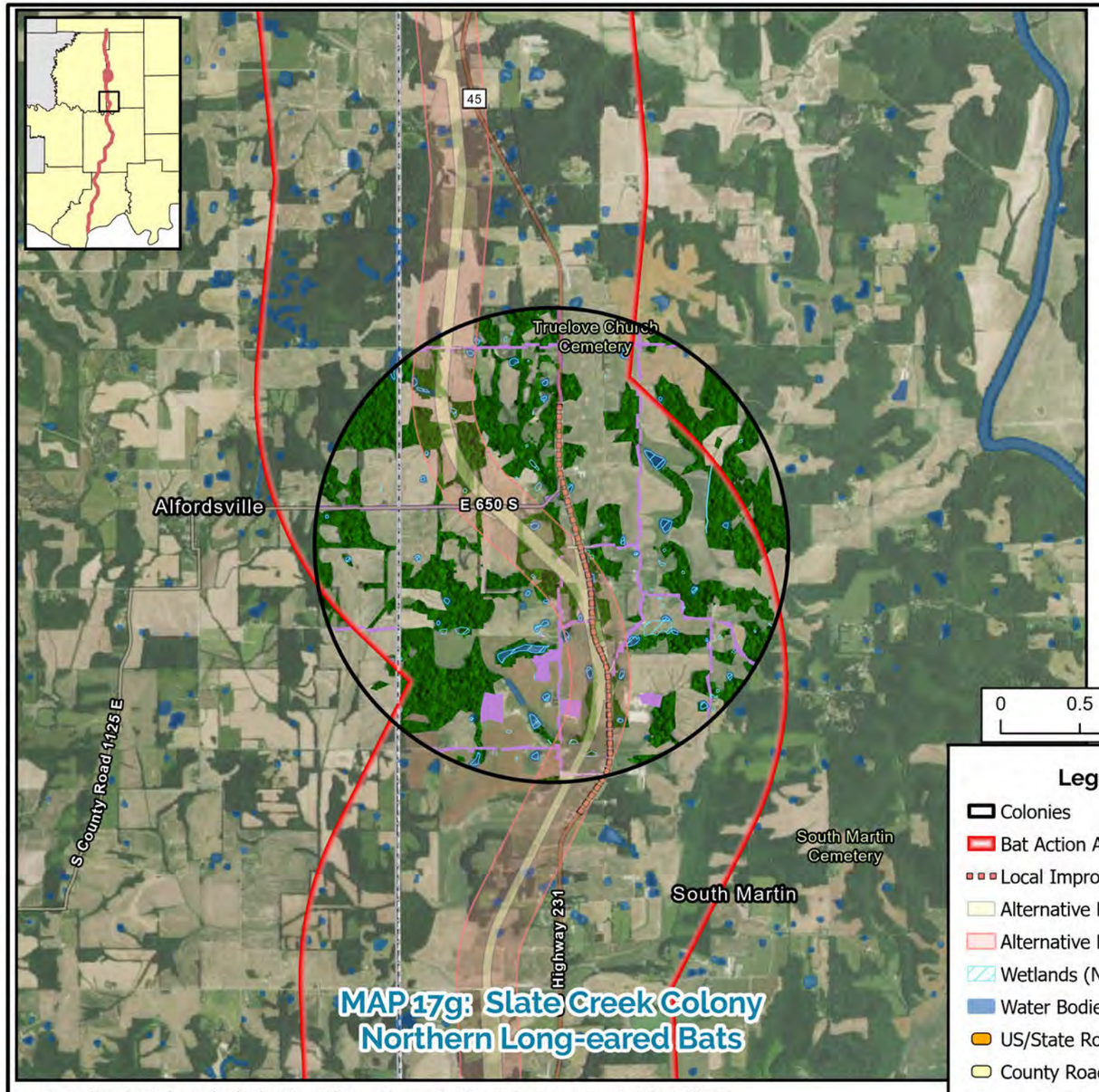
Centerline in Colony (miles): New Alternative = 2.35 mi, Improvement #5: 2.40 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	2933	100.00%	567	100.00%	176	100.00%
Agriculture	2800	61.9%	1838	62.6%	397	70.0%	88	49.9%
Forest	1525	33.7%	933	31.8%	138	24.4%	39	22.5%
Developed	138	3.0%	103	3.5%	24	4.2%	37	20.9%
Other	62	1.4%	60	2.0%	8	1.5%	12	6.7%
NWI Wetlands	486	10.7%	131	4.5%	5	0.8%	1	0.4%

Centerline in Colony (miles): New Alternative = 2.91 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	3806	100.0%	672	100.00%	219	100.00%
Agriculture	2525	55.8%	2145	56.4%	372	55.3%	95	43.4%
Forest	1587	35.1%	1292	33.9%	253	37.6%	100	45.9%
Developed	261	5.8%	240	6.3%	33	4.9%	19	8.7%
Other	151	3.3%	129	3.4%	14	2.1%	4	2.0%
NWI Wetlands	42	0.9%	27	0.7%	2	0.4%	1	0.2%

12/5/2022 cjb



MAP 17g: Slate Creek Colony Northern Long-eared Bats

Centerline in Colony (miles): New Alternative = 3.22 mi, Improvement #6: 2.39 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	4106	100.00%	779	100.00%	248	100.00%
Agriculture	2613	57.8%	2388	58.2%	475	61.0%	138	55.6%
Forest	1579	34.9%	1395	34.0%	227	29.1%	68	27.5%
Developed	252	5.6%	240	5.9%	56	7.1%	40	16.1%
Other	83	1.8%	82	2.0%	21	2.8%	2	0.7%
NWI Wetlands	67	1.5%	66	1.6%	12	1.6%	2	0.7%

0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

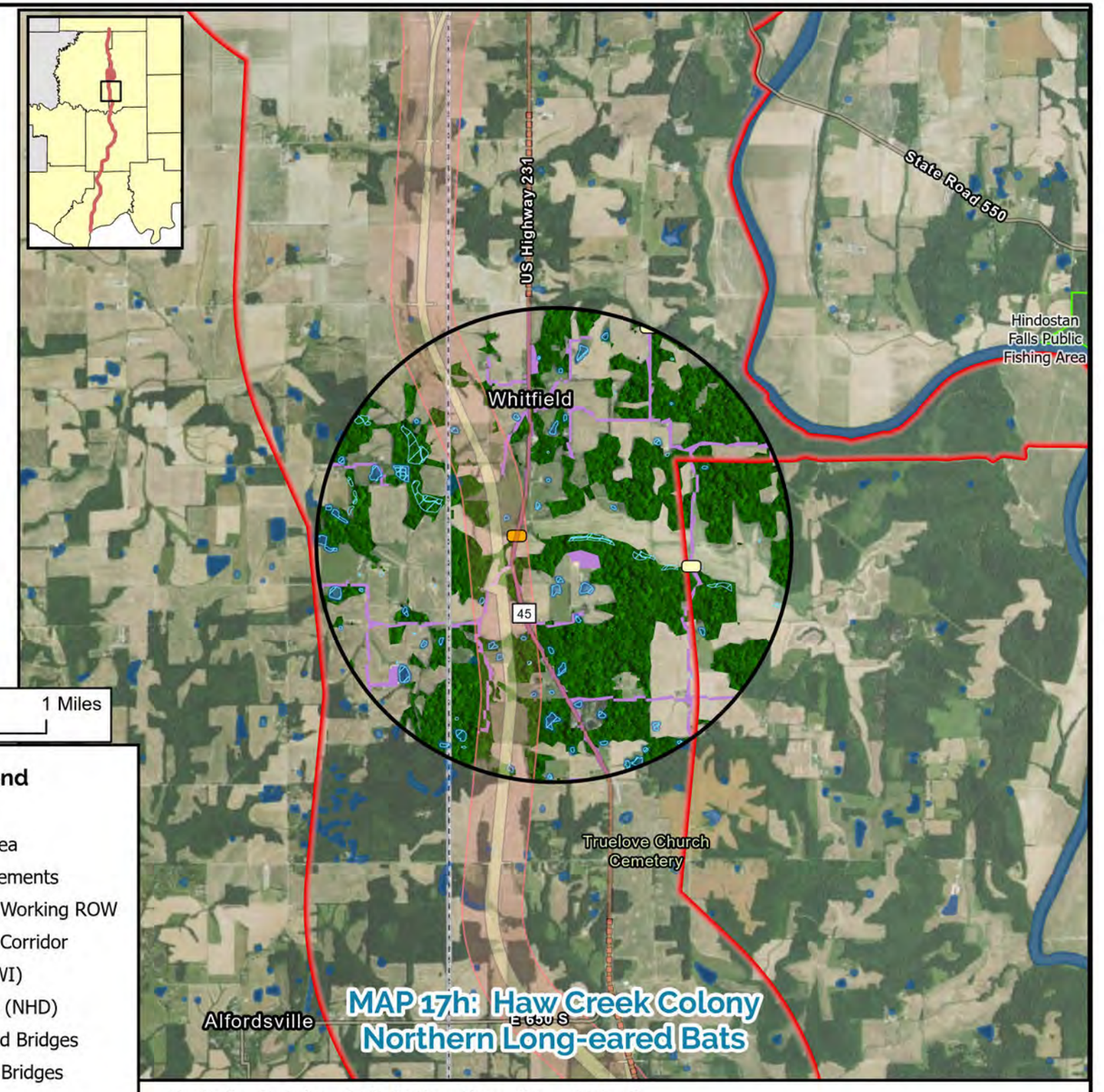
Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

- Forests
- Developed

N

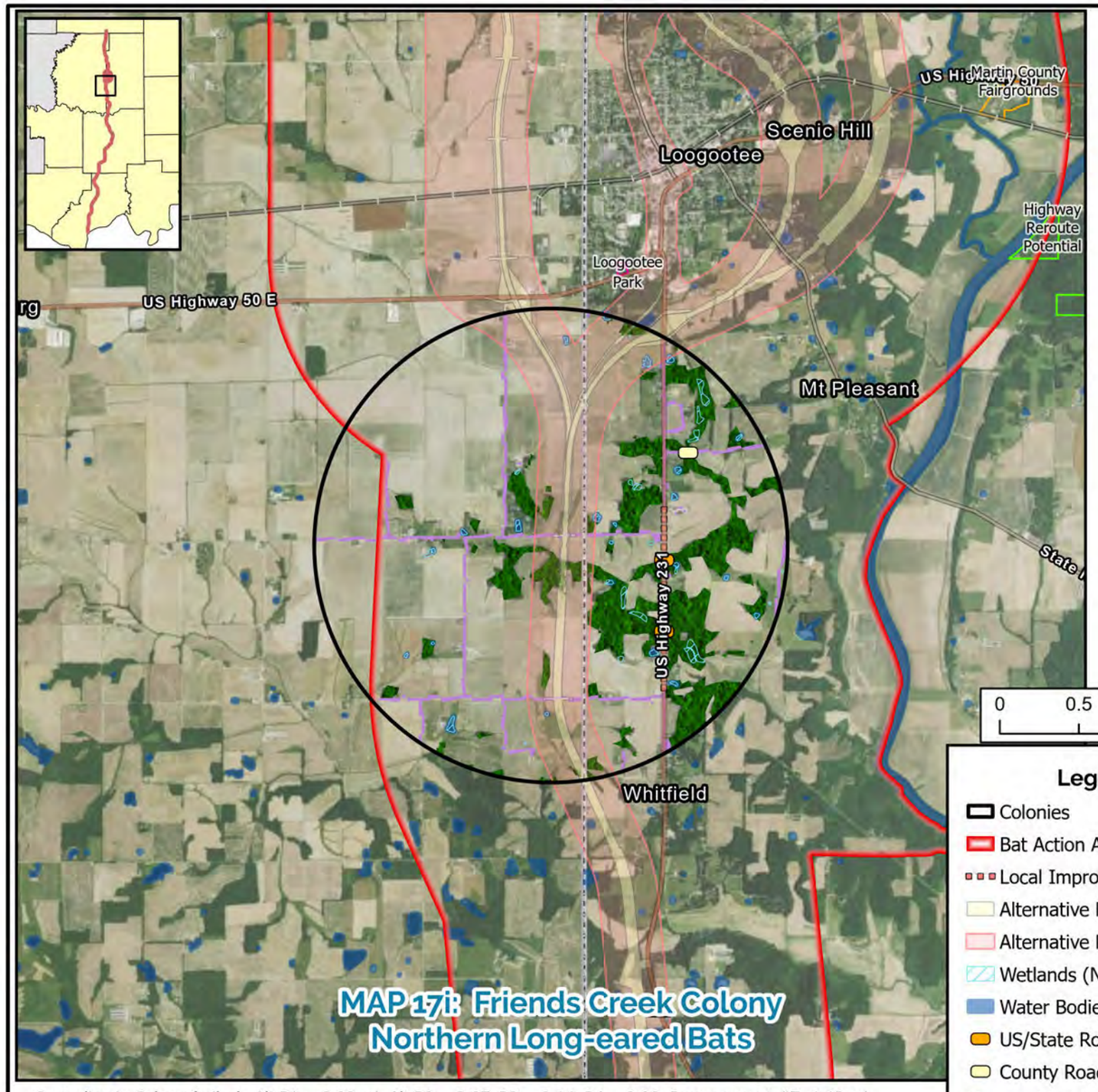


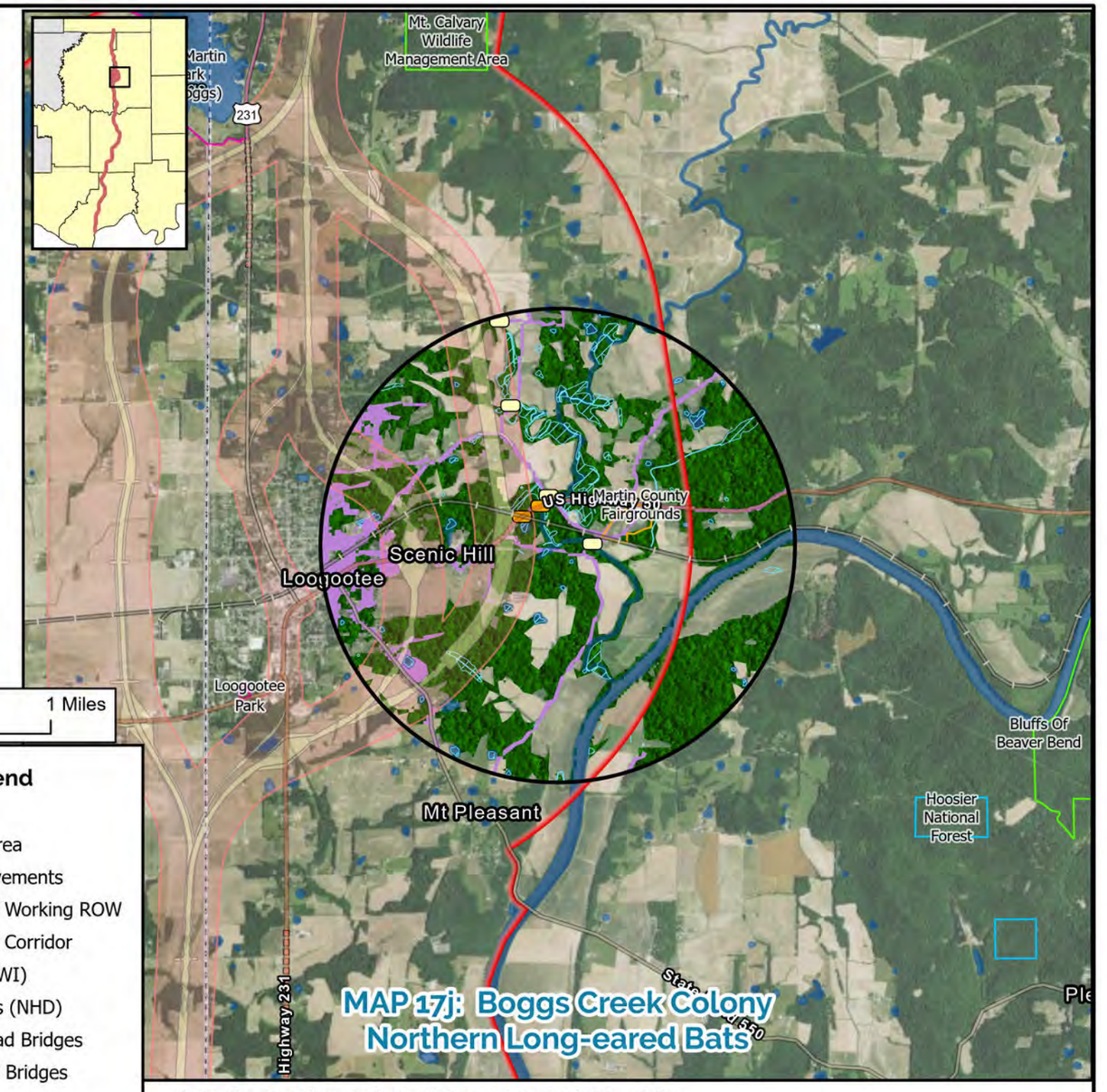
MAP 17h: Haw Creek Colony Northern Long-eared Bats

Centerline in Colony (miles): New Alternative = 2.83 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	3974	100.00%	685	100.00%	136	100.00%
Agriculture	2350	51.9%	2088	52.5%	447	65.3%	106	77.5%
Forest	1902	42.0%	1628	41.0%	201	29.4%	26	19.3%
Developed	227	5.0%	213	5.4%	34	4.9%	4	3.1%
Other	45	1.0%	44	1.1%	3	0.4%	0	0.1%
NWI Wetlands	92	2.0%	88	2.2%	5	0.7%	0	0.3%

12/5/2022 cjb





0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

Managed Lands
- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)
- Forests
- Developed

N

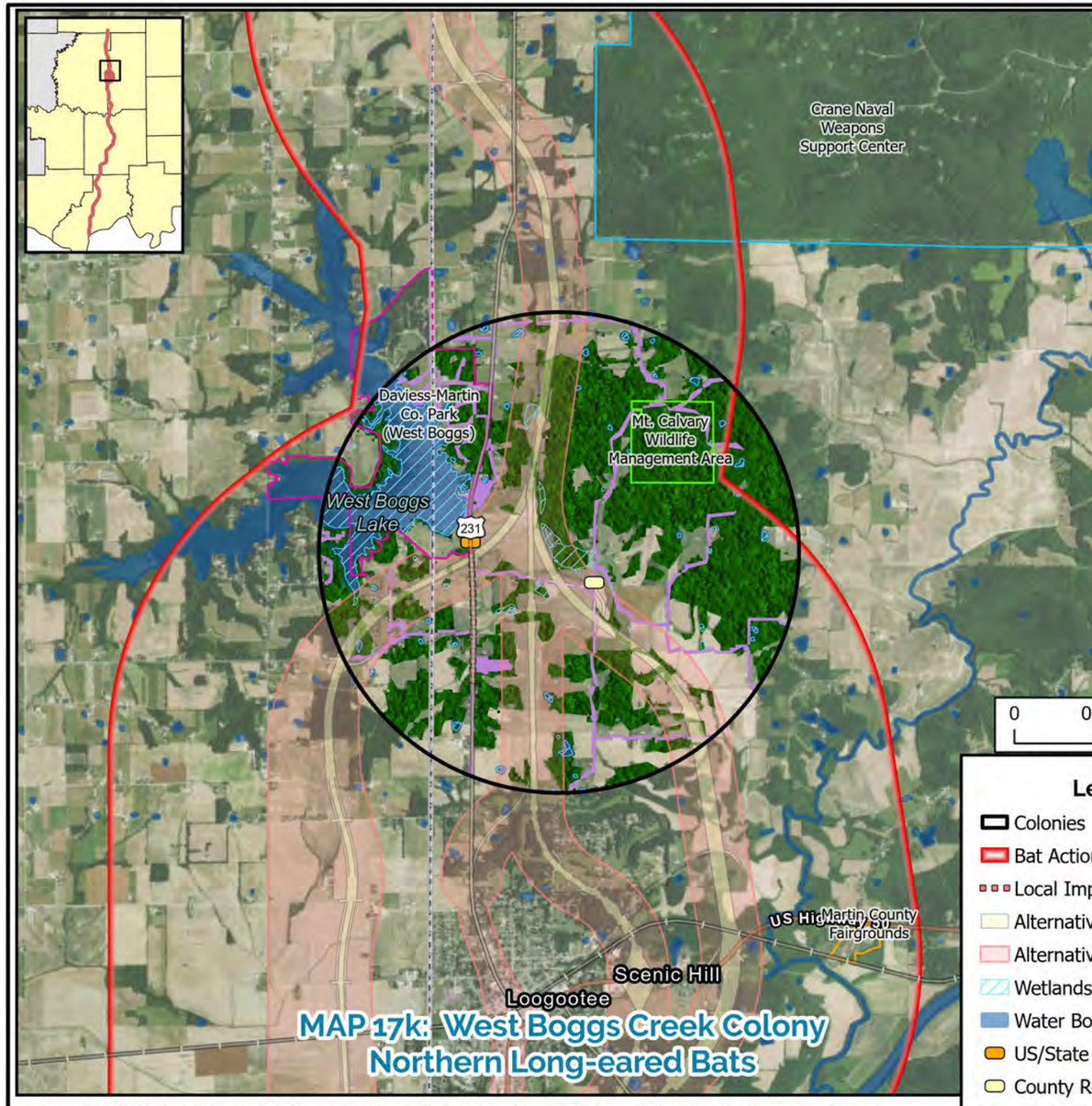
Centerline in Colony (miles): Alt P1 = 3.08 mi, Alt P2 = 3.07, P3 = 3.14, P4 = 3.08; Improvement #7: 1.13 mi

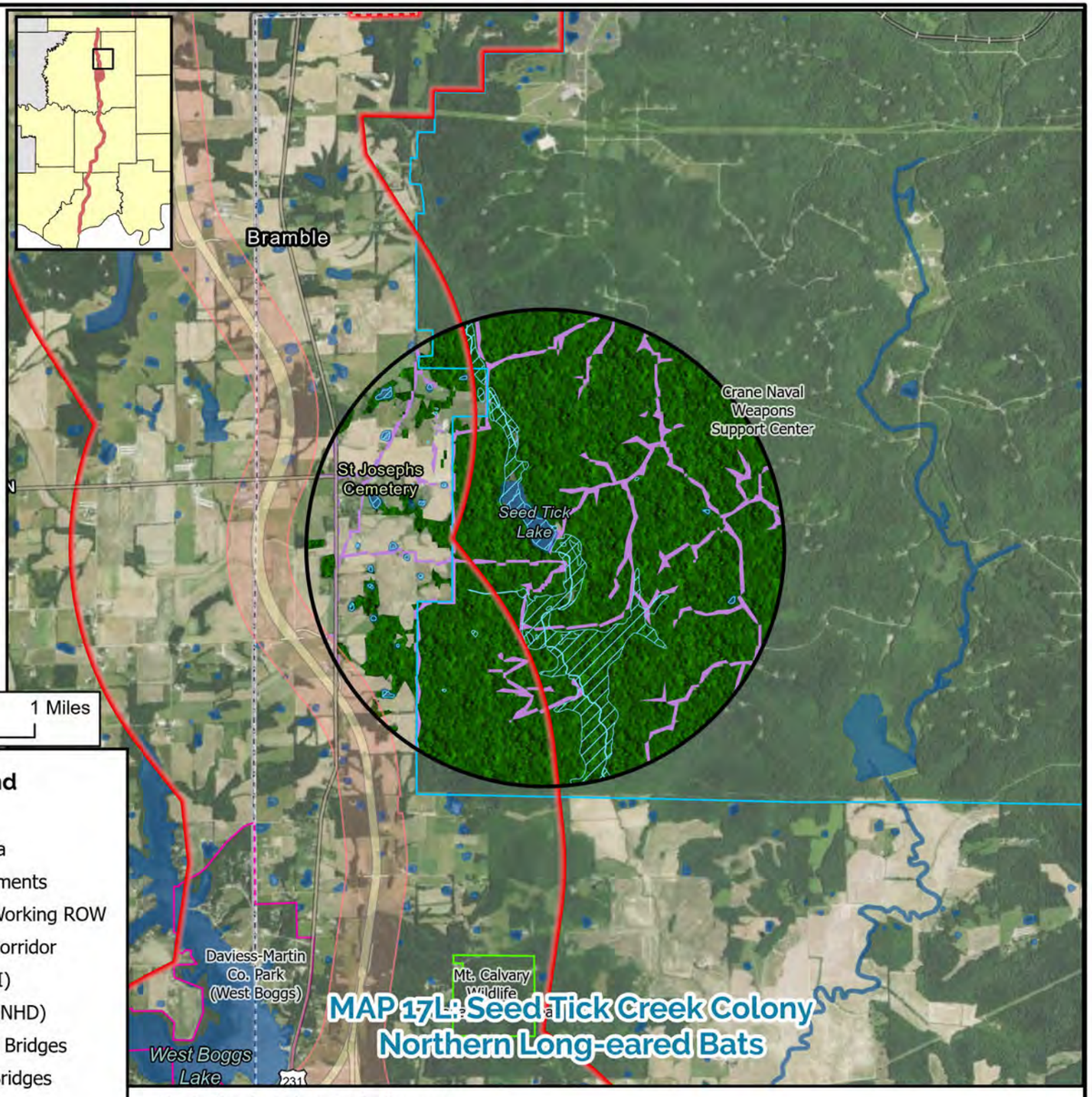
(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	4218	100.00%	745	100.00%	139	100.00%
Agriculture	3709	82.0%	3405	80.7%	634	85.1%	106	76.4%
Forest	613	13.6%	613	14.5%	69	9.3%	11	7.9%
Developed	192	4.2%	187	4.4%	40	5.4%	17	12.4%
Other	13	0.3%	13	0.3%	2	0.3%	5	3.2%
NWI Wetlands	35	0.8%	35	0.8%	2	0.3%	0	0.0%

Centerline in Colony (miles): Alt P3= 1.08 mi, Alt P4 = 2.76

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	3600	100.00%	666	100.00%	165	100.00%
Agriculture	1783	39.4%	1536	42.7%	252	37.8%	57	34.8%
Forest	2235	49.4%	1619	45.0%	351	52.8%	96	58.5%
Developed	357	7.9%	340	9.4%	47	7.1%	9	5.2%
Other	148	3.3%	105	2.9%	15	2.3%	3	1.5%
NWI Wetlands	175	3.9%	158	4.4%	26	3.9%	3	2.0%

12/5/2022 cjb





0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

- Forests
- Developed

N

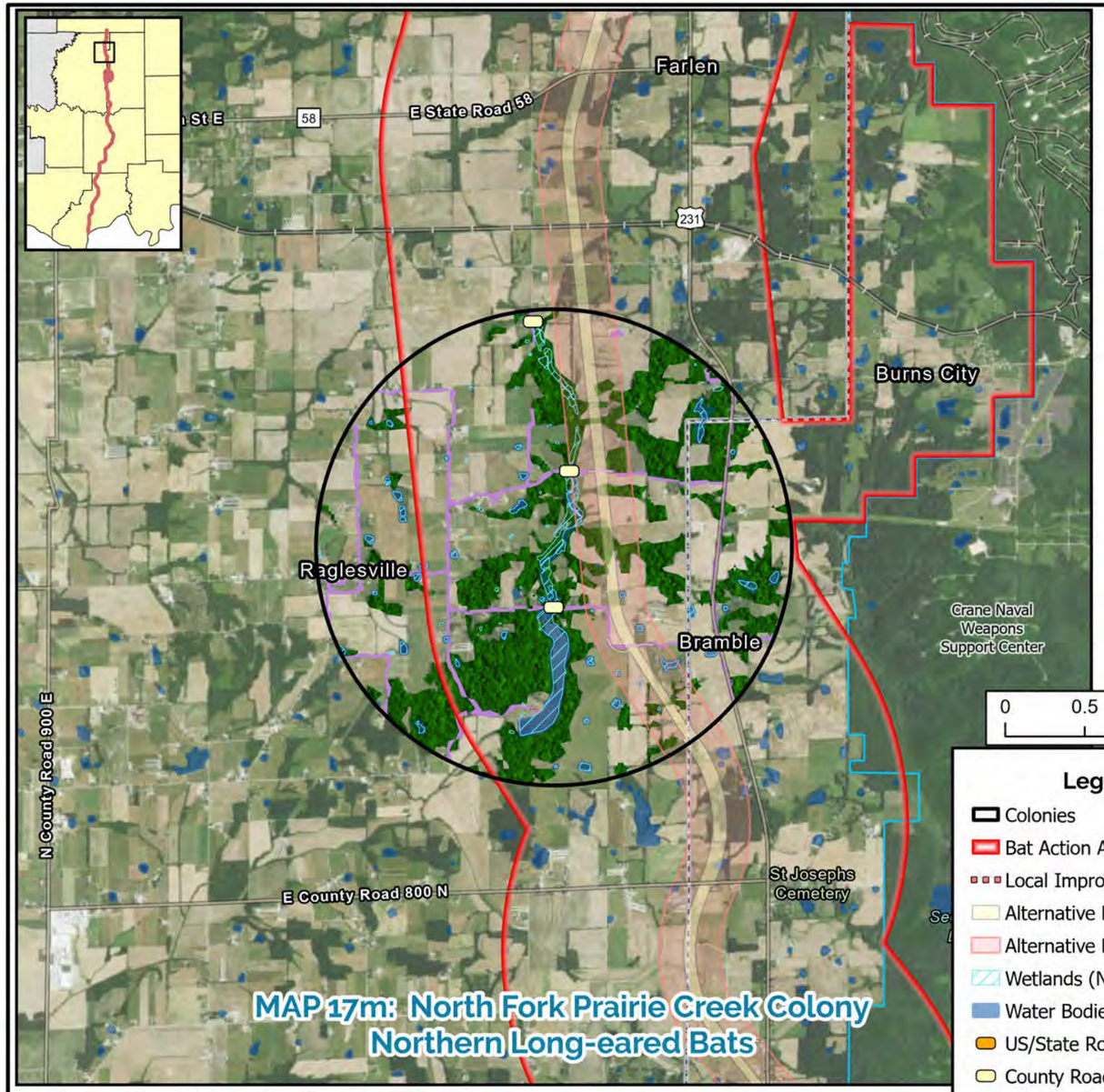
Centerline in Colony (miles): Alt P1 = 2.72 mi, Alt P2 = 3.00, P3 = 3.00, P4 = 3.12; Improvement #8: 0.78 mi

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	4402	100.00%	755	100.00%	142	100.00%
Agriculture	1822	40.3%	1821	41.4%	445	59.0%	95	67.1%
Forest	2042	45.1%	1926	43.7%	265	35.1%	30	21.2%
Developed	273	6.0%	272	6.2%	29	3.8%	15	10.4%
Other	386	8.5%	384	8.7%	16	2.1%	2	1.3%
NWI Wetlands	363	8.0%	362	8.2%	32	4.2%	1	0.5%

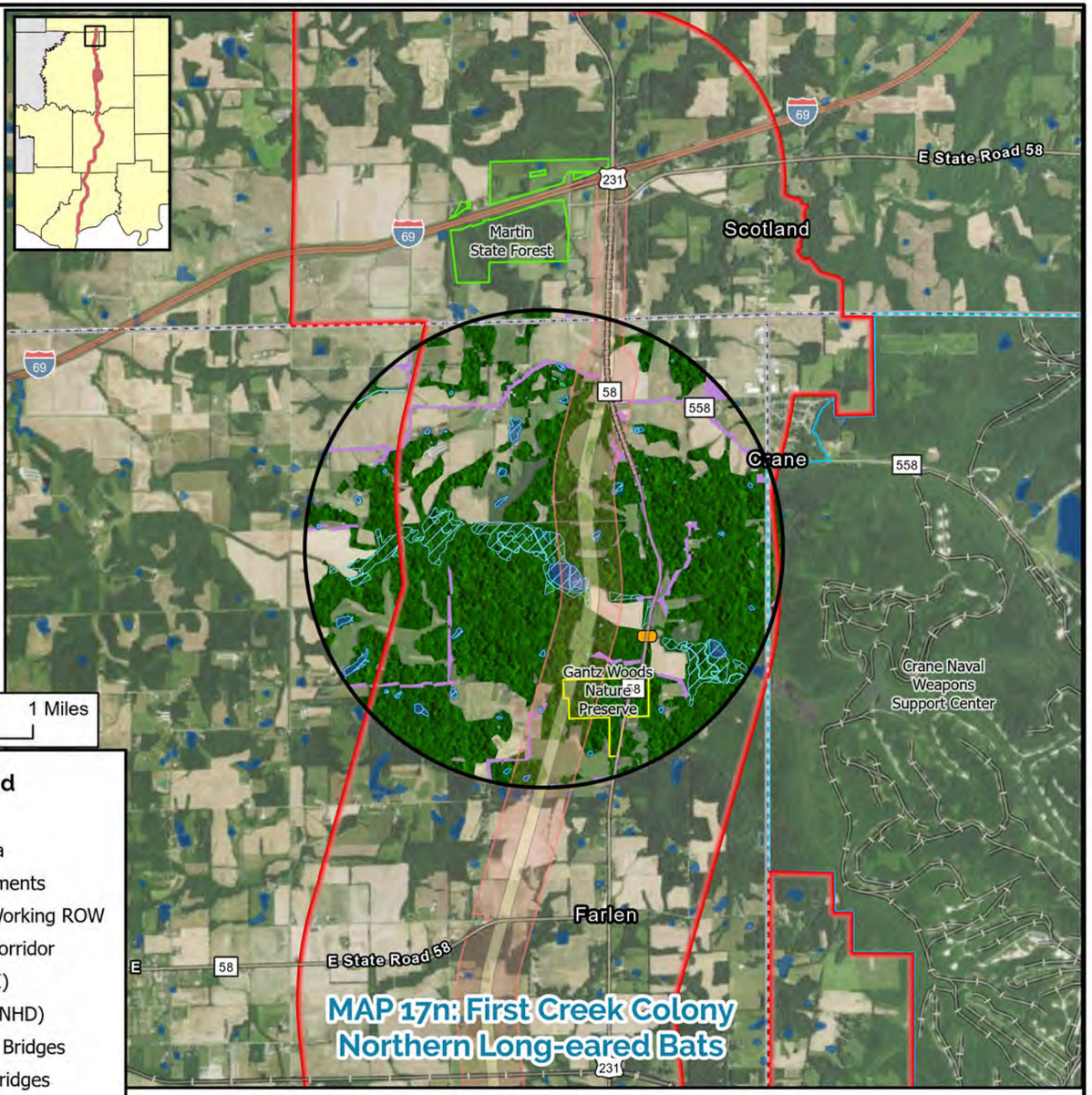
Centerline in Colony (miles): none

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	1713	100.00%	30	100.00%	0	100.00%
Agriculture	742	16.4%	733	42.8%	23	78.0%	0	0.0%
Forest	3386	74.8%	846	49.4%	4	14.7%	0	0.0%
Developed	347	7.7%	123	7.2%	2	7.3%	0	0.0%
Other	52	1.2%	11	0.6%	0	0.0%	0	0.0%
NWI Wetlands	360	7.9%	19	1.1%	0	0.0%	0	0.0%

12/5/2022 cjb



MAP 17m: North Fork Prairie Creek Colony Northern Long-eared Bats



MAP 17n: First Creek Colony Northern Long-eared Bats

0 0.5 1 Miles

Legend

- Colonies
- Bat Action Area
- Local Improvements
- Alternative P Working ROW
- Alternative P Corridor
- Wetlands (NWI)
- Water Bodies (NHD)
- US/State Road Bridges
- County Road Bridges

Managed Lands

- Federal
- State
- Local
- Land Trust
- Private

Land Use (NLCD 2016)

- Forests
- Developed

N

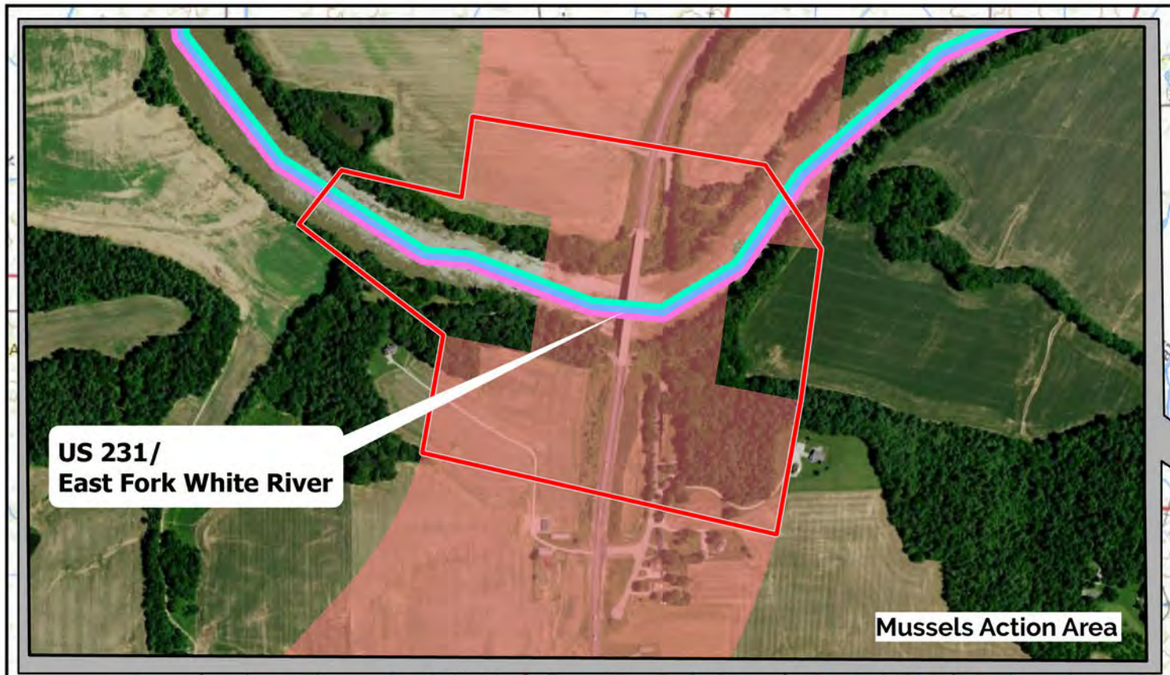
Centerline in Colony (miles): New Alternative: 2.85

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	3743	100.00%	690	100.00%	136	100.00%
Agriculture	2916	64.5%	2331	62.3%	512	74.3%	112	81.9%
Forest	1311	29.0%	1170	31.2%	146	21.1%	16	11.5%
Developed	213	4.7%	164	4.4%	21	3.1%	7	4.8%
Other	84	1.8%	78	2.1%	10	1.5%	2	1.7%
NWI Wetlands	155	3.4%	143	3.8%	20	2.9%	0	0.0%

Centerline in Colony (miles): New Alternative - 3.01 mi., Improvement #9: 1.0 mi.

(Acres)	Colony	% within Colony	Bat Action Area	% Within Action Area	Corridor	% Within Corridor	Alt P4	% Within Alt P4
Total	4524	100.00%	3936	100.00%	700	100.00%	179	100.00%
Agriculture	1471	32.5%	1155	29.3%	241	34.5%	63	34.9%
Forest	2708	59.9%	2464	62.6%	404	57.6%	94	52.2%
Developed	186	4.1%	164	4.2%	25	3.6%	11	6.4%
Other	159	3.5%	153	3.9%	30	4.3%	12	6.5%
NWI Wetlands	243	5.4%	209	5.3%	26	3.7%	3	1.8%

12/5/2022 cjb



East Fork White River

MID-STATES CORRIDOR

MAP 18
Mussel Spp. Occurrences

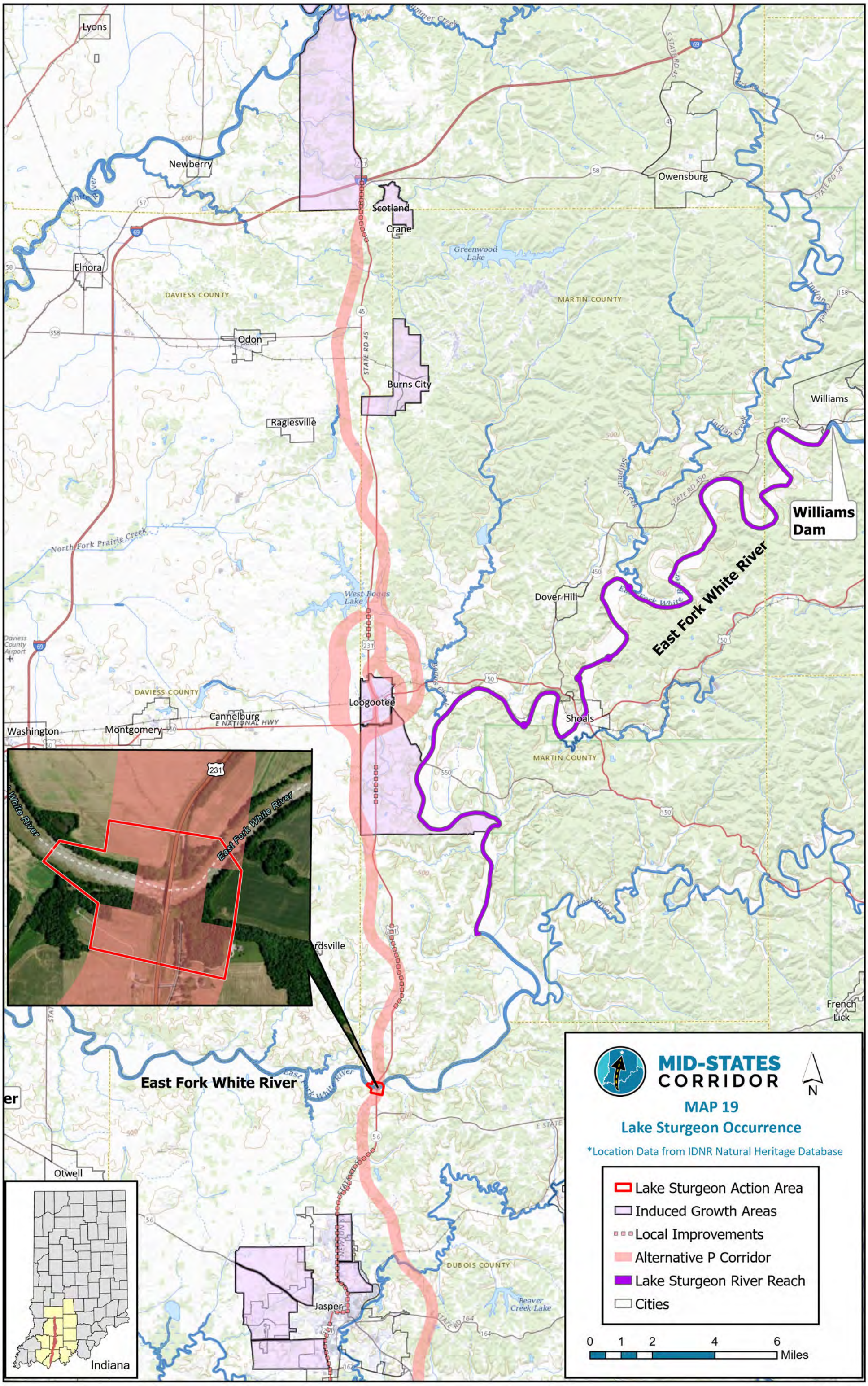
N

- Local Improvements
- Alternative P Corridor
- Induced Growth Areas
- Cities
- Mussel Action Area
- Fanshell Reaches
- Fat Pocketbook Reaches
- Rough Pigtoe Reaches
- Salamander Reaches
- Sheepnose Reaches

0 1 2 4 6 Miles

Indiana

12/6/2022 cjb


Lyons
Newberry
Scotland
Crane
Owensburg
Elnora
DAVIESS COUNTY
MARTIN COUNTY
Greenwood Lake
Odon
Burns City
Williams
Raglesville
Williams Dam
East Fork White River
North Fork Prairie Creek
West Boggs Lake
Dover Hill
Daviess County Airport
DAVIESS COUNTY
Loogootee
Cannelburg
Washington
Montgomery
Shoals
MARTIN COUNTY
East Fork White River
Otwell
DUBOIS COUNTY
Jasper
Beaver Creek Lake
French Lick
Indiana
MID-STATES CORRIDOR
N
MAP 19
Lake Sturgeon Occurrence
*Location Data from IDNR Natural Heritage Database
Lake Sturgeon Action Area
Induced Growth Areas
Local Improvements
Alternative P Corridor
Lake Sturgeon River Reach
Cities
0 1 2 4 6
Miles
12/5/2022 cjb

Appendix B
Mid-States Corridor
Pre-Consultation Agreement
Tier 1 Section 7 Consultation
FHWA, INDOT and USFWS

MID-STATES CORRIDOR

PRE-CONSULTATION AGREEMENT

Tier 1 Section 7 Consultation
Between FHWA, INDOT & US Fish & Wildlife Service

1) Project Background

The Mid-States Corridor Project is a proposed highway to provide an improved transportation link between SR 66 and I-69 to improve business and personal regional connectivity in Dubois County and the surrounding region. The project evaluated a 12-county region around Dubois County to consider potential alternatives and respective benefits and impacts associated with those potential routes. Due to the size of this study area and project, a Tiered NEPA evaluation process was implemented to determine a preferred route for this improvement. The preferred route defined by this process is identified as Alternative P and includes a new terrain corridor generally following the existing US 231 route through the central portion of the study area.

Five corridor Sections of Independent Utility (SIU) have been identified for subsequent Tier 2 Studies along this corridor and nine local improvements along existing US 231 are also included, each of which is also a SIU. The Tier 2 studies will define the facility type and specific right of way for the facility. For the Local Improvements, the Tier 2 studies (possibly CE level NEPA documents) will fully define the improvement (passing lane, turn lane, intersection improvement, etc.) and right of way needs. The overall schedule for full development of this corridor is currently not specifically defined pending programming of funds, but it is anticipated to extend over several years and INDOT programming cycles.

Based on these project considerations Section 7 Consultation is planned to be Tiered with a Tier 1 Biological Assessment and Biological Opinion conducted to address the entire corridor and subsequent Tier 2 Biological Assessments and Biological Opinions being prepared independently for each SIU. Also due to the overall project timing, candidate and proposed species will be addressed through conferencing during Tier 1 and Tier 2 to avoid future project delays if/when listing is formalized by USFWS.

2) Species to be Considered

a) Early coordination with USFWS identified the following species of concern:
   i) Indiana bat (*Myotis sodalis*) Endangered
   ii) Gray bat (*Myotis grisescens*) Endangered
   iii) Northern long-eared bat (*Myotis septentrionalis*) Threatened
   iv) Little brown bat (*Myotis lucifugus*) National Listing Workplan FY22
   v) Tricolored bat (*Perimyotis subflavus*) Proposed
   vi) Least tern (*Sterna antillarum*) Endangered
   vii) Fanshell (*Cyprogenia stegaria*) Endangered
   viii) Sheepnose (*Plethobasus cyphyus*) Endangered
   ix) Rough pigtoe (*Pleurobema plenum*) Endangered
   x) Fat pocketbook (*Potamilus capax*) Endangered
   xi) Rabbitsfoot (*Quadrula quadrula*) Endangered

xii) Lake sturgeon (*Acipenser fulvescens*) National Listing Workplan FY24
xiii) Northern cavefish (*Amblyopsis spelaea*) National Listing Workplan FY23
xiv) Hoosier cavefish (*Amblyopsis hoosieri*) National Listing Workplan FY23
xv) Round hickorynut (Obovaria subrotunda) Proposed threatened
xvi) Salamander mussel (*Simpsonaias ambigua*) National Listing Workplan FY22
xvii) Monarch butterfly (*Danaus plexippus*) Candidate
xviii) Bald eagle (*Haliaeetus leuicocephalus*) Delisted/Bald and Golden Eagle Protection Act

b) Eliminated Species: Four species noted in previous USFWS correspondence have been eliminated from concern due to either delisting or known regional ranges beyond the area potentially affected by preferred Alternative P.
   i) Least tern - Delisted
   ii) Rabbitsfoot - Endangered
   iii) Round hickorynut - Proposed threatened
   iv) Northern cavefish/ Hoosier cavefish - National Listing Workplan FY23
c) Listed Species
   i) Indiana bat - Endangered
   ii) Gray bat - Endangered
   iii) Northern long-eared bat - Threatened
   iv) Fanshell - Endangered
   v) Sheepnose - Endangered
   vi) Rough pigtoe - Endangered
   vii) Fat pocketbook - Endangered
d) Candidate/Proposed Species
   i) Monarch butterfly
   ii) Tricolored bat
   iii) Little brown bat
   iv) Salamander mussel
   v) Lake sturgeon
e) Based on the extended programming schedule for the overall development of this corridor, currently identified candidate/proposed species will be included in the Biological Assessment for Conference coordination along with the Formal Consultation for the currently listed species. The Service anticipates developing a Conference Opinion for the species not yet listed that would be able to be transitioned to a formal Biological Opinion if/when the candidate/proposed species are listed as threatened or endangered.

3) Definitions of Tier 1 Action Areas (bats)

a) No Hibernacula have been identified; therefore, no Winter Action Area has been defined.
b) Action Area – Tier 1
   i) A single all-encompassing Tier 1 potential Action Area will be based on the farthest-reaching stressor (construction noise), based on the corridor centerline.
   ii) Induced growth areas identified will be added to the Action Area where they extend beyond the construction noise limit in Tier 1. These will be amended if needed during Tier 2.

4) Analyses to Support Tier 1 Biological Opinion/Conference Opinion

a) Assessment Methods
   i) Bats: The Tier 1 BA will include a review/discussion of USFWS and IDNR capture and hibernacula records relative to the Alternative P corridor and an assessment of proximity to Priority caves. Additionally, the Tier 1 BA will identify multiple possible maternity colonies for each bat species along the corridor. Acreage/percentage of colonies within the corridor

and acreage/percentage of forest within the corridor and working alignment will be included in the general Tier 1 analysis. A general review of forest fragmentation using the working alignment will also be conducted. No field surveys are planned for Tier 1.

(1) For possible maternity colony locations, the same centroid was used for all species (see attached maps).
   (a) 2.5 mile radius – Indiana bat, little brown bat, tricolored bat
   (b) 1.5 mile radius – Northern long-eared bat

ii) Mussels: The assessment of potential impacts to mussels will be limited to a review of a previous substrate/unionid survey conducted at the East Fork White River and personal communications with Brant Fisher (IDNR). Mussel species will be evaluated if they have population potential within the East Fork White River reach crossed by Alternative P, which is designated to be adjacent to the existing US 231 bridge crossing. The species of concern to be evaluated include the eastern fanshell, fat pocketbook and salamander mussels. Mussels from the initial species list identified within the study area that will not be assessed due to no anticipated effect based on lack of existence in the specified reach of concern include the rough pigtoe and sheepnose mussels. No field surveys are planned for Tier 1.

iii) Lake Sturgeon: The assessment of potential impacts to the lake sturgeon is limited to a literature review of IDNR annual reports of the species on the East Fork White River and personal communications with Brant Fisher (IDNR). No field surveys are planned for Tier 1.

iv) Monarch butterfly: The Monarch butterfly is assumed to be present throughout the study area where pollinator habitat exists. Only general evaluation of the existence of monarch butterfly habitats within the corridor will occur.

b) Anticipated effects determinations

i) Based on informal consultation to date along with initial records analysis Tier 1 determinations of effect based on assumed presence or probable absence within the action area and the anticipated impacts to the species are anticipated as follows:

(1) Biological Opinion
   (a) Indiana bat – Likely to adversely affect
   (b) Northern long-eared bat – Likely to adversely affect
   (c) Fanshell – Likely to adversely affect
   (d) Fat pocketbook – Likely to adversely affect

(2) Conference Opinion
   (a) Tricolored bat – Likely to adversely affect
   (b) Little brown bat – Likely to adversely affect
   (c) Salamander mussel – Likely to adversely affect
   (d) Monarch butterfly – Likely to adversely affect

(3) The following species area anticipated to receive a Tier 1 determination of May affect, not likely to adversely affect:
   (a) Gray bat
   (b) Sheepnose
   (c) Rough pigtoe
   (d) Lake sturgeon

5) **Tier 2 Bat Surveys**

a) Role/timing of mist-netting surveys

Mist net surveys will be conducted during Tier 2 prior to the Tier 2 formal consultation on a Section by Section (SIU) basis. Tier 2 mist netting will follow the current active USFWS protocol

in terms of level of effort (LOE) for the Indiana bat and northern long-eared bat and would be seasonally constricted to May 15 through August 15.

a) Role of acoustic surveys
Acoustics may be used as a screening measure to determine the best locations where mist netting would be proposed for the formal presence/absence survey.

b) Consultation with USFWS regarding survey locations (not entire linear project)
Survey locations will be proposed to the USFWS throughout the project corridor where suitable habitat exists using the protocol guidelines for determining the minimum number of net nights required for a valid survey. For linear projects involving the northern long-eared bat the current minimum LOE is 4 net nights per km. Since the NLEB has a higher LOE, this species will drive the number of net nights unless the guidance changes.

c) Surveys would be used to identify maternity colonies. Any maternity colonies that are identified would receive additional analysis. The action area would not be modified or dictated by the results of the survey effort.

6) Tier 2 Mussel Surveys

a) Prior to Tier 2 formal consultation, mussel presence/absence surveys will be conducted in accordance with the IDNR guidelines and the Allegheny protocol under acceptable weather and river stage conditions during the summer.

b) Mussel bed avoidance will be prioritized during Tier 2 development. Any mussel beds that cannot be avoided through the Tier 2 development will be coordinated for relocation during the Tier 2 consultation (see Anticipated Mitigation - Mussel Species for mussel relocation efforts).

7) Treatment of Local Improvements

a) These relatively minor projects would only be relevant for the bats and the monarch butterfly. No other species considered as part of the Mid-States Corridor project would have potential impact from these identified projects.

b) Local Improvements may advance as individual projects or small groups. Each Local Improvement is an independent utility project for subsequent Tier 2 development. Based on the scope and nature of the Local Improvements, the extent of impacts will be evaluated through IPaC to determine if it qualifies for the Range-wide Programmatic Consultation and what, if any, compensation through the ILF is warranted. Additional informal consultation as appropriate will be conducted to fully evaluate all potential impacts and any other consultation needs for these projects.

8) **Anticipated Mitigation**

a) Bat species – Forest Impacts related to bat species will prioritize use of 1. In-Lieu Fee (ILF) Programs; 2. Habitat Banks; and 3. Permittee-Responsible Mitigation (PRM) in that order of priority. Permittee Responsible Mitigation would only be targeted based on a particular value as defined during Tier 2 consultation with an anticipation of increased credit value. Mitigation for suitable non-wetland forest habitat will be completed at a 3:1 ratio for areas beyond 300 feet of existing paved roads. Mitigation for suitable non-wetland forest habitat within 300 feet of existing paved roads will be completed at a 1.5:1 ratio. This will be addressed for all suitable habitat impacts including associated utility relocations and borrow/fill/staging areas.

i) Mitigation would be combined for all bat species being considered and listed at the time of the Tier 2 Consultation. This would include “stacking” of credits for ILF mitigation and would use fee schedules in place at the time of the Tier 2 Consultation to address the combined mitigation requirements. If Permittee-Responsible Mitigation is utilized, habitat

focus will address all species listed at the time of the Tier 2 Consultation and will address all pertinent habitats in site selection and mitigation elements through coordination with USFWS.

ii) Mitigation will occur for direct forest impacts as determined during Tier 2 based on actual right of way impacts.

iii) Wetland impacts related to bat species will be addressed by wetland mitigation under CWA/Section 404 permitting.

b) Mussel species - A mussel harvest/relocation survey will be conducted prior to bridge construction. This effort will be conducted for listed species based on the results of the Tier 2 presence/absence survey. In the unlikely event that neither state nor federal species are identified during the presence/absence phase, additional coordination to determine the necessity of additional survey and/or harvest/relocation efforts would be conducted during Tier 2 Consultation.

i) If federal/state mussels are identified in the Tier 2 presence/absence surveys, the harvest/relocation avoidance/minimization effort will be conducted the summer prior to planned bridge construction initiation.

ii) Follow-up surveys will be conducted post-construction at the relocation site to monitor success of the relocation effort.

iii) The potential remains for mitigation to occur through the ILF program under development with IDEM and/or any broader ILF programs that may be implemented by USFWS in place at the time of the Tier 2 Consultation. If utilized, this would be in addition to harvest/relocation efforts for any impacted mussel beds.

c) Lake sturgeon

i) For the purposes of the Tier 1 BA, we acknowledge that the lake sturgeon does on occasion venture as far downstream as the US 231 bridge and beyond; however, it is more often found upstream. Based on this, maintaining adequate fish passage and flow during bridge construction, along with removal of all obstacles post-construction will be addressed in the bridge construction specifications. Specific measures to address and ensure these elements will be developed during Tier 2.

d) Monarch butterfly - Pollinator habitat areas will be developed at select locations along the corridor. These will be coordinated during Tier 2 consultation.

e) Measures to avoid and minimize take

i) Bats: Seasonal tree clearing AMMs will be implemented for all habitat impacts including associated utility relocations and borrow/fill/staging areas.

ii) Mussels: Bridge pier location planning and construction impact coordination will be conducted during Tier 2 Design to minimize impacts and avoid mussel beds where possible.

iii) Monarch: Additional AMMs including seasonal brush/vegetation removal, limited pesticide use, reduced/seasonal mowing, weed species management, etc. will be discussed and developed during Tier 2.

Agreed to for content and approach.

FEDERAL HIGHWAY ADMINISTRATION

By: X MICHELLE LYNN HERRELL Digitally signed by MICHELLE LYNN HERRELL Date: 2023.01.20 13:45:37 -05'00'
for: Jermaine R. Hannon
Indiana Division Administrator

UNITED STATES FISH & WILDLIFE SERVICE

By: X
Patrice Ashfield
Acting Field Supervisor

INDIANA DEPARTMENT OF TRANSPORTATION

By: X LEHilden
Laura Hilden
Environmental Services Director

Appendix C
USFWS Responses

United States Department of the Interior
Fish and Wildlife Service

Indiana Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

September 10, 2019

Mr. Jason Dupont
Lochmueller Group, Inc.
6200 Vogel Road
Evansville, Indiana 47715

Project: Mid-States Corridor in Southern Indiana, Des. No. 1801941

Dear Mr. Dupont:

This responds to your letter dated August 5, 2019 requesting U.S. Fish and Wildlife Service (Service) comments on the aforementioned project. The Service has also received a copy of the Draft Purpose and Need Statement and attended an agency scoping meeting on August 20, 2019 to further discuss the project.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (l6 U.S.C. 661 et. seq.) and are consistent with the intent of the National Environmental Policy Act of l969, the Endangered Species Act of l973, as amended, and the U. S. Fish and Wildlife Service's Mitigation Policy.

The Federal Highway Administration (FHWA) in cooperation with the Indiana Department of Transportation (INDOT) and the Mid-States Corridor Regional Development Authority (RDA) are evaluating several potential routes in southern Indiana to provide new and improved transportation facilities beginning from the Ohio River at Rockport (Spencer County) and continuing north to connect with either I-69 or State Road (SR) 37. Roadway facility types considered may range from "Super-Two" type roads to four-lane roads with different levels of access control (Super-Two type roads include periodic passing lanes in alternating directions on two-lane rural roadways).

The purpose of the project is to provide better access to southern Indiana populations and manufacturing centers, including better connections to existing multimodal centers (air, river barge and rail connections). It also is intended to improve regional traffic safety in southern Indiana and support economic development in southern Indiana.

INDOT is developing this as a tiered project and has initiated development of a Tier 1 Environmental Impact Statement (EIS), which is intended to culminate in an EIS and Record of Decision (ROD). Preliminarily, alternatives have been developed into study bands which focus on resources over an approximately two-mile wide area. As these are further studied, refined

corridors approximately 2,000 feet wide will be developed within the study bands. Finally, a working alignment will be developed within each corridor to estimate impacts and preliminary construction and engineering costs.

Multiple alternatives are being considered and all alternatives will include existing US 231 beginning at Rockport and continuing to I-64 north of Dale; this stretch has already be improved in recent years. Alternatives will have either an eastern or western bypass around the cities of Huntingburg and Jasper. North of Jasper there will be multiple alternatives using existing facilities, new terrain construction, or a combination of both. The total length of the proposed corridors will vary between approximately 55 and 120 miles.

The Study Area includes 12 counties and encompasses 4,780 square miles of southern Indiana (Monroe, Greene, Daviess, Lawrence, Martin, Pike, Dubois, Orange, Warrick, Spencer, Perry, and Crawford counties). The area is comprised primarily of agricultural and forested land, although urban lands make-up a minor portion of the overall landscape.

AREA RESOURCES

Karst

The proposed project includes a large area with karst topography which contains numerous sinkholes, caves, springs, sinking streams, etc. Construction in areas such as this can be difficult and costly, both financially and to the environment. Excavation which intersects karst features or rerouting of drainage can drastically alter underground water and air flow patterns, resulting in significant adverse impacts to cave ecosystems and destabilization of surface soils. Drainage containing contaminants from construction sites, highway ditches, or other sources can also have substantial impacts. Since karst groundwater systems receive very little filtering by soil percolation, subsurface water quality is very sensitive to pollutants in surface runoff.

The Lost River watershed is located in the karst region and is crossed by at least one of the proposed alternatives. The Lost River is one of the largest sinking streams in the country. The watershed is over 200 square miles and begins like a typical river in western Washington County. As the stream winds its way into Orange County, the water begins to sink into swallow holes in the river bed. Eventually, it entirely disappears into a large underground system of water-carved passages and caves, leaving over 20 miles of dry river bed above ground before re-emerging near Orangeville (Grubbs, S.). The Wesley Chapel Gulf, part of the Lost River system, was named a National Natural Landmark in 1972.

As a result of the karst topography, unique subterranean fauna are known to occur in this area. These ecosystems are often fragile and easily susceptible to disturbance. Various obligatory cave species have been found in this region of the state including beetles, spiders, isopods, crayfish and salamanders. One such species is the newly described Hoosier cavefish (*Amblyopsis hoosieri*). This species is found in southern Indiana and was recently distinguished taxonomically from the northern cavefish (*Amblyopsis spelaea*) based on genetic, morphological, and geographic evidence. The type locale is found at Spring Mill State Park. There are also numerous records for this species along the area where the Crawford Uplands and the Mitchell

Plain Natural Regions meet, including portions of Lawrence, Orange, Crawford, and Martin Counties.

In 2011, after being petitioned to list the northern cavefish (*Amblyopsis spelaea*) as threatened or endangered, the Service determined that listing may be warranted. As a result, the Service has planned to conduct a status assessment and make a decision on whether or not to list the northern cavefish by 2022. Since the taxonomic split between the Hoosier cavefish and the northern cavefish in 2014, it is unclear what the Service's options are for adding the Hoosier cavefish to its listing plan. Currently, the Hoosier cavefish has no federal status although it is listed as endangered by the State of Indiana. If the Hoosier cavefish were to be added to the Service's listing plan, additional consultation may be needed for alternatives located near Hoosier cavefish habitat (alternatives east of existing US 231).

There have been previous karst and roadway issues in this part of the state, including a sinkhole opening along SR 37 near Mitchell in the mid 90's, as well as a couple of failures along a recently constructed road near the French Lick Airport in Orange County. Alternatives proposed in this part of the study area will need to have karst features identified and avoidance and minimization measures developed to reduce impacts. Impacts will be mitigated in accordance with our Memorandum of Agreement with the Indiana Department of Transportation.

Threatened and Endangered Species

The proposed project is within the range of the following federally endangered and threatened species:

Indiana bat (*Myotis sodalis*) (E)
northern long-eared bat (*Myotis septentrionalis*) (T)
sheepnose mussel (*Plethobasus cyphyus*)
fat pocketbook mussel (*Potamilus capax*) (E)
rough pigtoe mussel (*Pleurobema plenum*) (E)
gray bat (*Myotis grisescens*) (E)
least tern (*Sterna antillarum*) (E)
fanshell mussel (*Cyprogenia stegaria*) (E)
rabbitsfoot mussel (*Quadrula quadrula*) (E)
Indiana bat Critical Habitat

Indiana bats hibernate in caves then disperse to reproduce and forage in relatively undisturbed forested areas associated with water resources during spring and summer. Recent research has shown that they will inhabit fragmented landscapes with adequate forest for roosting and foraging. Young are raised in nursery colony roosts in trees, typically near drainageways in undeveloped areas. Like all other bat species in Indiana, the Indiana bat diet consists exclusively of insects. There are numerous records of the Indiana bat in the project area and suitable summer and winter habitat throughout the region.

Northern long-eared bats (NLEB) typically roost singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees (snags) (typically ≥3 inches dbh) in forest areas. Males and non-reproductive females may also roost in cooler places, like caves and mines. The NLEB appears opportunistic in selecting roosts, using tree species based on presence of cavities or crevices or presence of peeling bark. It has also been occasionally found roosting in structures like barns and sheds (particularly when suitable tree roosts are unavailable). They forage for insects in upland and lowland woodlots and tree lined corridors. During the winter,

NLEBs predominately hibernate in caves and abandoned mine portals. There are many NLEB capture, hibernacula, and roost records in the 12-county project area although the number of NLEBs appears to be decreasing since the emergence of the disease White-nose Syndrome.

There are multiple Indiana bat and northern long-eared bat hibernacula in the northeast portion of the study region, including a Priority 1 and Priority 2 cave. The majority of these are found in Monroe, Greene, Martin, Lawrence, and Orange Counties. The Crane Naval Surface Warfare Center has been previously mist-netted for bats and contains numerous capture records for Indiana and northern long-eared bats, as well as multiple roosts for both species. Along with multiple years of mist-net survey data from the I-69 studies, we understand the forested areas of this part of the state to support multiple colonies of Indiana and northern long-eared bats. There is also at least one mine with a record of northern long-eared bat use on the western side of the study area, near Petersburg.

Gray bats inhabit caves year-around and migrate between winter hibernation caves and summer maternity cave roosts for reproduction and foraging. Preferred foraging habitat is along wooded stream corridors and the forage base often includes a high proportion of aquatic insects. There are some foraging records for the gray bat in Spencer and Perry Counties and multiple acoustic records associated with I-69 summer surveys. There are also a couple of historical records of the gray bat in caves near the Towns of Bedford and Mitchell in Lawrence County.

Based on the abundance of forest and caves and previous records in the project area, surveys to determine impacts to threatened and endangered bats will likely be necessary. These surveys will help to determine applicable avoidance and minimization measures, as well as the need for habitat mitigation.

The interior least tern (*Sterna antillarum*) is the smallest tern found in North America. Least terns nest on barren to sparsely vegetated sandbars along rivers, sand and gravel pits, lake and reservoir shorelines, and occasionally gravel rooftops. They hover over and dive into standing or flowing water to catch small fish. There are recent records of the federally endangered least tern at the southern termini of the project near the Rockport Power Plant and east of the Town of Grandview. There are also records at a state property in Greene County. Depending on the scope of work in these area, additional coordination may be needed for this species.

Multiple mussel species are known to occur in the study area, primarily in the East Fork White River and Ohio River. The rabbitsfoot mussel is a medium to large mussel, elongate and rectangular in shape. Rabbitsfoot is primarily an inhabitant of small to medium sized streams and some larger rivers. It usually occurs in shallow water areas along the bank and adjacent runs and shoals with reduced water velocity. Specimens also may occupy deep water runs, having been reported in 2.7 to 3.7 m (9 to 12 feet) of water. Bottom substrates generally include gravel and sand. There are records for the rabbitsfoot in the Ohio River, in southeastern Spencer County.

The fat pocketbook mussel is a large mussel that prefers sand, mud, and fine gravel bottoms of large rivers. It buries itself in these substrates in water ranging in depth from a few inches to eight feet, with only the edge of its shell and its feeding siphons exposed. Reproduction requires

a stable, undisturbed habitat and a sufficient population of fish hosts to complete the mussel's larval development. There are multiple records for the fat pocketbook in the East Fork White River, including within and near two of the western proposed alternatives. Impoundments and dredging for navigation, substrate disturbance, and irrigation and flood control have altered or destroyed much of this mussel's habitat.

The fanshell mussel is a medium-sized shell, seldom exceeding 3.2 inches in length and found in medium to large rivers. It buries itself in sand or gravel in deep water of moderate current, with only the edge of its shell and its feeding siphons exposed. Reproduction requires a stable, undisturbed habitat and a sufficient population of fish hosts to complete the mussel's larval development. The fanshell mussel is considered to be extant in the East Fork White River throughout the entire project area, with numerous records particularly in Lawrence, Martin, and Dubois Counties.

The rough pigtoe is a medium sized mussel 3 to 4 inches in length with an inflated, triangular shaped shell. Shell color ranges from dark to yellowish brown. Light green rays may be present on the shell of younger individuals. This species is endemic to the Ohio River system and is found in stable substrates composed of a mixture of relatively firm and clean gravel, sand, and silt. There are records of the rough pigtoe in the East Fork White River upstream of US 231 to Williams Dam.

Finally, the sheepnose mussel occurs in the project area in the East Fork White River in Lawrence and Martin Counties, as well as multiple locations in the Ohio River, including near the US 231 bridge at Rockport. The sheepnose is a medium-sized mussel that grows to about 5 inches in length. It lives in larger rivers and streams where it is usually found in shallow areas with moderate to swift currents flowing over coarse sand and gravel.

Mussel surveys may be required to determine presence or absence of the species described above, depending on the preferred alternative selected. Avoidance and minimization measures, along with mitigation, may be warranted based on project specifics.

This endangered species information is provided for technical assistance only, and does not fulfill the requirements of Section 7 of the Endangered Species Act. Depending on the alignment selected, various studies may be necessary to determine impacts to threatened and endangered species. Specific avoidance and minimization measures for threatened and endangered species will be developed based on survey results and ongoing consultation.

Other Natural Resources

In addition to mussels, large rivers such as the East Fork White River, Ohio River, and the Patoka River, provide habitat for numerous other species, including fish, reptiles, amphibians and birds. Bald eagle populations have continued to increase in recent years and are often found along large rivers and reservoirs. There are over 50 known nesting records for the bald eagle in the project area (many of them along the East Fork White River). Coordination under the Bald and Golden Eagle Protection Act may be necessary. Additional information on bald eagles and permitting requirements can be found at: https://www.fws.gov/midwest/eagle/.

Lake Sturgeon (*Acipenser fulvescens*) are another rare species known to occur in this part of the state. They are slow-growing, long lived fish that can reach lengths of greater than 2m. Lake sturgeon were once widely distributed in the Ohio River basin; however, it is believed that the only extant Ohio River watershed population is found in the East Fork White River, including the project study area (Drauch 2008).

Recently (August 14, 2019), the Service released a 90-day finding on a petition to list U.S. populations of lake sturgeon. The Service found that the petition presented substantial scientific or commercial information indicating that the petitioned action may be warranted for the lake sturgeon due to potential threats associated with dams and hydroelectric facilities, dredging and channelization, contaminants, habitat fragmentation, the species' life-history characteristics, and invasive species. The petition also presented substantial information that the existing regulatory mechanisms may be inadequate to address impacts of these threats. The next step will be for the Service to add the lake sturgeon to its listing plan and then complete a status assessment. Once that is completed, the Service will issue 12-month finding on whether or not listing is warranted. Depending on which alternatives are selected, and the results of the 12 month finding, Section 7 consultation on lake sturgeon may be necessary.

Besides being habitat for numerous species, several of the rivers in the study area also have special designations within the state. Portions of the Patoka River, East Fork White River, and the Lost River have been included on the Natural Resource Commission's (NRC) list of Outstanding Rivers and/or have been listed on the National Park Service's Nationwide Rivers Inventory (NRI). Rivers on the NRC's list are known to have particular environmental or aesthetic interest. In order to be listed on the NRI, a river must be free-flowing and possess one or more Outstandingly Remarkable Values (ORVs) related to natural, cultural, and recreational resources.

The study area contains multiple parks and public lands including the Glendale Fish and Wildlife Area and the Hoosier National Forest. Less known areas include the Buffalo Flats and Wenning-Sheritt Seep Springs Nature Preserves. The Buffalo Flats Nature Preserve is located northeast of Jasper along Kellerville Road and is a high-quality forested wetland located in the Patoka River floodplain. This nature preserve provides substantial wildlife habitat and wildlife travel corridors. The area is owned and managed by the Indiana Department of Natural Resource's Division of Nature Preserves. The preserve is the only known Indiana site for the Western Cottonmouth, one of two endangered snakes residing in Indiana. The other state-listed snake, the copperbelly water snake, has also been documented at Buffalo Flats Nature Preserve.

The Wenning-Sheritt Seep Springs Nature Preserve northwest of Jasper contains high-quality, wet-mesic floodplain forest, upland forest, and marsh and acid seep communities. This area is owned and managed by The Nature Conservancy.

Section 4(f) of the Transportation Act of 1966 requires that land from a publicly owned park, recreation area or wildlife or waterfowl refuge or any significant public or private historical site shall not be used by the Federal Highway Administration for highway right-of-way unless a determination is made that there is no feasible and prudent alternative to the use of land from

such property. Furthermore, the proposed action must include all possible planning to minimize harm to the property which results from such use. A Section 4(f) determination concerning project impacts may be required as part of the environmental review process if federal funds are utilized.

Section 6 (f) (3) of the Land and Water Conservation Fund (LWCF) Act provides that property acquired or developed with grants from the LWCF shall not be converted to other than public outdoor recreation uses without the prior approval of the Secretary of the Interior. This program is administered by the National Park Service. Any such lands that are converted must be replaced with lands of equivalent usefulness and location. A determination may be necessary concerning whether any lands using LWCF monies will be converted by the proposed project.

In addition, there are several I-69 mitigation properties located within the study boundary that should be given consideration during project planning.

DRAFT PURPOSE AND NEED STATEMENT

The Service was provided a copy of the Draft Purpose and Need Statement for the Mid-States Corridor Project on August 13, 2019 and attended an agency meeting on August 20 to further discuss the project and the Draft Purpose and Need Statement. The Purpose and Need Statement was developed to set the stage for consideration of different alternatives developed to address the specific transportation problem(s).

The Draft Purpose and Need Statement mentions several previous studies that support the need for a major north-south corridor in southern Indiana. We are aware of a previous project that was proposed in the region along US 231 from I-64 to SR 56 at Haysville. The Draft EIS for the project (and 2011 Supplemental Draft EIS) was eventually withdrawn in 2014. The Federal Register Notice indicated that "Due to a reevaluation of the traffic information, the project is no longer warranted and the Notice of Intent is rescinded". Further clarification as to what has changed such that another project is warranted should be included in the supporting evidence of the Purpose and Need Statement.

Also, it is unclear how the I-69 project (including the new Ohio River Crossing at Evansville and Section 6, which is yet to be constructed) fits into these various analyses and future analyses. The newly constructed I69 corridor is approximately only 20 miles west of most of the proposed Mid-States Corridor alternatives and parallels much of the newly proposed corridor. The need for a new limited access facility in such close proximity to I69 is not clear. We recommend that safety, traffic, and economic effects from the completion of I69 be evaluated and more thoroughly discussed in the Purpose and Need Statement.

Based on the resource information discussed above, the Service does not support any of the alternatives that branch in an easterly direction from the US 231 mainline. The topography, forests and karst resources in this area are unique and support sensitive ecosystems that should be avoided. Furthermore, we recommend that new terrain alternatives be avoided to reduce impacts to natural resources and farmland, avoid habitat fragmentation, and minimize new stream and river crossings.

Wetland and stream impacts may require permits from the U.S. Army Corps of Engineers, the Indiana Department of Environmental Management's Water Quality Certification program and the Indiana Department of Natural Resources. Wetland impacts should be avoided, and any unavoidable impacts should be compensated for in accordance with the U.S. Army Corps of Engineers mitigation guidelines.

We appreciate the opportunity to coordinate early in the process to help reduce impacts to natural resources and look forward to reviewing additional project details once those are available. We also accept the FHWA's invitation to be a Cooperating Agency for the project. If you have any questions or need more information, please feel free to contact Robin McWilliams Munson of my staff at Robin_McWilliams@fws.gov or 812-334-4261 x. 207. Robin will be the point of contact for the project.

Sincerely,

Scott Pruitt
Field Supervisor

Cc: (via email)
Michelle Allen, Federal Highway Administration, Indianapolis, IN
Laura Hilden, INDOT, Indianapolis, IN
Matt Buffington, IDNR, Indianapolis, IN
Virginia Lasweski, USEPA, Chicago, IL
Deborah Snyder, USCOE, Indianapolis, IN
Randy Braun, IDEM, Indianapolis, IN

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United States Department of the Interior
Fish and Wildlife Service

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March 23, 2020

Mr. Jason Dupont
Lochmueller Group, Inc.
6200 Vogel Road
Evansville, Indiana 47715

Dear Mr. Dupont:

These comments have been prepared in accordance with Section 7 of the Endangered Species Act of 1973, as amended. Our comments are consistent with the intent of the National Environmental Policy Act of l969 and the U. S. Fish and Wildlife Service's Mitigation Policy.

The Service has recently reviewed the Tier 1 Environmental Impact Study - Screening of Alternatives Report (Screening Report) for the Mid-States Corridor Project. We also were able to take part in the agency meeting on March 3rd as well as participate in the March 4th auto tour of the project area to see first-hand many of the alignment variations and options. The project begins along existing US 231 in Spencer County at Rockport, IN and continues north to eventually connect to I-69 via several proposed alignments.

The Screening Report initially screened twenty-eight preliminary alternatives on ten routes. From there, ten preliminary alternatives on five routes were developed and those routes have been carried forward for detailed study.

The routes were grouped into three geographic families: Northwest, North Central, and Northeast. Cost, performance, and impacts were used to screen among alternatives within the same family. Facility types considered included freeway, expressway, and Super-2.

The Screening Report has recommended the following alternatives for further analysis in the Tier 1 Draft Environmental Impact Statement (DEIS):

Northwest:

Alternative B (Expressway only)
Alternative C (Expressway and Freeway)

Northcentral:

Alternative P (Expressway, Freeway, and Super 2)

Northeast:

Alternative M (Expressway, Freeway, and Super 2)
Alternative O (Expressway only)

According to the information presented in the Screening Report, the Northwest Family has the fewest forest, stream, floodplain and karst impacts. This alternative also is likely to be the least expensive to construct (per comments made at the agency meeting). Conversely, the Northeast Family of alternatives appears to have the highest number of environmental impacts and be the most expensive. Impacts to forests are estimated to be between 1,369 and 1,998 acres, wetlands between 35 and 50 acres, and acres of karst features from 152 to 482. In addition, stream impacts are expected to be between 74,335 and 104,523 linear feet and floodplain impacts between 175 and 464 acres. Some of these amounts are over three times the impacts of the Northwest Family.

Due to the significantly higher amount of impacts from construction of the Northeast alternatives, the Service recommends that those routes (M and O) be eliminated from further consideration. The topography, forests and karst resources in this area are unique and support sensitive ecosystems, including federally threatened and endangered species, and should be avoided.

Furthermore, during the auto tour it was obvious that flooding and topography was more significant along the eastern side of the Cities of Huntingburg and Jasper. We recommend that each alternative that moves forward include an analysis of a western bypass around these two cities.

Threatened and Endangered Species

One of the key resources evaluated in the Screening Report for the preliminary alternatives is threatened and endangered species. The Service has been coordinating with the Federal Highway Administration (FHWA) in Indiana, as well as with the Indiana Department of Transportation (INDOT) on federally listed species within the project area. The following comments pertain to Section 2.4.9 of the Screening Report.

The Service provided a species list for the project area, including specific information on each species, in our letter to Jason Dupont of Lochmueller Group dated September 10, 2019; that list is still valid and is accurately reflected in the Screening Report. In addition to currently listed species, there are several local species that are in varying stages of the Endangered Species Act listing process. The Service has developed a National Listing Workplan[1] to help address the potential listing of these and other species over the next five years. The following species, (including the year they are to be evaluated), are included in the National Listing Workplan and may potentially be found within the project area:

Round hickorynut (Obovaria subrotunda), Fiscal Year 2020

[1] A species' inclusion in this workplan does not mean it is going to be listed as endangered or threatened under the ESA. That determination would be made following a rigorous scientific assessment of the species status. See https://www.fws.gov/endangered/what-we-do/listing-workplan.html

Salamander mussel (Simjpsonaias ambigua), Fiscal Year 2022
Little brown bat (Myotis lucifugus), Fiscal Year 2023
Tri-colored bat (Perimyotis subflavus), Fiscal Year 2021

The Screening Report indicates that the tubercled blossom mussel, a federally endangered species, occurs in the project area (page 28). The Service does not consider the tubercled blossom mussel to be extant in Indiana and does not include it on our state species list. The State of Indiana has also removed it from their list. In addition, on page 29, the report mentions the copperbelly watersnake (*Nerodia erythrogaster neglecta*) as being a federally listed species in the area; however, only the northern population (found in three counties in northeast Indiana) is federally listed.

Lake sturgeon (*Acipenser fulvescens*) is a rare species known to occur in the project area. It is listed as Endangered by the State of Indiana. The Lake sturgeon population found in the East Fork of the White River is the last reproducing population of the Ohio River strain known to exist within the Ohio River Watershed. Although it is not currently on the National Listing Workplan, on August 14, 2019, the Service released a 90-day finding on a petition to list U.S. populations of lake sturgeon. The Service found that the petition presented substantial scientific or commercial information indicating that the petitioned action may be warranted for the lake sturgeon due to potential threats associated with dams and hydroelectric facilities, dredging and channelization, contaminants, habitat fragmentation, the species' life-history characteristics, and invasive species. The Service is expected to make a 12 month finding on whether or not to list the species as threatened or endangered in the near future.

In summary, due to the significantly higher amount of impacts from construction of the Northeast alternatives to unique and sensitive ecosystems, along with the potential for significantly greater impacts to State and Federal listed species, the Service recommends that routes (M and O) be eliminated from further consideration.

We appreciate the opportunity to coordinate early in the process to help reduce impacts to natural resources and look forward to reviewing additional project details once those are available. If you have any questions or need more information, please feel free to contact Robin McWilliams Munson of my staff at Robin_McWilliams@fws.gov or 812-334-4261 x. 207.

Sincerely,

Scott Pruitt
Field Supervisor

cc (via email):
Kari Carmany-George, FHWA, Indianapolis, IN
Michelle Allen, FHWA, Indianapolis, IN
Kyanna Moon, INDOT, Indianapolis, IN
Virginia Laszewski, EPA, Chicago, IL
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United States Department of the Interior
Fish and Wildlife Service

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June 29, 2021

Mr. Jason Dupont
Lochmueller Group
6200 Vogel Road
Evansville, IN 47715

RE: Mid-States Corridor Project (Des. No. 1801941) updated T&E species list

Dear Mr. Dupont,

This responds to your letter dated June 10, 2021, requesting an updated species list for the Mid-States Corridor project in southern Indiana. These comments have been prepared in accordance with Section 7 of the Endangered Species Act of 1973, as amended. Our comments are consistent with the intent of the National Environmental Policy Act of l969 and the U. S. Fish and Wildlife Service's Mitigation Policy.

The Service has provided threatened and endangered species information for the Mid-States project on two previous occasions, the latest in a March 23, 2020 letter to Mr. Jason Dupont. Since that time, additional species and project information has become available, resulting in the recent request for an updated list. Furthermore, the National Listing Workplan was recently updated in January 2021 (https://www.fws.gov/endangered/esa-library/pdf/National-Listing-Workplan-FY21-FY25.pdf); the most current workplan dates are included where applicable.

The proposed project is currently comprised of five potential alternative alignments: B, C, M, P and O. The Service is providing this updated list of species based on each alignment corridor. In the case of the aquatic species, some alignments are only adjacent to or near the species' habitat, as opposed to directly crossing it; this is indicated below. This list will be addressed in the Tier 1 Environmental Impact Statement (EIS) and will help facilitate the evaluation of alternatives in the EIS relative to potential impacts to threatened and endangered species. Further in-depth analysis of species' impacts will be addressed in the Tier 1 Biological Assessment based on the preferred alignment. Following is a list of species potentially affected by each alignment.

Alternative B:

- Indiana bat (*Myotis sodalis*) – federally endangered
- Gray bat (*Myotis grisescens*) – federally endangered

- Northern long-eared bat (*Myotis septenrionalis*) – currently federally threatened; status assessment ongoing; National Listing Workplan date FY22
- Little brown bat (*Myotis lucifugus*) – status assessment ongoing; National Listing Workplan date FY22
- Tri-colored bat (*Perimyotis subflavus*) – status assessment ongoing; National Listing Workplan date FY22

- Fanshell mussel (*Cyprogenia stegaria*) – federally endangered
- Fat pocketbook mussel (*Potamilus capax*) – federally endangered

- Bald Eagle (*Haliaeetus leucocephalus*) – federally delisted; protected under Bald and Golden Eagle Protection Act

- Monarch (*Danaus plexippus*) – candidate species. Listing was warranted but precluded due to other priority listing actions. Species will be reviewed each year and is included on the National Listing Workplan for listing in FY24.

Alternative C:

- Indiana bat (*Myotis sodalis*) – federally endangered
- Gray bat (*Myotis grisescens*) – federally endangered
- Northern long-eared bat (*Myotis septenrionalis*) – currently federally threatened; status assessment ongoing; National Listing Workplan date FY22
- Little brown bat (*Myotis lucifugus*) – status assessment ongoing; National Listing Workplan date FY22
- Tri-colored bat (*Perimyotis subflavus*) – status assessment ongoing; National Listing Workplan date FY22

- Fanshell mussel (*Cyprogenia stegaria*) – federally endangered
- Fat pocketbook mussel (*Potamilus capax*) – federally endangered

- Bald Eagle (*Haliaeetus leucocephalus*) – federally delisted; protected under Bald and Golden Eagle Protection Act

- Monarch (*Danaus plexippus*) – candidate species; listing warranted but precluded due to other priority listing actions; species will be reviewed each year and is included on the National Listing Workplan for listing in FY24

Alternative M:

- Indiana bat (*Myotis sodalis*) – federally endangered
- Gray bat (*Myotis grisescens*) – federally endangered
- Northern long-eared bat (*Myotis septenrionalis*) – currently federally threatened; status assessment ongoing; National Listing Workplan date FY22

- Little brown bat (*Myotis lucifugus*) – status assessment ongoing; National Listing Workplan date FY22
- Tri-colored bat (*Perimyotis subflavus*) – status assessment ongoing; National Listing Workplan date FY22

- Fanshell mussel (*Cyprogenia stegaria*) – federally endangered
- Fat pocketbook mussel (*Potamilus capax*) – federally endangered
- Rough pigtoe mussel (*Pleurobema plenum*) – federally endangered; found in EFWR proximal/adjacent to alternative M
- Sheepnose mussel (*Plethobasus cyphyus*) – federally endangered; found in EFWR proximal/adjacent to alternative M
- Salamander mussel (*Simpsonaias ambigua*) – status assessment ongoing; National Listing Workplan date FY22; found in EFWR proximal/adjacent to alternative M

- Lake Sturgeon (*Acipenser fulvescens*) – recently added to the National Listing Workplan for FY24; found in EFWR proximal/adjacent to alternative M

- Bald Eagle (*Haliaeetus leucocephalus*) – federally delisted; protected under Bald and Golden Eagle Protection Act

- Monarch (*Danaus plexippus*) – candidate species; listing warranted but precluded due to other priority listing actions; species will be reviewed each year and is included on the National Listing Workplan for listing in FY24

Alternative P:

- Indiana bat (*Myotis sodalis*) – federally endangered
- Gray bat (*Myotis grisescens*) – federally endangered
- Northern long-eared bat (*Myotis septenrionalis*) – currently federally threatened; status assessment ongoing; National Listing Workplan date FY22
- Little brown bat (*Myotis lucifugus*) – status assessment ongoing; National Listing Workplan date FY22
- Tri-colored bat (*Perimyotis subflavus*) – status assessment ongoing; National Listing Workplan date FY22

- Fanshell mussel (*Cyprogenia stegaria*) – federally endangered
- Fat pocketbook mussel (*Potamilus capax*) – federally endangered
- Rough pigtoe mussel (*Pleurobema plenum*) – federally endangered; found in EFWR proximal/adjacent to alternative P
- Sheepnose mussel (*Plethobasus cyphyus*) – federally endangered; found in EFWR proximal/adjacent to alternative P
- Salamander mussel (*Simpsonaias ambigua*) – status assessment ongoing; National Listing Workplan date FY22; found in EFWR proximal/adjacent to alternative P

- Lake Sturgeon (*Acipenser fulvescens*) – recently added to the National Listing Workplan for FY24; found in EFWR proximal/adjacent to alternative P

- Bald Eagle (*Haliaeetus leucocephalus*) – federally delisted; protected under Bald and Golden Eagle Protection Act

- Monarch (*Danaus plexippus*) – candidate species; listing warranted but precluded due to other priority listing actions; species will be reviewed each year and is included on the National Listing Workplan for listing in FY24

Alternative O:

- Indiana bat (*Myotis sodalis*) – federally endangered
- Gray bat (*Myotis grisescens*) – federally endangered
- Northern long-eared bat (*Myotis septenrionalis*) – currently federally threatened; status assessment ongoing; National Listing Workplan date FY22
- Little brown bat (*Myotis lucifugus*) – status assessment ongoing; National Listing Workplan date FY22
- Tri-colored bat (*Perimyotis subflavus*) – status assessment ongoing; National Listing Workplan date FY22

- Hoosier cavefish/ Northern cavefish (*Amblyopsis Hoosieri/Amblyopsis spelaea*) – Hoosier cavefish and northern cavefish recently taxonomically split; Hoosier cavefish found north of Ohio River but currently only northern cavefish on the National Listing Workplan (FY22).

- Bald Eagle (*Haliaeetus leucocephalus*) – federally delisted; protected under Bald and Golden Eagle Protection Act

- Monarch (*Danaus plexippus*) – candidate species; listing warranted but precluded due to other priority listing actions; species will be reviewed each year and is included on the National Listing Workplan for listing in FY24

Please note, as a result of project changes, additional species information, and species delisting, the rabbitsfoot mussel (*Quadrula cylindrica cylindrica*), round hickorynut mussel (*Obovaria subrotunda*), and interior least tern (*Sterna antillarum athalassos*) are no longer included in threatened and endangered species evaluations for this project.

We appreciate the opportunity for continued coordination on this project and to work collaboratively for the conservation of federally protected species and other resources of concern. If you have any questions please contact Robin McWilliams Munson of my staff at Robin_McWilliams@fws.gov or 812-334-4261 x. 207.

Sincerely,

Scott Pruitt
Field Supervisor

Cc:
Michelle Allen, FHWA
Kari Carmany-George, FHWA
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Daniel Corbin, INDOT
Sandra Bowman, INDOT
Ronald Bales, INDOT
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Appendix D
Northern Arizona University
Species from Feces Results
Redacted

U.S. Department of Transportation
Federal Highway Administration

Errata

Date:	June 1, 2023
Issuing Office:	Federal Highway Administration Indiana Department of Transportation
Address:	Indiana Department of Transportation 100 N Senate N758-ES Indianapolis, IN 46204
Name of Document:	Mid-States Corridor Project Tier 1 Biological Assessment Southwest Indiana January 27, 2023
Project Des. No.:	1801941

The following changes were made to the document following formal Endangered Species Act Section 7 Consultation review by the U.S. Fish and Wildlife Service:

Errata 1

Location: Section 12.4.6 USFWS and IDNR Species Records Summarization; Page103, fourth paragraph, second sentence.

Incorrect Statement: The USFWS considers an 83-mile reach from the White River confluence to near the Lost River confluence as suitable habitat for the mussel.

Correct Statement: The USFWS considers an 83-mile reach of the White River and East Fork White River from the Wabash River confluence to near the Lost River confluence as suitable habitat for the mussel

Errata 2

Location: Section 11.5.6 USFWS and IDNR Species Records Summarization; Page43, second paragraph, second sentence.

Incorrect Statement: The closest documented little brown bat hibernacula is approximately 7 miles to the northeast of the Alternative P corridor termini at I-69 (same cave as for the little brown bat).

Correct Statement: The closest documented tricolored bat hibernacula is approximately 7 miles to the northeast of the Alternative P corridor termini at I-69 (same cave as for the little brown bat).