United States Department of the Interior

FISH AND WILDLIFE Service
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In Reply Refer To:
FWS/R2/OKES/
02EKOK00-2015-F-1000

November 20, 2015

Jane Summerson, Ph.D.
U.S. Department of Energy
Office of Electricity Delivery and Energy Reliability
P.O. Box 5400, Building 391
Albuquerque, New Mexico 87185-5400

Dear Dr. Summerson:

This letter transmits the U. S. Fish and Wildlife Service's (Service) biological opinion, pursuant to section 7 of the Endangered Species Act of 1973 (16 USC 1531 *et seq.*), as amended (Act), addressing the anticipated impacts of the proposed Plains and Eastern Clean Line transmission project on species that are federally-listed under the Act. Pursuant to 50 C.F.R. §402.07, the U.S. Department of Energy (DOE), Southwestern Power Administration (SWPA) and Tennessee Valley Authority (TVA) agreed to have DOE serve as the lead agency for purposes of this consultation. Accordingly, DOE is considering whether to participate, acting through SWPA, in the proposed Project pursuant to authority granted under Section 1222(b) of the Energy Policy Act of 2005. Participation in the proposed Project, pursuant to Section 1222, may include actions such as designing, developing, constructing, owning, operating, maintaining, and/or possibly decommissioning of project elements within the states where SWPA operates. Further, the proposed Project requires TVA's authorization to allow interconnection to the TVA transmission system. Any such interconnection would require upgrades to TVA's transmission system to protect grid reliability while accommodating Clean Line's request to inject 3,500 MW into the TVA system. Therefore, DOE, SWPA and TVA each have federal actions related to the proposed Project.

Clean Line Energy Partners LLC of Houston, Texas, (parent company of Plains and Eastern Clean Line LLC and Plains and Eastern Clean Line Oklahoma LLC, which are two entities collectively referred to herein as "Clean Line") is proposing to construct and operate an overhead ± 600-kilovolt (kV) high voltage direct current (HVDC) electric transmission system and associated facilities with the capacity to deliver approximately 3,500 megawatts of power primarily from renewable energy generation facilities in the Oklahoma and Texas Panhandle regions to load-serving entities in the Mid-South and Southeast United States via an interconnection in Arkansas and an interconnection with the TVA in Tennessee. Major facilities associated with the proposed Project include converter stations, an approximate 1,161 km (721.5-mile) long HVDC transmission line; an alternating current (AC) collection system; and both permanent and temporary access roads.

The enclosed biological opinion (BO) outlines and evaluates the potential effects of this proposed transmission project, and associated facilities, on species that are federally listed under the Act. This BO also identifies specific project elements that will avoid or minimize adverse effects of the proposed Project on listed species and designated critical habitat. The purpose of this BO is to ensure that this proposed federal action does not jeopardize the continued existence of any threatened, endangered or proposed species or result in the destruction or adverse modification of critical habitat. Section 7 allows the Service up to 90 calendar days to conclude formal consultation with DOE and an additional 45 calendar days to prepare our biological opinion (unless we mutually agree to an extension).

The DOE submitted a Biological Assessment (BA) and request for formal consultation on March 27, 2015. We received their March 27, 2015, request on March 30, 2015. The DOE, SWPA and TVA have determined that the proposed action may affect 25 species, as explained below, within the States of Oklahoma, Texas, Arkansas and Tennessee.

The DOE has determined, based upon information contained within the March 27, 2015, BA and other supporting documents, that the proposed Project is not likely to adversely affect the following 19 species or any proposed or designated critical habitat:

Species	**Common Name**	**Scientific Name**
Aquatic Invertebrates	Curtis pearlymussel	*Epioblasma florentina curtisii*
	Fat pocketbook	*Potamilus capax*
	Pink mucket	*Lampsilis abrupta*
	Rabbitsfoot	*Quadrula cylindrica cylindrica*
	Scaleshell mussel	*Leptodea leptodon*
	Snuffbox	*Epioblasma triquetra*
	Speckled pocketbook	*Lampsilis streckeri*
	Spectaclecase	*Cumberlandia monodonta*
Fish	Arkansas darter	*Etheostoma cragini*
	Arkansas River shiner	*Notropis girardi*
	Pallid sturgeon	*Scaphirhynchus albus*
Amphibian	Ozark hellbender	*Cryptobranchus alleganiensis*
Birds	Interior least tern	*Sternula antillarum athalassos*
	Piping plover	*Charadrius melodus*
	Red knot	*Calidris canutus rufa*
	Sprague's pipit	*Anthus spragueii*
	Whooping crane	*Grus americana*
Plants	Geocarpon	*Geocarpon minimum*
	Pondberry	*Lindera melissifolia*

On May 11, 2015, the Service requested additional information regarding the interior least tern, piping plover, rufa red knot and whooping crane. At that time the BA relied on protection measures, such as an avian protection plan, in reaching its conclusions regarding impacts to federally-listed species. However some of these measures, such as the avian protection plan, have not been developed. Because these plans and the measures they contain are essential to minimizing project related impacts, particularly the risk of avian mortality due to collision with the proposed transmission lines, and were instrumental in reaching determinations for these species in the BA, we could not accurately assess the project related impacts and any offsetting measures to these species without this information. We requested, in our May 11, 2015, letter that this information be provided to the Service or DOE provide a written statement that the data are

unavailable. If the requested data are not available, the Service may assume that adverse impacts, including collision mortality, may occur where appropriate protective measures are not in place.

By letter dated May 27, 2015, DOE responded to the Service's request for additional information. The DOE indicated that Clean Line intends to develop an avian protection plan consistent with the Avian Power Line Interaction Committee guidance and that sufficient information on the appropriate protective measures is already provided in the BA. As explained in the BA, DOE concluded that the risk of collision is highly unlikely and that measures in the BA are sufficient to avoid or minimize the risk of collision. For the whooping crane, the DOE and Clean Lines committed to marking the transmission line within 0.4 km (0.25 miles) of any suitable stopover habitat. Consequently, the Service concurs with the determination of not likely to adversely affect the whooping crane. The Service also concurs with the determination of not likely to adversely affect for the above species, with the exception of the interior least tern and piping plover. Although the risk of collisions for these species is low, the Service could not reasonably conclude that the risk of a collision with the transmission lines or the anticipated wind generation facilities is effectively avoided, except for the whooping crane, and thus no take would occur from the proposed Project. Anticipated impacts to the interior least tern and piping plover will be addressed in the Service's BO.

In addition, DOE determined that the proposed Project is likely to adversely affect the following six species:

Species	Common Name	Scientific Name
Terrestrial Invertebrates	American burying beetle	*Nicrophorus americanus*
Mammals	Gray bat	*Myotis grisescens*
	Indiana bat	*Myotis sodalis*
	Northern long-eared bat	*Myotis septentrionalis*
	Ozark big-eared bat	*Corynorhinus townsendii ingens*
Bird	Lesser prairie-chicken	*Tympanuchus pallidicinctus*

At the time the BA was prepared, the northern long-eared bat was proposed for listing and DOE requested formal conference on this species. However, the northern long-eared bat is now listed, the effective date being May 4, 2015. Consequently, a formal conference is no longer appropriate and the Service will consider impacts to the northern long-eared bat as part of our formal consultation.

An addendum to the BA was provided to the Service on July 9, 2015, that identified 22 new route variations that were not included in the BA. These variations resulted in relatively minor changes to the proposed transmission line route. Based on DOE's review of the variations, no changes in the species determinations were made by DOE.

Since the addendum to the BA was prepared, the U.S. District Court for the Western District of Texas, in Case number 7:14-CV-00050-RAJ, vacated the Service's final rule listing the lesser prairie-chicken as threatened. This decision was rendered on September 1, 2015. Consequently, the Service will not be addressing the lesser prairie-chicken in the subject BO.

As a reminder, the Act requires that after initiation of formal consultation, the Federal action agencies may not make any irreversible or irretrievable commitment of resources that limits future options. This practice insures agency actions do not preclude the formulation or implementation

of reasonable and prudent alternatives that avoid jeopardizing the continued existence of endangered or threatened species or destroying or modifying their critical habitats.

Thank you for the opportunity to review the biological assessment. Questions or comments should be referred to Mr. Ken Collins of this office at 918/581-7458.

Sincerely,

Jonna E. Polk

Jonna E. Polk
Project Leader

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM
Regional Director, Fish and Wildlife Service, Atlanta, GA
Chris Turner, SWPA, Tulsa, OK
Chuck Nicholson, TVA, Knoxville, TN
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Enclosure

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Enclosure

BIOLOGICAL OPINION

INTRODUCTION

Purpose

This biological opinion (BO) outlines and evaluates the potential effects of the proposed Plains and Eastern Clean Line transmission project (Project), including associated facilities and related actions, on species that are federally listed under the Act. This BO also identifies specific project elements that will avoid or minimize adverse effects of the proposed Project on listed species and designated critical habitat. The purpose of this BO is to ensure that this proposed federal action does not jeopardize the continued existence of any threatened, endangered or proposed species or result in the destruction or adverse modification of any designated or proposed critical habitat. The BO is based on the best available information, including the DOE BA and draft Final Environmental Impact Statement (EIS), Service files, pertinent literature, discussions with recognized species authorities and other reliable sources. A complete administrative record of this consultation is on file in the Oklahoma Ecological Services Field Office in Tulsa, Oklahoma.

Consultation History

As a part of this project, several public hearings and agency meetings were held, in accordance with the National Environmental Policy Act (NEPA) compliance process, but were not specifically undertaken to address section 7 consultation requirements. Additionally DOE held multiple conference calls intended to inform and update cooperating agencies with respect to the NEPA process. These calls may have included discussions about the section 7 consultation process but were very general in nature and did not specifically address nor were a significant component of the section 7 consultation process. The DOE also held many meetings and conference calls with Native American tribal representatives regarding tribal involvement in the project and to facilitate compliance with historic preservation responsibilities and to coordinate with the tribes pursuant to section 106 of the National Historic Preservation Act (16 USC § 470(f)). These meetings also were not specifically a part of the section 7 consultation process. Consequently the above identified activities are not included in this section.

In September of 2012, the Service initially began to participate in pre-permitting interagency workshops and meetings with Clean Line Energy Partners LLC (Clean Line) to discuss pertinent information on fish and wildlife conservation concerns and to provide informal comments on proposed routes and associated planning materials for the subject transmission line.

Then on March 27, 2013, Clean Line met with the Service at the Oklahoma Ecological Services Field Office in Tulsa to discuss informal consultation pursuant to 7(a)(2) of the Endangered Species Act (Act) and to request an official list of federally-listed, proposed and candidate species and any proposed or designated critical habitats within the Project planning area. During the meeting the Service established/identified specific Service leads and points of contact for the Project. The Service's Southwest Region, on May 2, 2013, provided a formal species list, by letter, to Clean Line in response to their March 27, 2013, request to initiate informal consultation on the proposed Project.

On October 29, 2013, DOE and Clean Line met with the Service at the Southwest Regional Office to discuss the proposed Project and current timeline, the planned endangered species review, the proposed biological evaluation framework and identification of additional data needs. Representatives from the Southeastern Region participated by telephone. Clean Line and the Service discussed the Master Species Information Sheets and geospatial data for each species, as provided to the Service by Clean Line, and the process for Service review and comment.

The Service subsequently provided information regarding appropriate protocols for conducting surveys of federally-listed species within the proposed Action Area to Clean Line on December 31, 2013. The following week, on January 6, 2014, the Service held an internal teleconference to discuss the planned January 13, 2014, meeting with DOE and Clean Line.

On January 13, 2014, the Service met with Clean Line at our Southwest Regional Office to provide our review of the Master Species Information Sheets, as previously provided by Clean Line on October 29, 2013. Representatives from the Service's Southeast Region participated by telephone. The participants continued discussions concerning species survey protocols and species that would be evaluated during the consultation. Participants also were provided an update of the current Project timeline.

Clean Line conducted an informal agency consultation discussion via teleconference on February 18, 2014. The call included Clean Line, the DOE, Southwestern Power Administration, and the Service's Southwest and Southeastern Regions. The purpose of the call was to provide Clean Line an opportunity to obtain clarification on the plans for field surveys in 2014 to support the development of the BA for the Project. Clean Line indicated that they were revising the Master Species Information Sheets to reflect Service comments received January 27, 2014, and noted that Clean Line did not have any questions at this time regarding the specific Service comments. Clean Line representatives led a discussion concerning specific Service comments on surveys and survey protocols.

Clean Line submitted a letter to the Service's Southwest Region on February 26, 2014, requesting an update to the list of federally listed and proposed endangered and threatened species and critical habitat that may occur in the counties intersected by the proposed Project.

Clean Line also submitted a letter to the Service's Southwest Region on March 3, 2014, requesting technical assistance with respect to clarification on surveys and survey protocols to inform the development of a Data Collection and Evaluation Plan to Support the BA for the Plains and Eastern Project.

On April 4, 2014, the Service's Southwest Region provided Clean Line with a letter updating the list of federally listed and proposed endangered or threatened species and critical habitat for the proposed Project. The letter also provided a response to Clean Line's clarification request regarding species surveys and survey protocols.

Clean Line submitted to the Service a Data Collection and Evaluation Plan to Support the BA for the Plains and Eastern project on April 16, 2014. This Plan called for the Project to collect and assess desktop data for all species identified by the Service as potentially occurring in the project area. Desktop studies would be used for species: 1) that have been locally extirpated; 2) for which a required element of their life cycle is not present, obviating the potential for their occurrence; or

3) where current data on local distribution and occurrence are available or where it has been determined that surveys would not add new information that would appreciably change effects determinations. The Plan also provided that Clean Line would conduct surveys to provide additional data necessary to inform the Biological Assessment based on the Master Species List developed in consultation with the Service.

Clean Line conducted an informal agency consultation discussion via teleconference on May 1, 2014. The call included Clean Line, the DOE, and the Service's Southwest and Southeastern Regions. The call provided the Service an opportunity to discuss Endangered Species Act issues and Clean Line's Data Collection and Evaluation Plan to Support the BA for the Project, and to establish data needs for future effects determinations. DOE, Clean Line, and Service discussed potential survey methodologies for several species as outlined in the Data Collection and Evaluation Plan.

Clean Line representatives John Kuba and Jason Thomas, along with David Plumpton (Ecology and Environment, Inc.), and American burying beetle (ABB) expert Amy Smith, held a conference call on July 3, 2014, with Service's Oklahoma Ecological Services Field Office representatives Daniel Fenner and Anita Barstow to present the results of the ABB desktop habitat assessment and to discuss next steps associated with the Project, including the need for habitat surveys. John Kuba provided a brief update on the status of the Biological Evaluation/Biological Assessment along with a review of the ABB efforts performed to date, including a discussion of the data collection and evaluation efforts for ABB.

Clean Line conducted an informal agency teleconference on October 6, 2014. The call included Clean Line and Service Region 2 biologists Wade Harrell, Vanessa Burge, and Christine Willis. The call provided the Service an opportunity to discuss Clean Line's Whooping Crane Habitat Suitability Modeling to support the BA for the Project.

The DOE, on November 25, 2014, provided the draft BA, with appendices, to the Service for informal review and comment.

On December 4, 2014, Clean Line and DOE conducted an informal teleconference with biologists from the Service's Southwest and Southeast Regions to discuss the November 25, 2014, transmittal of the draft BA for review by the Service. The purpose of the call was to provide a summary of the draft BA framework and to address any initial questions from the Service.

On January 14, 2015, the two Service Regions (Southwest and Southeast) conducted an internal conference call to discuss Service comments on the November 2014 draft BA. Two days later the Southwest Region provided information by electronic mail to DOE and Clean Line regarding the status of listing for the northern long-eared bat.

The Service provided written comments on the draft BA on January 20 and 21, 2015. Comments included general remarks and questions regarding the analysis of "take" as part of the not likely to adversely affect/likely to adversely affect determination as well as species-specific comments regarding the Arkansas darter, bats, lesser prairie-chicken, red knot, Sprague's pipit and Ozark cavefish.

In Albuquerque on January 22, 2015, DOE and Clean Line conducted an informal agency consultation meeting with the Service's Southwest and Southeast Region representatives to

discuss comments provided by the Service on the draft BA. Clean Line and DOE provided initial responses to comments and facilitated further discussion with the Service to inform revisions to the draft BA prior to initiating formal consultation.

On January 26, 2015, Clean Line conducted an informal teleconference with Tommy Inebnit, Service biologist in the Arkansas Ecological Services Field Office, to follow up on several questions that were not addressed during the January 22 meeting in Albuquerque. Clean Line and DOE responded to comments on the draft BA and provided further information regarding the action areas defined for each of the four bat species summarized in the draft BA.

In a letter dated January 30, 2015, the Service provided additional written comments and further clarification of comments provided on January 16th and 21st, 2015. Comments focused on further clarifications regarding treatment of "take" and evaluation of insignificant and discountable effects. Specific comments followed, involving the interior least tern, whooping crane, and bat species.

On March 10, 2015, the Service's Southwest Region confirmed with Clean Line that the list of 30 species previously identified for inclusion in the BA was accurate, and that no new species have been listed or are proposed for listing within the proposed action area.

In a March 27, 2015, letter, DOE requested initiation of formal consultation on the proposed Plains and Eastern Clean Line transmission project and provided the Final BA.

On May 11, 2015, the Oklahoma Ecological Services Field Office provided a letter to DOE acknowledging receipt of DOE's Final BA and requested additional information regarding federally-listed migratory birds potentially impacted by the proposed Project.

By letter dated May 27, 2015, DOE provided additional information and clarifications to the Final BA regarding four migratory bird species.

A July 9, 2015, letter from DOE provided an addendum to the Final BA providing 22 new route variations for certain sections of the proposed transmission route.

DESCRIPTION OF THE PROPOSED ACTION

The proposed action consists of construction and operation of an approximately 1,161.1 km (km) (721.5-mile), overhead ± 600 kilovolt (kV) high-voltage direct current (HVDC) electric transmission system and associated facilities (Appendix). The proposed transmission line will have the capacity to deliver approximately 3,500 megawatts (MW) of power from renewable energy generation facilities in the Oklahoma and Texas Panhandle regions to load serving entities in the Mid-South and southeastern United States via an interconnection with Tennessee Valley Authority (TVA) in Tennessee; and, 500 MW to the Midcontinent Independent System Operator (MISO) via an intermediate substation in Arkansas. In addition to the preferred route, several sections also contain alternate routes that are still under consideration for development. The life of the proposed Project may exceed 80 years. A full, detailed description of the project was provided in Clean Line Energy Partners (2014a) and will only be summarized here.

The overhead HVDC system will consist of a ± 600 kV HVDC overhead electric transmission line with the capacity to deliver approximately 3,500 MW to the TVA electrical transmission system

and 500 MW to an intermediate substation within MISO. Components of the HVDC transmission system includes tubular and lattice steel tower structures used to support the transmission line, communications/control and protection facilities (optical ground wire and fiber optic regeneration sites), and right-of-way (ROW) easements for the transmission line, typically with a width of approximately 45.7 to 61 meters (150 to 200 feet). Assuming the total transmission line length remains at 1,161.1 km (721.5-mile) and a maximum ROW width of 61 meters (200 feet), the impact footprint of just the transmission line would be as much as 70,821 square km (over 17.5 million acres). The actual ROW width will not be determined until additional engineering studies are completed.

Clean Line has proposed to locate two alternating current (AC)/direct current (DC) converter stations, one at each end of the transmission line. The western converter station would be located in Texas County, Oklahoma, and the eastern converter station in Shelby County, Tennessee. Clean Line also is studying an intermediate converter station to be located in Pope or Conway County, Arkansas. Each converter station will include a DC switchyard, DC smoothing reactors, DC filters, valve halls, an AC switchyard, AC filter banks, AC circuit breakers and switches, and transformers. Also associated with these converter stations will be required transmission facilities between each converter station and the point of interconnection to the existing AC grid. These transmission lines include: a double circuit 345kV AC transmission line connecting the future Xcel Energy/Southwestern Public Service Company's Optima (formerly known as Hitchland 2) substation in Oklahoma; two 500kV AC ties connecting to bays within the TVA Shelby Substation in Tennessee; and another 500kV AC transmission line connecting to a point along an existing 500kV transmission line in Arkansas.

Additionally, four to six AC collection lines of up to 345kV each will be constructed to facilitate efficient interconnection of wind generation facilities in the Oklahoma and Texas Panhandle regions to the Texas County converter station. Specific components of these AC collection lines will include tubular or lattice steel transmission line support structures; communications facilities; control and protection facilities; and ROW easements with each transmission line having a typical width of approximately 45.7 to 61 meters (150 to 200 feet). The length of these collection lines varies in length from 21.4 to 64.7 km (13.3 to 40.2 miles).

Clean Lines also anticipates the need for access roads to access project facilities and work areas during the construction and operation phases. Clean Line will use existing public and private roads and, as needed, construct new roads, some of which will be temporary, to certain permanent project features. Some temporary construction areas, such as multi-use construction yards, fly yards, tensioning and pulling sites, and wire-splicing sites will be needed, in addition to some temporary roads, during construction.

Additionally, in their draft EIS (DOE 2014), DOE anticipates that wind power facilities would be constructed or existing wind power facilities utilized, from parts of the Oklahoma and Texas Panhandle regions within a 64.3 km (40 mi) radius of the western converter station in Texas County, Oklahoma. Clean Lines also prepared a technical report (Clean Line 2014b) regarding wind generation that formed the basis for DOE's evaluation. Based on these analyses, a build out of some 4,000 MW of wind power would be anticipated in order to provide the anticipated 3,500 MW of power. Additionally, should the Arkansas converter station be built, the total wind power facility build out could be as much as 4,550 MW.

The technical report also identified 14 Wind Development Zones where wind power would likely be developed. However two of those zones were dropped from consideration due to a lack of development interest in those zones. The Wind Resource Area that encompasses the 14 Wind Development Areas is roughly 9,971 square km (3,850 square miles). Total land area in the 12 remaining zones is about 5,576 square km (2,153 square miles). However, further refinement by Clean Line revealed that approximately 4,791 square km (1,850 square miles) of land is potentially suitable for wind development within the 14 zones and 4,377 square km (1,690 square miles) within the remaining 12 zones. Clean Line estimated that about 20 to 30 percent of the land within the Wind Development Zones would actually be developed for wind generation and also utilize the HVDC for transmission of the generated power. Clean Line assumed all of this development would be new because only a small percentage of the transmission capacity would be used by existing development. Additional information regarding the 12 Wind Development Zones is provided in the technical report (Clean Line 2014b).

Assuming an average generation capacity of 2.5 MW per turbine, this development scenario could result in the placement of some 1,820 wind turbines within a 64.3 km (40 mi) radius of the western converter station. On average, this is a density of 0.14 turbines per square km (0.36 turbines per square mile) within a 40-mile radius of the western converter station. If the land area within the 12 wind development zones that is potentially suitable for wind is entirely developed, the density of wind generation facilities would average about 1.1 turbines per square mile. Turbine densities likely will be higher within the developed areas considering only 20 to 30 percent of the land area within these zones would be developed for wind generation. Based on Service's experience with wind farm development in Oklahoma and Texas panhandles, none of these proposed wind projects would have a federal nexus requiring further analysis under section 7 unless these projects seek take coverage under a Habitat Conservation Plan pursuant to section 10 of the Act. In 2008, the Service began working with the Wind Energy Whooping Crane Action Group (WEWAG) to develop a programmatic Habitat Conservation Plan (HCP) for the endangered whooping crane that will cover the migratory flyway from the United States/Canada border to coastal Texas. The partners working on this project include 19 wind energy companies, two Service (the Mountain Prairie and Southwest Regions), and nine states, including Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, and Texas. In November of 2013, WEWAG submitted a draft HCP to the Service and state partners for review. This review is ongoing and to date no HCP has been approved.

In developing their wind generation technical report, Clean Line submitted a request for information (RFI) in July of 2013 regarding potential wind energy generation facilities that might be considered in the future for the identified wind resource area. In response to this RFI, Clean Line received responses from 19 wind generation companies that indicated that approximately 16,000 MW of potential wind generation is currently under various stages of development by these companies.

Description of the Action Area

The Action Area includes the 28 counties located in Oklahoma, Arkansas and Tennessee where the main HVDC line route would be placed, those counties where wind projects are anticipated to occur and three counties in Texas where AC lines also would be constructed (Table 1).

Table 1. Counties within the Action Area, by State, for the proposed Clean Line Transmission Project

Oklahoma	Arkansas	Tennessee	Texas
Texas	Pope	Shelby	Hansford
Beaver	Conway	Tipton	Ochiltree
Harper	Crawford		Sherman
Woodward	Franklin		
Major	Johnson		
Garfield	Van Buren		
Kingfisher	Cleburne		
Logan	White		
Payne	Jackson		
Lincoln	Cross		
Creek	Poinsett		
Okmulgee	Mississippi		
Muskogee			
Sequoyah			

Because the proposed action traverses such a large area, a variety of habitats would be impacted by this proposed action. However, more detailed information on the action area is provided in the BA and in the draft EIS (DOE 2014) and will not be repeated here. The BA and Draft EIS (DOE 2014) should be examined if more detailed information is desired.

Conservation Measures

Conservation measures included with the proposed Project provide for a variety of minimization and avoidance measures. These measures fall into one of five different categories: General Measures, Land Use Measures, Soils and Agriculture Measures, Fish, Vegetation and Wildlife Measures and Waters, Wetlands and Floodplains Measures. A complete listing of these measures, by category, is provided in the March 2015 Final BA. Also included are Species-specific Measures which are also provided in the Final BA under the sections on each species.

In the BA, Clean Line committed to addressing any unavoidable take of the American burying beetle with habitat offsets (mitigation), such as conservation banking, in proportion to project related impacts. Clean Line also committed to conducting presence/absence surveys along the length of the proposed route within ABB range to better refine where occupied habitat exists. For gray bats, Clean Line committed to conducting surveys of appropriate regions within the entire route for karst/subterranean features that could be used by gray bats. They also committed to restricting project activities to daylight hours to minimize impacts to foraging or migrating bats. Other measures implemented to minimize impacts to other bats may provide some protection to gray bats. Clean Line committed to restrict tree clearing to periods outside of the summer resident season of Indiana bats, where those trees are found to be occupied. However the BA did not clearly describe how roosts would be determined to be occupied. Occupancy of roost trees is typically documented using telemetry (radio-tracking) of tagged bats (Service 2015a). Clean Line committed to using the current Indiana bat summer survey guidelines to determine presence or likely absence of the species prior to construction. Clean Line also committed to coordinating with the Service to mitigate all impacts on habitat occupied by the Indiana bat. A buffer of 30.5 meters (100 feet) will be placed around occupied Indiana bat maternity roost trees during

construction. Additionally they will limit (period of one half hour after dawn and before dusk) clearing and heavy equipment operation activities with 91.4 meters (300 feet) of documented roost trees during the maternity season. For the northern long-eared bat (NLEB), Clean Line committed to mitigate for impacts of the project on occupied NLEB habitat, although they did not specifically state how occupancy would be determined. They did commit to conducting surveys to determine presence or absence of the NLEB prior to construction. A buffer of 30.5 meters (100 feet) will be placed around occupied NLEB maternity roost trees during construction. Clean Line also committed to restrict tree clearing to periods outside of the summer resident season of NLEB, where those trees are found to be occupied. No specific measures were identified for Ozark big-eared bat. Instead Clean Line will rely on measures identified to minimize impacts to Indiana bats as measures for the Ozark big-eared bat.

Monitoring and Evaluation

The conservation measures provided in the BA include monitoring of sedimentation, erosion and run-off from construction areas and monitoring of water yield and contamination provided blasting is used. Specific monitoring actions for listed species post-construction were not provided in the BA.

STATUS OF THE SPECIES

This section summarizes the biology, ecology and status of the seven affected species (American burying beetle, gray bat, Indiana bat, northern long-eared bat, Ozark big-eared bat, interior least tern and piping plover) throughout their range, as provided in the section below. This information is used to assess whether the federal action would be likely to jeopardize the continued existence of these species. The "Environmental Baseline" section that follows summarizes similar information on these species specifically within the action area and provides the foundation for the Service's assessment of the effects of the proposed action, as presented in the "Effects of the Action" section. The BA provides additional information on the status of these species within the action area.

Species Description and Life History—American Burying Beetle

Species and Critical Habitat Description

The American burying beetle (ABB; *Nicrophorus americanus*) was listed in 1989 (54 FR 29652) and no critical habitat has been designated. An experimental population has been established on the in Wah'Kon-tah Prairie in southwest Missouri (76 FR 43973).

The ABB is the largest silphid (carrion beetle) in North America, reaching 2.54 to 4.6 centimeters (1.0 to 1.8 inches) in length (Wilson 1971, Anderson 1982, Backlund and Marrone 1997). The most diagnostic feature of the ABB is the large orange-red marking on the raised portion of the pronotum, a feature shared with no other members of the genus in North America (Service 1991).

Life History

The ABB is a nocturnal insect that lives only for one year. The ABB is active only during the summer months and will bury themselves in the soil for the duration of the winter. Immature beetles (tenerals) emerge in late summer, over-winter as adults, and comprise the breeding

population the following summer (Kozol 1990). Adults and larvae are dependent on carrion for food and reproduction. They must compete for carrion with other invertebrate species, as well as some vertebrate species.

Mature ABBs have wings and are strong fliers. They have been reported moving distances ranging from 0.16 to 4.2 km (0.10 to 2.6 miles) in various parts of their range (Bedick *et al.* 1999, Creighton and Schnell 1998, Jurzenski *et al.* 2011, Schnell *et al.* 1997-2006). When not involved with brood rearing, carrion selection by adult ABBs for food can include an array of available carrion species and sizes (Trumbo 1992). American burying beetles also capture and consume live insects. Immediately upon emergence from their winter hibernation, ABBs begin searching for a mate and a proper carcass for reproduction. Once a carcass has been located, inter-specific as well as intra-specific competition occurs until usually only a single dominant male and female burying beetle remain with the carcass (Scott and Traniello 1987).

A more complete life history account of the American burying beetle can be found at: ***http://www.fws.gov/southwest/es/Oklahoma/ABB_Add_Info.htm***.

Habitat

Soil conditions for suitable ABB habitat must be conducive to excavation by ABBs (Anderson 1982; Lomolino and Creighton 1996). Level topography and a well formed detritus layer at the ground surface are common habitat features (Service 1991). The ABB is considered a feeding habitat generalist and have been successfully live-trapped in several vegetation types including native grasslands, grazed pasture, riparian zones, mature forest, coniferous forests, deciduous forest with little undergrowth, and oak-hickory forest, as well as on a variety of various soil types (Creighton *et al.* 1993; Lomolino and Creighton 1996; Lomolino *et al.* 1995; Service 1991, Service 2008a, Walker 1957). ABBs are widely believed to depend on landscape-level heterogeneity of habitat that supports the small mammals, birds and other sources of carrion necessary for their life cycle. A diverse habitat of patches of woodland, shrubland, forests and herbaceous areas are believed to be key elements for good ABB habitat. This interspersion of the vegetative cover types creates the habitat mosaic needed to support appropriate densities of favored carrion species.

Population Status and Distribution

The ABB is relatively easy to capture, yet estimates of ABB population size are problematic and obtaining precise estimates of absolute or even relative densities remain a challenge (Service 2008a). The trappable ABB population experiences a relatively rapid turnover rate due to factors such as natural mortality, dispersal, and burrowing underground and attending carrion/broods (Creighton and Schnell 1998). Because the ABB completes its lifecycle in one year, each year's population levels are largely dependent on the reproductive success of the previous year. Therefore, populations may be cyclic (due to weather, disease, etc.), with high numbers/abundance in one year, followed by a decline in numbers the succeeding year. These short-term stochastic events are not expected to have long-term effects in robust populations (Service 2008a).

Most of the ABB range within the Action Area is in Oklahoma (Figure 1). A smaller portion of the ABB range within the Action Area occurs in Arkansas (Figure 2). Clean Line utilized a study of favorable ABB habitat in the 200-foot HVDC ROW and a wider 1,200-foot corridor where the proposed Project traverses the range of the ABB. This study included a desktop analysis to

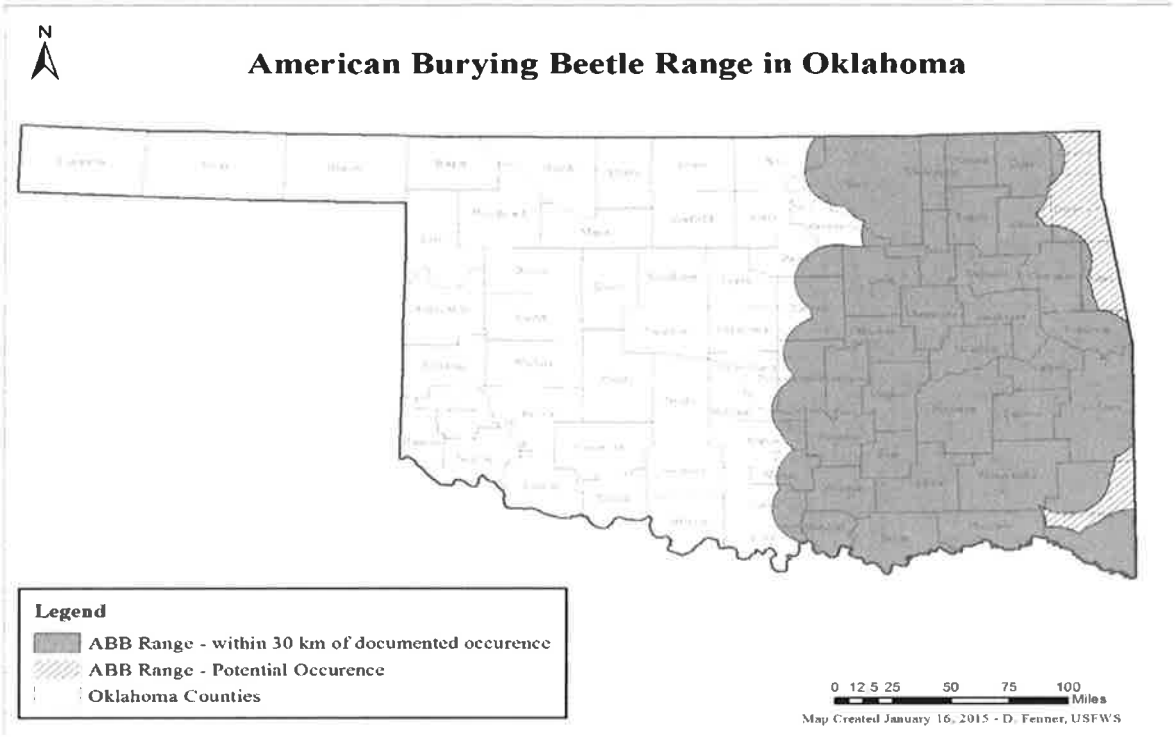

Figure 1. ABB Range in Oklahoma.

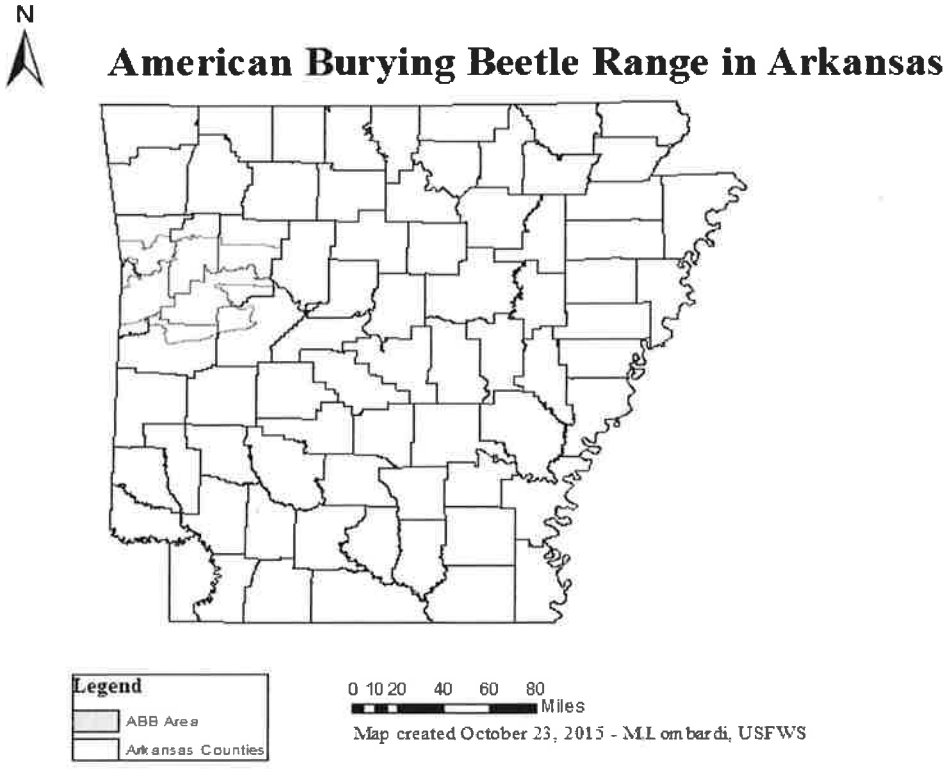

Figure 2. ABB Range in Arkansas.

determine favorable and unfavorable habitats based on criteria developed by the Service (2015b) to identify areas unfavorable to the ABB. The predictive value of this desktop analysis was verified through aerial imagery and field verification of randomly selected locations. Additional information on the desktop analysis, including a discussion of the purpose and methods of the study, is provided in Appendix C of the BA. The proposed Project would traverse 336 km (209 miles) of ABB range in Oklahoma and Arkansas.

Numerous surveys have been conducted in Oklahoma and western Arkansas. The majority of these surveys are associated with projects such as road construction, oil and gas projects, and similar development activities that may result in soil disturbance and impacts to ABB habitat. Project proponents typically contract with permitted surveyors to conduct surveys (Service 2014a) for ABB in an effort to assess whether ABBs may occur within these project areas. Because these surveys are specifically associated with a particular proposed development project, they are limited in their temporal and spatial distribution and only limited conclusions can be drawn from these surveys. The known ABB range in Oklahoma has expanded, but this could be explained by increases in survey effort and surveyed area.Kozol *et al.* (1994) examined ABB genetic variation within and between the Block Island, Rhode Island population and the eastern Oklahoma and western Arkansas population. Both populations have low levels of genetic variation, and most of the variation occurs within a single population. There were no unique diagnostic bands within either population, but they found the Oklahoma-Arkansas population to be somewhat more diverse. Reduced genetic variation is often a result of founder effect, genetic drift, and inbreeding.

A smaller number of surveys have been conducted for scientific research and are more appropriately designed to draw more specific conclusions. Scientifically designed survey data have been collected annually or biennially from McAlester Army Ammunition Plant, Camp Gruber, Ouachita National Forest, Connors State College, The Nature Conservancy's Tallgrass Prairie Preserve and Weyerhaeuser lands in Oklahoma, and at Fort Chaffee in Arkansas. These surveys provide trend data for the ABB. Surveys for the ABB have been conducted annually at Camp Gruber since 1992. ABB captures at these locations typically fluctuate on an annual or biennial basis, but in general ABB numbers appear stable or increasing, with the exception of the Weyerhaeuser lands. All of these areas, except for Weyerhaeuser lands in McCurtain County, provide large tracts of relatively natural habitat managed in such a way as to mimic the historic disturbance regime. Weyerhaeuser has conducted surveys since 1997. Surveys suggest the ABB population is greatly reduced or potentially extirpated from the southern-most tip of McCurtain County. However, relatively few surveys have been conducted in this area since 2008 to verify the status of the ABB in that area. The existing scientifically designed surveys indicate Camp Gruber, Fort Chaffee, and The Tallgrass Prairie Preserve represent areas with a relatively high-density of ABBs. These surveys also demonstrate that populations can fluctuate on an annual basis. In 2010, reports from researchers at The Tallgrass Prairie Preserve in Osage County, Oklahoma indicated a healthy population of around 1,400 ABB (personal communication with Carrie Hall 2011), in 2011the population was estimated to be around 500, and in 2012 the population was estimated between 2,554 – 4,379 beetles (Howard *et al.* 2012). These reports provide some estimates of the ABB status on a local basis and document relatively large fluctuations between years.

The Service identified areas in Oklahoma, known as ABB Conservation Priority Areas (CPAs), where positive surveys have been relatively concentrated over the last 10 years (Figure 3). These

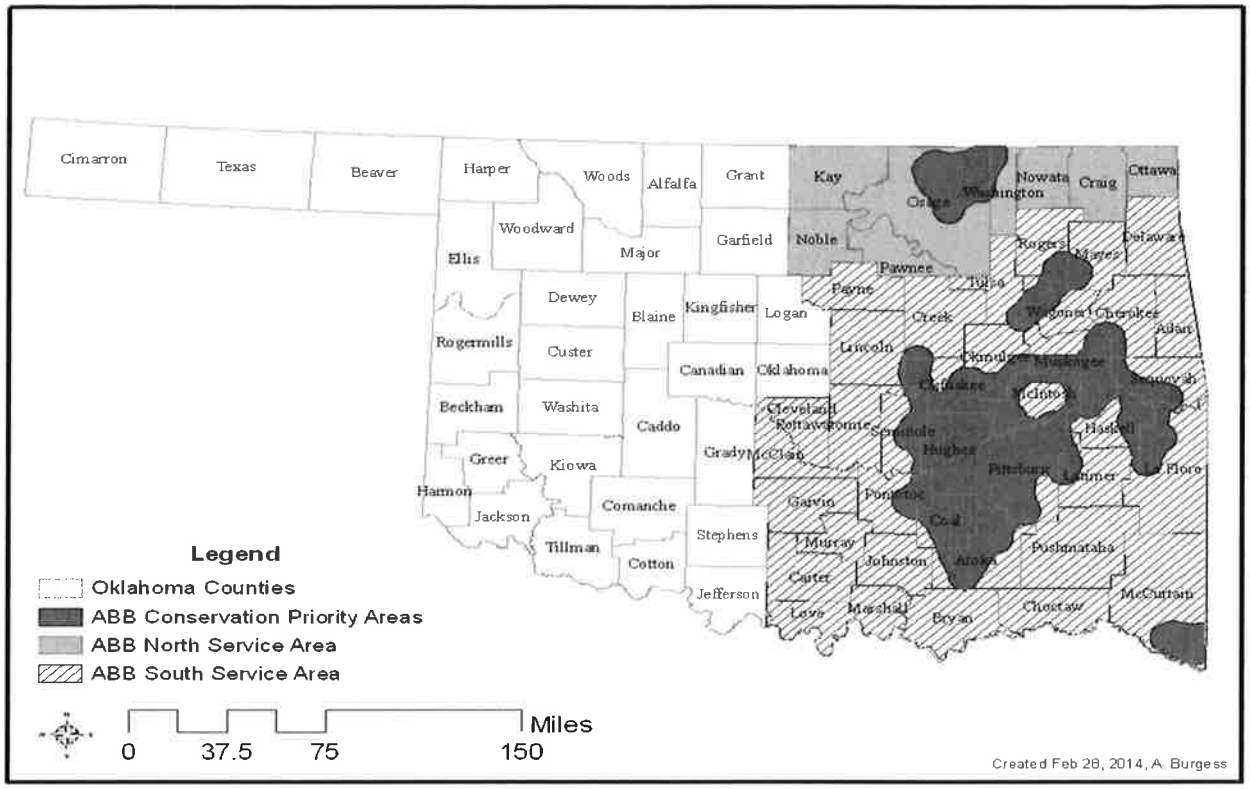

Figure 3. Conservation Priority Areas for the ABB.

CPAs change with new survey information and the most recent CPAs are identified on the Service website (http://www.fws.gov/southwest/es/Oklahoma/ABB_Add_Info.htm).

Reasons for Decline and Threats to Survival

Habitat fragmentation causes increased vertebrate scavenger populations, which leads to decreases in available carrion of the appropriate size, and increased competition between burying beetles (Creighton *et al.* 2007). There is little doubt that habitat loss and alteration affect this species at local or even regional levels, and could account for the extirpation of populations once they become isolated from others (Kozol 1995, Ratcliffe 1996, Amaral *et al.* 1997, Bedick *et al.* 1999). It is unclear if an extirpated ABB population can successfully be re-established. Protection of large areas of appropriate native habitat appears to be the best known method for enhancing the conservation of the ABB. Relatively large areas of native habitat tend to support the highest known ABB populations.

The American Burying Beetle Recovery Plan (Service 1991) and the 5-yr status review of the species (Service 2008a) identify the following factors as potential threats to the ABB: disease/pathogens, use of the pesticide DDT, direct habitat loss and alteration, interspecific competition, increase in competition for prey, increase in edge habitat, decrease in abundance of prey, loss of genetic diversity in isolated populations, unfavorable agricultural and grazing practices, and invasive species. None of these theories alone adequately explain why the ABB declined while the eight sympatric congeneric species are still relatively common rangewide (Sikes and Raithel 2002).

The prevailing theory regarding the decline of the ABB is habitat fragmentation (Service 1991). Habitat fragmentation likely caused: (1) a reduction in the availability of appropriately sized carrion suitable for ABB reproduction, and (2) an increase in competition with vertebrate scavengers for this carrion resource (Kozol 1995, Ratcliffe 1996, Amaral *et al.* 1997, Bedick *et al.* 1999, Creighton *et al.* 2007). Although much of the evidence suggesting the reduction of carrion resources as a primary mechanism of decline is circumstantial, this hypothesis fits the temporal and geographical pattern of the disappearance of ABBs, and is sufficient to explain why ABBs declined while related species did not. In a fragmented ecosystem, larger species have been shown to be negatively affected before smaller species, a phenomenon that has been well-documented with carrion and dung beetles in South America (Klein 1989).

Since the middle of the 19th century, certain animal species in the favored weight range for ABBs have either been eliminated from North America or significantly reduced over their historic range (Service 1991), including the passenger pigeon (*Ectopistes migratorius*), greater prairie-chicken (*Tympanchus cupido*) and wild turkey (*Meleagris gallopavo*). Fragmentation of large contiguous habitats into smaller pieces or patches of habitat may increase species richness, but the species composition usually changes. In this way, historically large expanses of natural habitat that once supported high densities of indigenous species are now artificially fragmented, supporting fewer or lower densities of indigenous species that once supported ABB populations, and also facilitating increased competition for limited carrion resources among the "new" predator/scavenger community.

Analysis of the species habitat likely to be affected

The ABB potentially will be affected directly by construction activities that may crush or otherwise cause mortality of the species. Habitat loss and alteration of suitable habitat also would impact the ABB. Critical habitat has not been designated for the ABB. Therefore, none will be affected.

Species Description and Life History—Gray Bat

Species and Critical Habitat Description

The gray bat (*Myotis grisescens*) was federally-listed as endangered on April 28, 1976 (41 FR 17740). Critical habitat has not been designated. The final recovery plan was signed on July 8, 1982 (Service 1982). The Service completed a five-review on the status of the gray bat on September 30, 2009 (Service 2009a). The Service determined that the existing listing classification of endangered remains valid primarily due to the potential threat of white-nose syndrome (WNS).

The gray bat is a medium-sized bat with gray fur. The species belongs to the plain-nosed bat family, Vespertilionidae, and is one of the largest species within the genus *Myotis* in eastern North America (Decher and Choate 1995). The gray bat has a wingspan of 25 - 28 centimeters (10 - 11 inches) and forearm lengths of 40 - 47 millimeters (1.5 - 2.0 inches). Weights range between approximately 7.0 - 16 g (0.3 - 0.65 ounces) (Tuttle 1976a, Service 1980, Harvey *et al.* 1981, Decher and Choate 1995).

The gray bat can be distinguished from other species in the genus *Myotis* by the uniform color of its dorsal fur in which hair shafts are gray from base to tip. The dorsal hairs of other bats within

its range are bi- or tri-colored. Additionally, the wing membrane attaches at the ankle of the foot instead of at the base of the toes as in other members of the genus (Barbour and Davis 1969, Harvey *et al.* 1981, Decher and Choate 1995, Tuttle and Kennedy 2005). The calcar on gray bats is not keeled and the skull has a distinct sagittal crest (Harvey *et al.* 1981, Mitchell, 1998).

Life History

Gray bats are one of the few species of North American bats that are cave obligates and inhabit caves year-round, migrating each year between winter and summer caves. Gray bats have been documented to regularly migrate from 17 to 437 km (10.5 to 271.5 miles) between summer maternity caves and winter hibernacula (Hall and Wilson 1966, Tuttle 1976b). Gray bats exhibit strong philopatry (site fidelity) to both summering and wintering sites (Tuttle 1976a, Tuttle 1979, Kennedy and Tuttle 2005, Martin 2007).

Courtship and mating of gray bats occurs in the fall when the bats begin to arrive at hibernacula. Male gray bats arrive at hibernacula first and compete for females (Tuttle and Kennedy 2005). After copulation, females enter hibernation for the winter. Males and juveniles typically will continue feeding for several weeks before entering hibernation. Males may remain active until early November before entering hibernation (Tuttle 1976a), but by mid-November, most gray bats are in hibernation.

Females typically do not give birth until the second year (Miller 1939). Average gestation is approximately 64 days. A single offspring is born in late May or early June. Newborn bats weigh approximately one-third of their mother's weight. Newborns typically become volant within 21-33 days after birth (Tuttle 1976b, Harvey 1994a, Tuttle and Kennedy 2005).

Bachelor males also segregate into separate aggregations. Home range of these bachelor colonies usually includes several caves and may extend up to 70 km (43.5 miles) along a particular river valley (Tuttle and Kennedy 2005).

Gray bats are insectivorous and feed at night on flying insects over bodies of water such as rivers, streams, lakes and reservoirs. Mayflies, caddisflies, and stoneflies make up the major part of their diet, but beetles and moths also are consumed (Harvey 1994, Tuttle and Kennedy 2005). Gray bats are known to travel up to 35 km (21.7 miles) from caves to prime feeding areas (LaVal *et al.* 1977, Tuttle and Kennedy 2005). However, most caves are within 1– 4 km (0.6 – 2.5 miles) of foraging areas (Tuttle 1976b).

Likely predators include species such as snakes, owls, raccoons (*Procyon lotor*), bobcats (*Lynx rufus*) and feral house cats. Predation and disease were not considered significant threats at the time of listing. Recorded longevity for gray bat is approximately 14-17 years (Harvey 1992, Tuttle and Kennedy 2005).

Additional information on the gray bat may be found in the 2009 5-year status review (Service 2009a) and in the BA hereby incorporated by reference.

Habitat

Winter hibernation sites are typically deep vertical caves that trap large volumes of cold air (Tuttle 1976a, Harvey *et al.* 1981, Harvey 1994, Martin 2007). Hibernation sites also often have multiple

entrances where there is good air flow (Martin 2007). Temperatures are approximately 5-9° C (41-48° F), though 1-4° C (34-39° F) appears to be preferred (Tuttle and Kennedy 2005). During hibernation, the species typically forms large clusters with some aggregations numbering in the hundreds of thousands of individuals (Harvey 1994, Tuttle and Kennedy 2005). Populations of gray bats at hibernacula often are comprised of individuals from large areas of their summer range. Some 95 percent of the species range-wide population is estimated to hibernate in only nine caves (Tuttle 1979).

Adult females begin to emerge from the hibernacula in late March, followed by juveniles and adult males. Females become pregnant after emerging in the spring (Harvey 1994, Tuttle and Kennedy 2005), and form maternity colonies of a few hundred to many thousands of individuals. Maternity colonies typically form in caves with domed ceilings that are capable of trapping body heat from clustered individuals. Temperatures typically range between 14-25° C (57-77° F) (Harvey 1992, Harvey 1994, Tuttle and Kennedy 2005, Martin 2007). Gray bats utilize forested areas for concealment as protection from predators such as eastern screech owls (*Megascops asio*) during movements between caves and foraging sites.

Population Status and Distribution

Major populations of the gray bat are found in Alabama, Arkansas, Kentucky, Missouri, and Tennessee. Smaller populations occur in Florida, Georgia, Indiana, Illinois, Kansas, Mississippi, North Carolina, Oklahoma, and West Virginia.

Overall, gray bat populations have increased and recovered in many areas of the species' range (Tuttle 1987, Harvey and Britzke 2002, Ellison *et al.* 2003, Tuttle and Kennedy 2005, Martin 2007, Sasse *et al.* 2007, Service 2009a). Dr. Michael Harvey of Tennessee Technological University has estimated changes in the overall population size across the range of the species based on general population trends. He reported that the species increased from approximately 1,575,000 to roughly 2,678,000 in 2002 and to about 3,400,000 in 2004 (Service 2009a). Martin (2007) noted that gray bat population levels have increased approximately 104 percent since 1982.

Population surveys have been ongoing throughout the range of the gray bat at hibernacula and maternity sites since the recovery plan was approved in 1982. There also have been surveys conducted for the species associated with various development projects. Techniques used to monitor various gray bat populations include direct counts, emergence counts, and measuring the extent of guano piles or ceiling stains at established roosts. Colonies of this species also have been monitored recently using near-infrared (NIR) or thermal infrared (TIR) videography with computer and statistical software packages.

Of the 29 priority 1 maternity sites listed in the 1982 Gray Bat Recovery Plan, populations at 13 sites (45 percent) have been stable or increasing (Martin 2007, Sasse *et al.* 2007, Elliott 2008, Service 2009a). Gray bat populations at many priority 2 caves also have been monitored, and roughly 33 percent of priority 2 caves across the species' range have stable or increasing populations (Service 2009a).

Ellison *et al.* (2003) statistically analyzed 1,879 observations of gray bats obtained from 334 roost locations (103 summer colonies and 12 hibernacula) in 14 south-central and southeastern states. Their analysis indicated that 94.4 percent (85.4 percent no trend; 9 percent upward trend) of the

populations showed stable or increasing populations while 6 percent had a decreasing population trend. Stable or increasing populations were reported for 83 percent (58 percent no trend; 25 percent upward trend) of the 12 hibernating colonies examined. However, in some areas (*e.g.,* Florida) the species has declined significantly at both hibernacula and maternity sites.

Sasse *et al.* (2007) analyzed data from 48 gray bat maternity sites involving three subpopulations in the Ozark Highlands of Missouri, Arkansas, and Oklahoma between 1978 and 2002. The authors report that 79 percent of these colonies were stable or increasing. However, Elliott (2008) estimated that despite an overall increase in gray bat numbers in Missouri, the overall state population of this species was still only about 46 percent of what the maximum past population was historically.

Reason for Decline and Threats to Survival

The gray bat was federally-listed as endangered in 1976 primarily due to vulnerability to human disturbance. Habitat loss and degradation and contamination from pesticides also were considered a cause of decline.

Human disturbance at both maternity roosts and hibernacula can be highly detrimental. Disturbance during the sensitive maternity period can result in bats moving to less preferred roost sites within caves or cave abandonment. Disturbance during early summer before the young can fly can result in thousands of young becoming dislodged and falling to their deaths (Tuttle, 1979). Every arousal during hibernation is energetically expensive. Fat reserves required to sustain the bats are utilized to some extent during each winter arousal. These fat reserves cannot be replaced until spring. Therefore, too many arousals during hibernation can exhaust a bat's limited fat reserves and result in mortality (Service 1982). Furthermore, only about 5 percent of available caves are suitable for gray bats (Tuttle 1979) with about 95 percent of the entire population hibernating in only 9 caves. Consequently, a large percentage of the population could be impacted due to disturbance at only a few caves.

Despite the gray bat's recovery in many areas, human disturbance continues to be the main reason for the continued decline of gray bats in caves that are not protected (Tuttle 1979, 1987; Rabinowitz and Tuttle 1980, Service 1982, Mitchell 1998, Martin *et al.* 2000, 2003; Shapiro and Hohmann 2005, Martin 2007, Sasse *et al.* 2007, Elliott 2008). Vandalism and breeching of locked cave gates and fences has been noted at multiple caves and continues to occur.

Degradation of foraging habitat, protective flight corridors, and food resources also presents a major threat to the gray bat. Gray bats feed primarily on aquatic insects in riparian areas and over rivers, streams, and other water bodies. Deforestation of wooded tracts and riparian zones in the vicinity of maternity caves (gray bats are known to forage up to 12 km from a summer cave) due to development and agricultural activities negatively impacts gray bats by reducing available foraging habitat and the wooded flight corridors that provide protection from predators (LaVal *et al.* 1977, Service 1982). Practices that result in increased pollution, turbidity and siltation in waterways over which gray bats forage, such as development and agricultural activities and the clearing of woody riparian zones, can be detrimental by reducing the local abundance of important prey, especially species sensitive to aquatic pollution such as mayflies, caddisflies, and stoneflies (Tuttle 1979, Service 1982).

Natural flooding and impoundment of waterways has resulted in temporary impacts to some caves and the complete submersion and loss of other important cave sites (Barbour and Davis 1969, LaVal *et al.* 1977, Tuttle 1979). Natural and man-made flooding remains a threat at some gray bat sites.

Pesticide contamination has been well documented in some populations of gray bats (Clark *et al.* 1978, 1980, 1983; Clawson and Clark 1989, Clawson 1991, Sasse 2005). Juvenile bats can be especially affected as they receive concentrated amounts of pesticides through their mother's milk when adult bats feed on insects exposed to pesticides (Clark *et al.* 1978).

Climate change could have a significant impact on temperate region bats, including the gray bat. Bogan (2003) predicted that projected climate changes could impact bats by adversely affecting their food supply or the internal roosting temperature of important caves.

The Service (2009) completed a 5-year review of the gray bat to assess whether the listing classification of endangered was still appropriate. Although the gray bat has recovered in many areas and the overall range-wide estimate continues to increase, the Service determined that the current listing classification of endangered should be retained primarily due to the potential threat of WNS.

The emergence of white-nose syndrome (WNS) has caused recent catastrophic declines among many species of bats in eastern North America (Lorch *et al.* 2011, Cryan *et al.* 2013a). Dead bats were first documented at four sites in eastern New York in the winter of 2006-2007. Initially, the cause of mortality was unknown. However, a white fungus was observed on the muzzles of many of the dead bats, and the term "white-nose syndrome" was used to characterize the malady. White-nose syndrome is a condition affecting primarily hibernating bats. Since 2006, WNS is implicated in the death of an estimated 5.7- 6.7 million bats of seven species across eastern North America. Bat population declines due to WNS are one of the fastest declines of wild mammal populations ever observed (Cryan *et al.* 2010; Frick *et al.* 2010). At the end of the 2014-2015 hibernating season, bats with WNS were confirmed in 26 states and five Canadian provinces.

The fungus associated with WNS was initially identified as *Geomyces destructans,* a previously undescribed species (Gargas *et al.* 2009). More recent phylogenetic analyses have led to reclassification of the WNS fungus as *Pseudogymnoascus destructans* (Minnis and Lindner 2013). The fungus invades living tissue, causing cup-like epidermal erosions and ulcers (Meteyer *et al.* 2009, Puechmaille *et al.* 2010). These erosions and ulcers may in turn disrupt the many important physiological functions that wing membranes provide, such as water balance (Cryan *et al.* 2010). The fungus thrives in the cold and humid conditions of bat hibernacula, and it is believed that WNS is transmitted primarily through bat-to-bat contact.

The fungus associated with WNS was documented from gray bats in Missouri during the spring of 2010. Then in 2012, the Service confirmed the presence of WNS in gray bats from Tennessee. This is the first confirmed incidence of this fungal disease in the gray bat. However, mortality events attributable to WNS have not occurred in any gray bat populations to date. Research is ongoing to determine whether all bats that come into contact with the fungus will develop WNS. However, the discovery of this fungal disease in gray bats is cause for concern. Because WNS appears to kill only hibernating bats, biologists are concerned that gray bat populations may be impacted during future hibernation seasons. Considering a large percentage of the gray bat

population hibernates in a limited number of caves, should gray bats develop WNS, disease transmission could occur rapidly and the resulting impacts could be severe.

Analysis of the species habitat likely to be affected

The Action Area lies south of the primary range of the gray bat in Oklahoma and Arkansas. However, the gray bat potentially will be affected primarily by alteration (loss or fragmentation) of riparian forests and wetland areas that serve as foraging habitat in Oklahoma and Arkansas. Impacts to cave habitats used by gray bats also may be possible. Critical habitat has not been designated for the gray bat. Therefore, none will be affected.

Species Description and Life History—Indiana Bat

Species and Critical Habitat Description

The Indiana bat (*Myotis sodalis*) was listed as an endangered species on March 11, 1967, (32 FR 4001) under the Endangered Species Preservation Act of October 15, 1966. In 1973, the Endangered Species Preservation Act was subsumed by the Endangered Species Act and extended full protection to the Indiana bat. Thirteen hibernacula (11 caves and two mines) in six states were designated as critical habitat for the Indiana bat on September 24, 1976 (41 FR 41914). No critical habitat occurs within or near the project area. The closest occurrence of critical habitat is in Missouri, about 185 km (115 miles) north of the project area.

The Indiana Bat Draft Recovery Plan: First Revision (Service 2007) updated the original 1983 recovery plan and provides the most current information on the status of the population recovery goals and recovery strategy. The recovery program for this species has four broad components: 1) range-wide population monitoring at the hibernacula with improvements in census techniques; 2) conservation and management of habitat (hibernacula, swarming, and to a degree, summer); 3) further research into the requirements of and threats to the species; and 4) public education and outreach (Service 2007).

The Indiana bat is a medium-sized insectivorous bat in the *Myotis* genus with a head and body length that ranges from 41 to 49 millimeters (1.6 to 1.9 inches). The Indiana bat closely resembles the little brown bat (*Myotis lucifugus*) but is distinguished from this species by its shortened toe hairs and a slightly keeled calcar.

The recovery program for the Indiana bat delineates four Recovery Units (RUs): the Ozark-Central, Midwest, Appalachian Mountains, and Northeast RUs. Recovery Units serve to protect both core and peripheral populations and ensure that the principles of representation, redundancy, and resiliency are incorporated (Service 2007). Oklahoma and Arkansas are within the Ozark-Central RU and Tennessee is located within the Midwest RU.

Life History

The Indiana bat is migratory, moving between winter hibernacula and summer habitats. The Indiana bat hibernates in caves and mines, often with other species of bats, during the months of October through April, although the period of hibernation varies across the range of the species, among years, and among individuals. Indiana bats, particularly females, are philopatric and return annually to the same hibernacula (LaVal and LaVal 1980).

In spring, Indiana bats emerge from hibernation. The timing of annual emergence varies across the range, depending on latitude and weather (Hall 1962). Females tend to emerge first, usually from late March to mid-April. Males typically will emerge by the beginning of May.

Soon after emergence, females become pregnant by delayed fertilization from deposited sperm that has been stored in their reproductive tracts over the winter. Reproductive females will typically leave immediately for summer habitat although some may linger for a few days near the hibernaculum. Males and non-reproductive females may reside near the hibernacula or disperse to summer habitat. Indiana bats can migrate hundreds of kilometers from their hibernacula to summer habitat where females will form maternity colonies (Service 2007).

Members of the same maternity colony exhibit strong site fidelity to summer roosting and foraging areas and will return to the same summer range annually. Upon arrival at their summer range, female Indiana bats will give birth and raise their pups. Female Indiana bats give birth to one young each year, typically in June or early July (Mumford and Calvert 1960, Humphrey *et al.* 1977, Thomson 1982). Most births occur in mid- to late June and lactation continues into July (Kurta and Rice 2002). Young bats are volant at about four weeks of age after which maternity colonies will begin disbanding. Most known maternity colonies consist of 50 to 100 adult female bats, with colony size averaging approximately 80 adult females (Whitaker and Brack 2002).

Indiana bats forage at night and consume a variety of flying insects found along rivers or lakes and in uplands. Indiana bats typically forage within 4.0 km (2.5 mi) of roost trees but may forage as much as 8.0 km (5 miles) from roost sites (Service 2007). When the locations of roost trees are unknown, the home range for a maternity colony is considered to be all suitable habitat within 8.0 km (5 mi) from capture points (Service 2011).

Fall migration from summer habitat to hibernacula may begin in late July or early August, although at many sites some bats remain in their maternity colony area through September to occasionally as late as October (Humphrey *et al.*1977, Kurta *et al.*1993). Members of a maternity colony do not necessarily hibernate in the same hibernacula (Kurta and Murray 2002).

Upon arrival at hibernacula in the fall, Indiana bats will mate and build up fat reserves by foraging, usually in close proximity to the cave. This pre-hibernation swarming activity is a critical part of the Indiana bat life cycle where sufficient fat reserves to sustain them through the winter are deposited (Hall 1962). Swarming behavior typically involves large numbers of bats flying in and out of cave entrances throughout the night, while most of the bats continue to roost in trees during the day.

Indiana bats, primarily adult males and non-reproductive females, may arrive at their hibernacula as early as late July (Brack 1983). The number of Indiana bats active at the hibernacula increases through August and peaks in September and early October (Cope and Humphrey 1977, Hawkins and Brack 2004, Hawkins *et al.* 2005). Swarming continues for several weeks and mating may occur on cave ceilings or near the cave entrance during the latter part of the period. After fall migration, females typically do not remain active outside the hibernaculum as long as males. Males may continue swarming through October in what is believed to be an attempt to breed with late arriving females.

Limited mating activity occurs throughout the winter and in spring before the bats leave hibernation (Hall 1962). Young female bats can mate in their first autumn and have offspring the following year, whereas males may not mature until the second year.

Habitat

Indiana bats typically hibernate in caves or mines where the ambient temperature remains below 10.0° C (50.0° F) but very rarely drops below freezing (Hall 1962, Myers 1964, Henshaw 1965, Humphrey 1978).

Summer/maternity colony habitats include riparian, bottomland and floodplain forests, wooded wetlands, and upland forest communities. Maternity roost sites are most often under the exfoliating bark of dead trees although live trees, especially shagbark hickory (*Carya ovata*), are also used if they have flaking bark under which the bats can roost. Maternity colonies typically use 10 to 20 trees each year, but only one to three of these are primary roosts used by the majority of bats for some or all of the summer (Callahan 1993, Callahan *et al.*1997). Roost trees can vary considerably in size, but primary roosts are usually large diameter (over 5 inches (in) in diameter at breast height) snags (dead trees). Although male Indiana bats may roost in trees less than 12.7 centimeters (cm; 5 in) diameter at breast height (dbh), suitable roosting habitat is defined as forest patches with trees of 12.7 cm (5 in) dbh or larger (Service 2015a). Although roost trees are often in mature, mostly closed-canopy forests, maternity roost trees are typically in open areas exposed to solar radiation (i.e., sunlight on the roost area for at least part of the day). These trees may be in canopy gaps in the forest, in a fence line, or along a wooded edge. Roost trees, although ephemeral in nature, may be occupied by a colony for a number of years until they are no longer suitable. Tree species frequently used for roosting include ash (*Fraxinus* spp.), elm (*Ulmus* spp.), hickory (*Carya* spp.), maple (*Acer* spp.), poplar (*Populus* spp.) and oak (*Quercus* spp.).

Population Status and Distribution

Indiana bats occur over much of the eastern half of the United States from Oklahoma, Iowa, and Wisconsin east to Vermont and south to northwestern Florida. The winter range is associated with regions of well-developed limestone caverns with major populations known to hibernate in Indiana, Kentucky, and Missouri. Smaller winter populations have been reported from Alabama, Arkansas, Georgia, Illinois, Maryland, Michigan, Mississippi, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, and West Virginia.

The 2015 range-wide population estimate of Indiana bats was 523,636 individuals, based on winter hibernacula survey information compiled by the Service (2015b). Extant winter populations are known from 281 different hibernacula located in 19 states (Service 2007). In 2015, more than 35% of Indiana bats (185,720 of 523,636) hibernated in caves in southern Indiana. Other states within the current winter range of the Indiana bat include Alabama, Arkansas, Michigan, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Vermont, Virginia, and West Virginia. Approximately 56% of the overall population hibernates in the Midwest RU. Based on 2015 data, more than 86% of the population is hibernating in just 17 sites, and 99% of the Indiana bat population is hibernating in WNS-confirmed or suspected sites. The 2015 population estimate of 523,636 bats is considerably reduced from the estimated 900,000 bats that reportedly existed when the species was listed in 1967 (Service 2015b).

Reasons for Decline and Threats to Survival

Initially, the Indiana bat was listed primarily due to large decreases in population size and an apparent lack of winter habitat. Since that time, additional information on the threats to the species have emerged and detailed information is provided in the draft revised Recovery Plan (Service 2007). Information regarding these threats is summarized below and generally includes habitat loss and degradation, disturbance, disease and several other natural or man-made factors.

Habitat Destruction/Degradation

In the past, purposeful modification of Indiana bat hibernacula, particularly those that altered the thermal regime of the cave, impacted the ability of the cave to support hibernating bats. Increased awareness of the importance of cave microclimates to bats and regulation under the Act have reduced, but not eliminated, this theat. Hibernacula also may be altered by natural events or catastrophes, such as the collapse of a mine or cave used by hibernating bats, that can impact wintering habitat.

Reduction and alteration of forest cover also can impact habitats used by Indiana bats outside of the winter hibernation period (Service 1983, Gardner *et al.*1990, Garner and Gardner 1992, Drobney and Clawson 1995, Whitaker and Brack 2002). However, loss and fragmentation of forest cover does not, in itself, significantly influence the presence or location of Indiana bat maternity colonies at a landscape scale (Farmer *et al.* 2002). Considering the species relies on forested areas for both roosting and foraging, loss and degradation of forested habitat likely does influence habitat quality and species persistence (survival and productivity) at a more local scale. The conversion of floodplain and bottomland forests, primarily for agriculture, also has been identified as a cause of concern (Humphrey 1978).

Presently, the most significant cause of forest conversion within the range of the Indiana bat is urbanization and associated development (Wear and Greis 2002, U.S. Forest Service 2005). Urbanization and its related developments typically result in permanent conversion of forested areas to other less suitable land uses. Indiana bats are known to use forest-agricultural interfaces for foraging but appear to avoid foraging in highly developed areas. At a study site in central Indiana, Indiana bats avoided foraging in a high-density residential area (Sparks *et al.* 2005), although maternity roosts have been found in low-density residential areas (Belwood 2002). Duchamp (2006) found that greater amounts of urban land use was negatively related to bat species diversity in north-central Indiana; several bat species, including the Indiana bat, were less likely to occur in landscapes with greater amounts of urban and suburban development. Development directly destroys habitat and fragments remaining habitat.

Disturbance

As with most species of bats, human disturbance during hibernation can impact survival of bats by causing the loss of critical fat stores that can increase the probability of starvation during the winter. Human disturbance to hibernating bats may result from cave commercialization (cave tours and other commercial uses of caves), recreational caving, vandalism, and research-related activities.

Disturbance of Indiana bats in the summer also may occur due to scientific research (netting and handling of bats) and habitat alteration in areas used as foraging and maternity sites. Callahan

(1993) and Timpone (2004) both observed abandonment of roost trees when heavy equipment was operated in the vicinity of roost sites. Minimizing disturbance in the vicinity of known roost sites, and checking suitable sites prior to disturbance to determine if they are occupied, can help to avoid disturbance-related mortality.

Disease and Predation

In the past, disease and predation were not considered to be major threats to the Indiana bat (Service 2007). However, as discussed previously for gray bats, the existence of WNS represents a significant threat to Indiana bat populations (Turner *et al.* 2011). Infected bats not only may experience epidermal erosions and lesions, some affected bats display abnormal behavior, including flying during the day and in cold weather prior to the emergence of insects and roosting in areas nearer to the cave entrance where temperatures may be colder and less stable. Many infected bats do not survive the winter. The exact processes by which the fungal skin infection leads to death are not known, but depleted fat reserves (*i.e.*, starvation) contribute to mortality (Reeder *et al.* 2012, Warnecke *et al.* 2012) and dehydration also may play a role (Willis *et al.* 2011, Cryan *et al.* 2013b, Ehlman *et al.* 2013). Some of the affected bats that survive hibernation likely emerge in such poor condition that they do not survive the summer. Among those bats that do survive, productivity of female survivors may be negatively affected (Francl *et al.* 2012).

The Northeast RU, where WNS was first observed in the winter of 2006-2007, lost almost 70% of its Indiana bats between 2007 and 2013 (Service 2013a). Populations declined by an additional 13.9 percent in this RU between 2013 and 2015 (Service 2015b). The Appalachian RU, where WNS was confirmed in the winter of 2008-2009, declined by 46 percent between 2011 and 2013 and by 70.1 percent between 2013 and 2015 (Service 2013a, Service 2015b). The Midwest Recovery Unit, where WNS was confirmed in the winter of 2010-2011, declined by 2.5 percent between 2011 and 2013 and by 13.8 percent between 2013 and 2015. The Ozark-Central Recovery Unit, where WNS was confirmed in the winter of 2011-2012, had not yet experienced declines by 2013 but saw a small decline of 0.3 percent between 2013 and 2015. Based on these observations, the arrival of the fungus in a particular area may precede large-scale fatality of bats by several years.

All hibernating populations of Indiana bats appear to be susceptible to WNS (Thogmartin *et al.* 2012) considering that infected source populations occur within the known migration distance for individual Indiana bats. Models of the impacts of WNS on Indiana bat populations suggest that WNS will cause local and regional extirpation of some wintering populations of Indiana bats and overall population declines exceeding 86 percent (Thogmartin *et al.* 2013). Although the long-term outcome is unknown, the implications of WNS for many species of bats, including the Indiana bat, appear severe.

Other Factors

In addition to cave or mine collapses, other natural catastrophes, particularly flooding and freezing episodes within hibernacula, have the potential to kill large numbers of Indiana bats, at least in localized areas (Service 2007). Restrictions on the use of organochlorine pesticides reduced the threat of environmental contaminants to Indiana bats. However, cholinesterase-inhibiting insecticides, organophosphates, and carbamates have now become the most widely used insecticides (Grue *et al.* 1997), and the impact of these chemicals on Indiana bats is not known. Considering their complex reproductive physiology, high energy demands and unique

thermoregulatory abilities, much more research needs to be conducted to determine the effects of these pesticides on bats.

The influence of climate change on Indiana bats is not well studied. Considering the species particular microclimatic needs during hibernation, the potential for impacts cannot be discounted. During winter, only a small proportion of caves provide the right conditions for hibernating Indiana bats and increasing surface temperatures due to climate change could affect the suitability of hibernacula. Impacts to the timing of emergence or availability of insect prey also appear likely. Loeb and Winters (2013) modeled potential influence of climate change on Indiana bat summer maternity range within the United States; in their model, the area suitable for summer maternity colonies of Indiana bats was forecasted to decline significantly.

Because the Indiana bat is migratory, the potential for collisions of bats with man-made objects is a growing concern, specifically with reference to collisions with turbines at wind energy facilities. Several studies have assessed the impact of wind turbines on bats (Johnson 2005, Kunz *et al.* 2007, Arnett *et al.* 2008, Hayes 2013, and Smallwood 2013). Kunz *et al.* (2007) reported that of the 45 species of bats that are found in North America, 11 had been recorded among the mortalities at wind energy facilities. Bat fatalities at wind turbines typically occur during late summer and autumn (Johnson 2005, Kunz *et al.* 2007, Arnett *et al.* 2008); suggesting that bats may be particularly susceptible during fall migration. Pruitt and Okajima (2014) reported on known fatalities of Indiana bats that appear to be associated with fall migration at wind energy sites. Indiana bats also may be susceptible to wind turbine fatalities while on summer range and/or during spring migration. However, incomplete knowledge of the migratory behavior of bats limits our ability to fully understand and evaluate why bats strike wind turbines (Larkin 2006).

Bats also may suffer barotrauma at wind energy sites, a phenomenon in which abrupt air pressure changes cause tissue damage to air-containing structures such as the lungs. The tympana (ear drums) of bats could potentially be affected by air pressure changes when bats fly in close proximity of wind turbine blades. Damage to the ear can result in impairment of hearing and echolocation abilities. The auditory system in bats plays a major role in echolocation, which is critical to a bat's ability to find prey and to navigate while flying. Any significant impairment of hearing would have the potential to affect survival. Both Rollins *et al.* (2012) and Grodsky *et al.* (2011) examined the ears of bats killed at wind turbines, and both noted damage to the ears in some of the bats, although both noted difficulty in distinguishing damage caused by traumatic injuries (*i.e.*, blunt force trauma caused by a turbine blade) versus barotrauma. So, while some bats that die at wind farms have injuries to the ear, it is not known to what extent there are also bats that fly near the blades and suffer damage, but are able to fly away. These delayed but potentially lethal effects following non-lethal contact with wind turbines (*i.e.*, bats sustain injuries and die sometime later) likely influences the ability of conservationists to accurately estimate bat mortality caused by wind energy facilities (Grodsky *et al.* 2011).

Analysis of the species habitat likely to be affected

Removal of living trees or snags which have the potential to serve as roosts for maternity colonies or individual bats, reduction of density of mature trees, and overstory canopy could result in the loss or alteration of the summer (roosting and foraging) and pre-hibernation (fall foraging) habitat. Critical habitat has not been designated for the Indiana bat in the general vicinity of the Action Area. Therefore, none will be affected.

Species Description and Life History—Northern Long-eared Bat

Species and Critical Habitat Description

The April 2, 2015, final listing rule (80 FR 17974) for the northern long-eared bat (NLEB) provides the best available information on NLEB life history and biology, status, distribution and threats. The information below is a summary from that document.

The NLEB was federally-listed as threatened on May 4, 2015. The final rule determined that critical habitat designation for the NLEB is prudent, but was not determinable at that time. Some forms of take for the species are covered under an Interim Special 4(d) rule.

The NLEB is a medium sized bat having an average adult body weight of 5 to 8 grams (0.2 to 0.3 ounces). Females are slightly larger than males (Caceres and Pybus 1997). Body length ranges from 77 to 95 millimeters (mm) (3.0 to 3.7 inches (in)) with a wingspread from 228 to 258 mm (8.9 to 10.2 in) (Caceres and Barclay 2000, Barbour and Davis 1969). Fur colors are medium to dark brown on the back; dark brown, but not black, ears and wing membranes; and tawny to pale brown fur on the ventral side (Nagorsen and Brigham 1993, Whitaker and Mumford 2009).

The NLEB can be distinguished from other Myotis species by its relatively long ears (average 17 mm (0.7 in)) (Whitaker and Mumford 2009). When laid forward, NLEB ears extend up to 5 mm (0.2 in) beyond the tip of the nose (Caceres and Barclay 2000). Within its range, the NLEB may be confused with the little brown bat or the western long-eared myotis (*Myotis evotis*). The NLEB is distinguished from the little brown bat by its longer ears, tapered and symmetrical tragus, slightly longer tail, and less glossy pelage; and, from the western long-eared myotis by its darker pelage and paler membranes (Caceres and Barclay 2000).

Life History

The NLEB is a temperate, insectivorous, migratory bat that hibernates in mines and caves in the winter and occupies forested areas in the summer for feeding and reproduction. Adult longevity is up to 18.5 years (Hall *et al.* 1957).

Northern long-eared bats forage at night, using hawking (catching insects in flight) and gleaning (picking insects from surfaces) behaviors along with acoustic cues to locate prey (Nagorsen and Brigham 1993, Ratcliffe and Dawson 2003). The NLEB diet is diverse and includes moths, flies, leafhoppers, caddisflies, and beetles (Griffith and Gates 1985, Nagorsen and Brigham 1993, Brack and Whitaker 2001). The most common insects found in NLEB diets are lepidopterans (moths) and coleopterans (beetles) (Brack and Whitaker 2001, Lee and McCracken 2004, Feldhamer *et al.* 2009, Dodd *et al.* 2012), and arachnids (Feldhamer *et al.* 2009). Diet composition differs geographically and seasonally (Brack and Whitaker 2001).

Most foraging occurs within mature forests (Caceres and Pybus 1997) above the understory but under the canopy about 1 to 3 m (3 to 10 ft) above the ground (Nagorsen and Brigham 1993). Foraging typically occurs on forested hillsides and ridges, rather than along riparian zones (Brack and Whitaker 2001, LaVal *et al.* 1977). Occasional foraging also takes place over small forest clearings and water, and along roads (van Zyll de Jong 1985). Peak foraging activity occurs within 5 hours after sunset followed by a secondary peak within 8 hours after sunset (Kunz 1973).

Brack and Whitaker (2001) did not find significant differences between male and female diet or between diets of adults and juveniles.

Males and non-reproductive females may summer near hibernacula, or migrate to summer habitat some distance from their hibernaculum. The NLEB is not considered to be a long distance migrant (typically 35-55 miles) (Nagorsen and Brigham 1993, Griffin 1940, Caire *et al.* 1979). Migration is an energetically demanding behavior for the NLEB, particularly in the spring when their fat reserves and food supplies are low and females are pregnant. The spring migration period typically runs from mid-March to mid-May (Caire *et al.* 1979; Easterla 1968; Whitaker and Mumford 2009). Fall migration typically occurs between mid-August and mid-October.

Like most North American bats, the NLEB hibernates during the winter months to conserve energy from increased thermoregulatory demands and reduced food resources. Individuals enter a state of torpor, during which internal body temperatures approach ambient temperature, metabolic rates are significantly lowered, and immune function declines (Thomas *et al.* 1990, Thomas and Geiser 1997, Bouma *et al.* 2010).

Depending on latitude, NLEB typically arrive at hibernacula in August or September, begin hibernation in October and November, and emerge from the hibernacula in March or April (Caire *et al.* 1979, Whitaker and Hamilton 1998, Amelon and Burhans 2006). The NLEB demonstrates strong fidelity for a particular hibernaculum (Pearson 1962), although they may not necessarily return to the same hibernaculum in successive seasons (Caceres and Barclay 2000). They also may move between hibernacula during the winter (Whitaker and Rissler 1992, Whitaker and Hamilton 1998). Northern long-eared bats typically are observed in small numbers (frequently less than 100) at hibernacula and comprise only a minor proportion of the total number of bats observed hibernating at a single site (Barbour and Davis 1969, Mills 1971, Caire *et al.* 1979, Caceres and Barclay 2000).

Prior to entering hibernation, males will congregate near hibernacula and begin mating activity as females begin to arrive (Whitaker and Hamilton 1998, Caceres and Barclay 2000, Amelon and Burhans 2006, Whitaker and Mumford 2009). This behavior, known as "swarming" may last several weeks, with most matings occurring during the latter part of this period. After mating, females enter directly into hibernation but not necessarily at the same hibernaculum where they mated. Females will store deposited sperm until spring (Racey 1979, Caceres and Pybus 1997) with ovulation occurring near the time of emergence. A single egg will be fertilized, resulting in a single embryo (Cope and Humphrey 1972, Caceres and Pybus 1997, Caceres and Barclay 2000). Hibernation typically begins no later than the end of November.

Upon emergence from the hibernacula in the spring, females will begin to seek suitable habitat for maternity colonies. Females are typically the first to emerge. This period after hibernation and just before spring migration to summer roosts occurs is referred to as "staging," a time when bats are focused on foraging and a limited amount of mating will occur. Spring staging and fall swarming typically occurs within 8.0 km (5 mi) of a hibernaculum. Young NLEB are typically born in late-May or early June, with females giving birth to a single offspring. Lactation then lasts 3 to 5 weeks, with pups becoming volant (able to fly) between early July and early August.

The NLEB actively forms colonies in the summer (Foster and Kurta 1999) and exhibit fission-fusion behavior (Garroway and Broders 2007). This behavior is characterized by members frequently coalescing to form a group (fusion), but composition of the group is in flux, with

individuals frequently departing to be solitary or to form smaller groups (fission) before returning to the main unit (Barclay and Kurta 2007). As part of this behavior, NLEB switch tree roosts often (Sasse and Pekins 1996), typically every 2 to 3 days (Foster and Kurta 1999, Owen *et al.* 2002, Carter and Feldhamer 2005, Timpone *et al.* 2010). Maternity colonies vary widely in size, although 30-60 adult females appear to be most common (Caceres and Barclay 2000, Whitaker and Mumford 2009). Female NLEB show some degree of philopatry to single roost trees and/or maternity areas. However, NLEB frequently use networks of roost trees often clustered around one or more central-node roost trees (Johnson *et al.* 2011). These roosting networks often include multiple alternate roost trees. Males and pregnant/lactating females generally roost separately (Caceres and Barclay 2000), with male and non-reproductive females often choosing cooler places, like caves and mines (Barbour and Davis 1969, Amelon and Burhans 2006) for roosting. Occasionally they may be observed roosting in structures like barns and sheds, particularly when suitable tree roosts are unavailable.

The NLEB selects tree roosts (see section on *Habitat* below) based on presence of cavities or crevices or the presence of peeling bark. Specific roosting sites include cavities, crevices, hollows or beneath bark of both living and dead trees and/or snags (typically ≥ 3 inches dbh).

Habitat

Suitable summer habitat for the NLEB is comprised of a variety of forested/wooded habitats where they will roost, forage, and travel. Summer habitat also may include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. These forested/wooded areas may be dense or looser aggregates of trees having variable amounts of canopy closure. Linear features such as fencerows, riparian forests, and other wooded corridors also may be used. Many species of bats, including the NLEB, consistently avoid foraging in, or crossing, large open areas, choosing instead to use tree-lined pathways or small openings (Patriquin and Barclay 2003, Yates and Muzika 2006). Further, wing morphology of the species suggests that they are adapted to moving in cluttered habitats. Thus, isolated patches of forest may not be suitable for foraging or roosting unless the patches are connected by a wooded corridor.

Tree species selected for roosting varies widely but are predominantly hardwoods. Roost tree species reported in the literature include: black oak (*Quercus velutina*), northern red oak (*Q. rubra*), silver maple (*Acer saccharinum*), sugar maple (*A. saccharum*), black locust (*Robinia pseudoacacia*), American beech (*Fagus grandifolia*), sourwood (*Oxydendrum arboreum*) and shortleaf pine (*Pinus echinata*) (Mumford and Cope 1964, Clark *et al.* 1987, Sasse and Pekins 1996, Foster and Kurta 1999, Lacki and Schwierjohann 2001, Owen *et al.* 2002, Carter and Feldhamer 2005, Perry and Thill 2007, Timpone *et al.* 2010). The NLEB most likely selects trees with suitable cavities or that retain their bark, regardless of species (Foster and Kurta 1999), in areas that provide structural habitat complexity (Carter and Feldhamer 2005).

Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (*e.g.*, abandoned or active mines, railroad tunnels). Winter hibernacula used by NLEB typically have significant cracks and crevices for roosting; relatively constant, cool temperatures (0-9° C (32-48° F)) and high humidity with minimal air currents. Humidity in hibernacula is often so high that droplets of water are often seen on their fur. Within hibernacula, NLEB are often observed having only the nose and ears visible. Generally, NLEB hibernate from October to April depending on

local climate (November-December to March in southern areas and as late as mid-May in some northern areas).

Population Status and Distribution

The NLEB ranges across much of the eastern and north central United States, and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia (Nagorsen and Brigham 1993, Caceres and Pybus 1997, Environment Yukon 2011) (Figure 4). In the United States, the species' range reaches from Maine west to Montana, south to eastern Kansas, eastern Oklahoma, Arkansas, and east through the Gulf States to the Atlantic Coast (Whitaker and Hamilton 1998, Caceres and Barclay 2000, Amelon and Burhans 2006). The species' range includes the following 37 States (plus the District of Columbia): Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming. Historically, the species has been most frequently observed in the northeastern United States and in Canadian Provinces, Quebec and Ontario, with sightings increasing during swarming and hibernation (Caceres and Barclay 2000). However, throughout the majority of the species' range it is patchily distributed, and historically was less common in the southern and western portions of the range than in the northern portion of the range (Amelon and Burhans 2006).

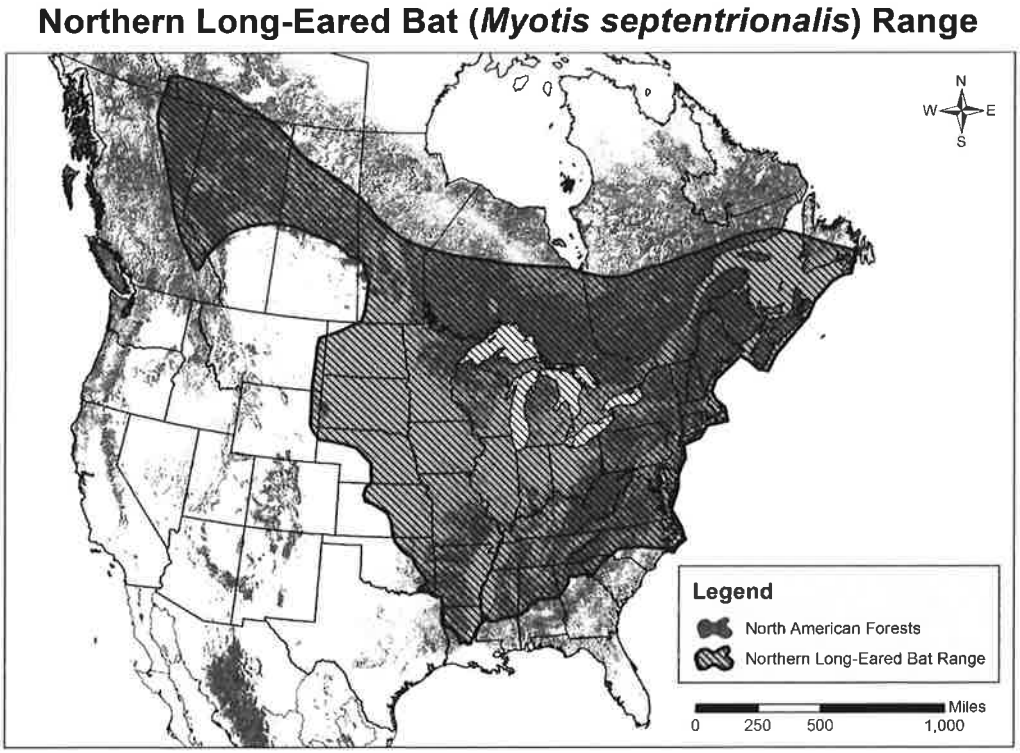

Figure 4. Range of the NLEB.

Although they are typically found in low numbers in inconspicuous roosts, most records of NLEB are from winter hibernacula surveys (Caceres and Pybus 1997). More than 780 hibernacula have been identified throughout the species' range in the United States, although many hibernacula

contain only a few (1 to 3) individuals (Whitaker and Hamilton 1998). Known hibernacula (sites with one or more winter records of northern long-eared bats) include: Alabama (2), Arkansas (41), Connecticut (8), Delaware (2), Georgia (3), Illinois (21), Indiana (25), Kentucky (119), Maine (3), Maryland (8), Massachusetts (7), Michigan (103), Minnesota (11), Missouri (more than 269), Nebraska (2), New Hampshire (11), New Jersey (7), New York (90), North Carolina (22), Oklahoma (9), Ohio (7), Pennsylvania (112), South Carolina (2), South Dakota (21), Tennessee (58), Vermont (16), Virginia (8), West Virginia (104), and Wisconsin (67). Northern long-eared bats are documented from hibernacula in 29 of the 37 States in the species' range. Other States within the species' range have no known hibernacula (due to no suitable hibernacula present, limited survey effort, or existence of unknown sites).

The NLEB final listing rule summarizes the abundance data available for each major region within the range. Data to support a range-wide population estimate for the species are unavailable. However, the final listing rule provides a rough population estimate for the states of Illinois, Indiana, Iowa, Ohio, Michigan, and Missouri of about 4 million NLEB.

Reason for Decline and Threats to Survival

No other threat is as severe and immediate for the NLEB as the disease white-nose syndrome (WNS). Previous sections of this document have provided general information on the occurrence and impact of WNS. As explained in the final listing rule, total NLEB counts have declined by an average of 96 percent since the arrival of WNS. Although there is uncertainty about how quickly WNS will spread through the remaining portions of the species' range, available information indicates that the disease will eventually spread throughout the range of the species. The presence of WNS was confirmed in Arkansas in 2014 from two NLEB collected from a cave in Marion County. Additionally, WNS has been observed in Arkansas from several locations in the Ouachita and Ozark Mountains. White-nose syndrome has now been documented on bats from caves in Franklin and Searcy counties. The fungus associated with WNS also has been found in mines in Garland and Polk counties, Arkansas.

Human and non-human modification of hibernacula, particularly altering or closing hibernacula entrances, is considered the next greatest threat after WNS to the NLEB. Some modifications, e.g., closure of a cave entrance with structures/materials besides a bat-friendly gate, can cause a partial or complete loss of the capability of a site to serve as a hibernaculum. Humans also can disturb hibernating bats, either directly or indirectly, resulting in an increase in energy-consuming arousal bouts during hibernation (Thomas 1995, Johnson *et al.* 1998).

During the summer, NLEB habitat loss is primarily due to forest conversion, and to a lesser degree, unsustainable forest management. Throughout the range of NLEB, forest conversion is expected to increase due to commercial and urban development, energy production and transmission, and natural changes. Forest conversion causes loss of potential habitat, fragmentation of remaining habitat, and if occupied at the time of the conversion, direct injury or mortality to individuals. Forest management activities, unlike forest conversion, typically result in temporary impacts to the habitat of NLEB, but also may cause direct injury or mortality to individuals. The net effect of forest management may be positive, neutral, or negative, depending on the type, scale, and timing of various practices.

Wind energy facilities are known to cause mortality of NLEB. While mortality estimates vary between sites and years, sustained mortality at particular facilities could cause declines in local

populations. Wind energy development within portions of the species' range is projected to continue.

Climate change also may affect this species, as NLEB are particularly sensitive to changes in temperature, humidity, and precipitation. Climate change may indirectly affect the NLEB through changes in food availability and the timing of hibernation and reproductive cycles.

Environmental contaminants, in particular insecticides, other pesticides, and inorganic contaminants, such as mercury and lead, also may have detrimental effects on NLEB. Contaminants may bio-accumulate (become concentrated) in the tissues of bats, potentially leading to a myriad of sub-lethal and lethal effects.

Fire is one type environmental stressor that may contribute to the creation of snags and damaged trees on the landscape, which NLEB frequently will use as summer roosts. However, fire may kill or injure bats, especially flightless pups. Prescribed burning is a common tool used in forest management throughout many parts of the species' range.

There is currently no evidence that the natural or manmade factors discussed above (hibernacula modification, forest conversion, forest management, wind energy, climate change, contaminants, fire) were separately or cumulatively contributing to significant range-wide population effects on the NLEB prior to the onset of WNS.

Analysis of the species habitat likely to be affected

Removal of living trees or snags which have the potential to serve as roosts for maternity colonies or individual bats, reduction of density of mature trees, and overstory canopy could result in the loss or alteration of the summer (roosting and foraging) and pre-hibernation (fall foraging) habitat. Critical habitat has not been designated for the NLEB. Therefore, none will be affected.

Species Description and Life History—Ozark Big-eared Bat

Species and Critical Habitat Description

The Ozark big-eared bat was federally-listed as endangered on November 30, 1979 (44 FR 69208). Critical habitat has not been designated. The final recovery plan was signed on March 28, 1995 (Service 1995). A five-year review on the current status of the Ozark big-eared bat was completed by the Service on May 22, 2008, wherein the Service determined that the existing listing classification of endangered remains valid (Service 2008b).

The Ozark big-eared bat belongs to the plain-nosed bat family, Vespertilionidae. The vesper bats are the second largest mammalian family after the Muridae (Old World rats and mice). The genus name of the Ozark big-eared bat at the time of listing was *Plecotus* based on the revised taxonomy of North American bats by Handley (1959). Handley determined that the three species of North American big-eared bats did not differ enough morphologically from the European species of the genus *Plecotus* to warrant unique generic status. The bats were considered members of the genus *Plecotus* and subgenus *Corynorhinus*. *Corynorhinus* was subsequently elevated from subgenera to full generic status and *Plecotus* was limited to species of the Palearctic as a result of additional studies based on morphology, karyotype, and mitochondrial DNA (Fedyk and Ruprect 1983, Stock 1983, Qumsiyeh and Bickham 1993, Tumlison and Douglas 1992, Volleth and Heller 1994,

Bogdanowicz *et al.* 1998). Studies on the phylogeny of North American big-eared bats using mitochondrial and nuclear DNA sequences confirmed the designation of three *Corynorhinus* species and corroborates the subspecies classification *Corynorhinus townsendii ingens* (Piaggio and Perkins 2005).

The Ozark big-eared bat is a medium-sized bat with distinctively large ears [30 – 39 millimeters (mm); 1.2 – 1.5-inches long] that connect at the base across the forehead. The tragus (*i.e.*, fleshy prominence in front of the external ear opening) is long (11 – 17 mm; 0.43 – 0.67 inches) and pointed. Prominent lumps occur on either side of the face (Kunz and Martin 1982). The long fur is light to dark brown on the back and paler tan underneath due to the brown base and tan to buff tip of the ventral hairs (Barbour and Davis 1969, Kunz and Martin 1982, Tumlison 1995). The Ozark big-eared bat is the largest and reddest of the five subspecies of *C. townsendii*. The bat has a wingspan of 305 – 330 mm (12 – 13 inches), a forearm length of 39 – 48 mm (1.5 – 1.9 inches), and weighs from 5 – 13 grams (0.2 – 0.5 ounces) (Kunz and Martin, 1982). The toe hairs do not extend beyond the claws. Maximum life span is estimated to be about 16 years based on recovery of banded bats (Paradiso and Greenhall, 1967, Harvey 1992).

Life History

The Ozark big-eared bat is an insectivorous bat that uses caves year-round. Colonies typically begin to form at hibernacula in October and November (Clark *et al.*, 1996 and 2002). Both sexes hibernate together in clusters that typically range from 2 -135 individuals (Clark *et al.*, 1993, 1997 and 2002). Ozark big-eared bats also will hibernate in larger groups of up to about 400 individuals or singly (Clark *et al.* 1996, 1997, and 2002). They tend to have small home ranges in comparison with other species of bats.

Ozark big-eared bats mate during fall and winter. Females become reproductively active during their first fall (Kunz and Martin 1982, Service 1995), while young males do not reach sexual maturity until their second fall (Kunz and Martin 1982). Females store deposited sperm in their reproductive tract during the winter hibernation period and delay fertilization until after emergence in the spring.

The Ozark big-eared bat is known to exhibit winter activity (Kunz and Martin 1982, Clark *et al.* 2002). Activity likely occurs in order to relocate within the same hibernaculum or among hibernacula to find a more thermally stable location when temperatures at the initial location become too extreme (Kunz and Martin 1982, Harvey and Barkely 1990). Ozark big-eared bats also may be seeking open water to drink (Avery 1985, Speakman and Racey 1989, Clark *et al.* 2002).

Hibernating colonies gradually begin to break up in spring from April through May (Clark *et al.* 2002). Females also become pregnant during this time (Kunz and Martin, 1982) and slowly begin to congregate at warm maternity caves to give birth and rear their young over the summer (Clark *et al.* 1993, 1996, and 2002). Distances between hibernacula and summer caves are known to range from 6.5 to 65 km (4 to 40 miles). The exact timing of the formation of maternity colonies varies between years, but usually occurs between late April and early June (Clark *et al.* 2002, Service 1995). Like other temperate bats, the species exhibits strong roost fidelity, returning to the same maternity sites and hibernacula year after year (Kunz and Martin 1982, Clark *et al.* 1996, Weyandt *et al.* 2005).

Ozark big-eared bats give birth to a single pup in May or June after a two-three month gestation period (Kunz and Martin 1982, Clark *et al.* 2002). Young bats grow rapidly and are capable of flight at three weeks and are weaned by six weeks of age (Kunz and Martin, 1982).

Maternity colonies will begin to break up in August (Kunz and Martin 1982, Clark *et al.* 1996, Wethington *et al.* 1996). Males are solitary during the summer maternity period (Kunz and Martin 1982, Harvey and Barkley 1990, Clark *et al.* 1993). Little else is known about their summer habitats (Service 1995).

Ozark big-eared bats typically emerge from their caves to forage shortly after sunset (Clark *et al.* 1993 and 2002). They primarily feed on moths, but also are known to eat beetles and other flying insects (Service 1995, Leslie and Clark 2002, Dodd 2006). Females forage relatively close to the maternity cave (about 1.0 – 2.0 km; 0.6 – 1.2 miles) during the early and middle portions of the maternity season. Short forage distances allow female bats to return several times during the night to take care of flightless young. As the maternity season progresses, average foraging distances (up to about 7.3 km; 4.5 miles) increases (Harvey 1992, Clark *et al.* 1993). Foraging longer distances from the cave later in the summer may reduce competition with newly volant young that have begun to forage.

Habitat

Ozark big-eared bats forage above the tree canopy in forested areas and along forest edges. These forested habitats provide an important food source for the Ozark big-eared bat. A recent study on the diet of the Ozark big-eared bat and prey abundance in Arkansas found that the bats prey on a wide diversity of moth species, and that most of the species are dependent upon woody forest plants as a host (Dodd 2006). Dodd (2006) also observed a positive correlation between woody species richness and moth occurrence. Conservation of the Ozark big-eared bat, therefore, requires not only protection of important caves but also forested habitat that supports abundant and diverse moth populations (Leslie and Clark 2002, Dodd 2006, Dodd and Lacki 2007). Conservation practices that encourage a diversity of woody forest plant species (*e.g.*, prescribed fire, selective thinning) to provide a rich prey base of moths likely benefits Ozark big-eared bat colonies.

The Ozark big-eared bat has been shown to selectively forage in both edge and forested habitats, primarily oak and oak-hickory forests, and tend to use habitats in proportion to their availability. A radio telemetry study of the foraging activity of females during the maternity season, for example, found that females used edge habitats more than expected (Clark *et al.* 1993). Another study, however, found that males selected forested areas during late summer (*i.e.,* September) while females failed to show preference for foraging habitat (Wethington *et al.* 1996).

Based on wing-loading characteristics (*i.e.,* the ratio of weight to wing area), the Ozark big-eared bat is considered a highly maneuverable flier. Ozark big-eared bats are well adapted to forage in either a cluttered environment such as forest interiors or relatively more open areas, such as edge habitats (Farney and Fleharty 1969, Leslie and Clark 2002, Clark *et al.* 2003, Wethington *et al.* 1996). The Ozark big-eared bat, therefore, is not as restricted in its selection of foraging habitats as other, less maneuverable bats. Selection of foraging habitat by this subspecies may change seasonally and likely is due to both foraging efficiency and the availability of prey (Clark *et al.* 1993, Wethington *et al.* 1996, Dodd 2006). Edge habitat may be selected at times of high moth abundance because it is relatively less costly to forage there as compared to the more cluttered

forest interior and woodland moths are abundant enough that the probability of encounter is high. However, during times of reduced moth abundance, Ozark big-eared bats may move into the forest interior to forage where the occurrence of their preferred prey is relatively higher (Dodd 2006).

Population Status and Distribution

The Ozark big-eared bat is endemic to the Ozark Highlands and Boston Mountains ecoregions (Omernik 1987) where it occurs in oak-hickory hardwood forests (Clark 1991, Leslie and Clark, 2002, and Service 1995). The current range of the Ozark big-eared bat includes northeastern Oklahoma and northwestern Arkansas. In Oklahoma, Ozark big-eared bats currently are known to occur in Adair, Cherokee, and Sequoyah counties. They were historically known from two caves in Delaware County, but have not been observed there recently. Twelve caves considered essential for the continued existence of the Ozark big-eared bat (*i.e.,* used by colonies of Ozark big-eared bats for maternity sites and/or hibernacula) occur in Oklahoma. In Arkansas, the Ozark big-eared bat is known to occur in Boone, Crawford, Marion, Searcy, Washington, and Franklin counties. Seven essential caves occur in Arkansas.

Ozark big-eared bat populations at essential hibernacula and maternity sites (20 caves) have been monitored using minimal census techniques since each essential site was discovered to obtain estimates on colony size and population trends (Puckette 2008; Harvey *et al.* 2006). Monitoring data reveal a disparity between summer and winter population estimates. Numbers of Ozark big-eared bats estimated from summer maternity counts are larger than those found during winter hibernacula counts. This indicates there likely are important hibernacula that have not yet been located. Population estimates and trends are therefore based on maternity colony counts.

The Service recently completed a 5-year review for the Ozark big-eared bat (Service 2008b). Five-year reviews are assessments of the best scientific and commercial data currently available for a listed species, and are used to determine whether or not a change in the federal classification of a species is warranted. Based on that five-year review, the Service (2008b) determined that neither the down nor de-listing criteria identified in the current recovery plan (Service 1995) had been met, and that significant threats to this species remain. Although additional essential caves have been discovered and protected since the time of listing, not all known caves have been afforded some form of protection (*e.g.,* a cave gate/grill, signs, fee-title purchase, conservation easement, etc) and it is likely that other important caves have yet to be located. Population trends of all individual colonies at essential caves are not well explained by available monitoring data.

At the time of listing, the Ozark big-eared bat was known from only a few caves in northwestern Arkansas, southwestern Missouri, and northeastern Oklahoma. The entire population was estimated to consist of about 100-200 individuals. Since listing, additional caves used by maternity colonies in the summer and as hibernacula have been discovered in Oklahoma and Arkansas. The population is estimated to currently consist of about 1,800 individual bats with about 400 in Arkansas and 1,400 in Oklahoma. The Ozark big eared bat is believed to be extirpated from Missouri.

Census counts indicate that the overall population has experienced a slightly increasing trend since 1997 (Service 2008b), when the last discovered essential maternity site from which we have several years of population data (a maternity cave in Arkansas) was added to the annual counts. The overall population estimate has averaged about 1,500 bats between 1997 and 2014.

Reasons for Decline and Threats to Survival

The Ozark big-eared bat was federally-listed due to its small population size, reduced and limited distribution, and vulnerability to human disturbance. Disturbance of hibernating bats causes the loss of critical fat stores and increases the probability of starvation during the winter, while disturbance at maternity roosts can result in loss of young. The bat also is listed as endangered by the States of Oklahoma, Arkansas, and Missouri (although the species is believed to have been extirpated from Missouri).

The Ozark Highlands ecoregion is under considerable development pressure and is one of the fastest growing areas in the country due to relatively inexpensive land prices and the aesthetics of the area. For example, the human population of Washington and Benton County, Arkansas, and Adair and Cherokee counties, Oklahoma, increased 39.0 percent, 59.0 percent, 14.2 percent, and 24.9 percent, respectively, from 1990 to 2000. Over the same period, the human population within the states of Oklahoma and Arkansas, and within the United States increased by only 9.7 percent, 13.7 percent, and 13.2 percent respectively (U.S. Census Bureau 2001). The Oklahoma Department of Commerce (ODOC) projects the human population of Adair and Cherokee counties, Oklahoma, to grow by about 35 percent over the next 23 years (ODOC 2002).

Vandalism and unauthorized human activity at maternity roosts and hibernacula still occur even at gated and signed caves. Therefore, human disturbance remains a serious threat. The disparity between summer and winter counts indicates there likely are more caves of importance to the Ozark big-eared bat of which the bat conservation community is not yet aware. A prerequisite to protecting these sites is knowledge of their location, so the need to continue search efforts for unknown Ozark big-eared bat caves continues. Current and future human population growth and development within the Ozark big-eared bat's range will result in the loss and fragmentation of foraging habitat. In addition to protecting the caves used by the Ozark big-eared bat, it will become increasingly important to protect and restore foraging habitat around these caves as development pressures increase in the future (Wethington *et al.* 1996, Leslie and Clark 2002).

A recent genetics study provides further insight into the need to protect each maternity colony. Weyandt *et al.* (2005) examined population genetic variability and found that maternally inherited markers differed among sites, indicating very strong site fidelity and limited dispersal by females and high natal philopatry. Due to the natural tendency for limited dispersal by female Ozark big-eared bats and the apparent corresponding lack of connectivity among colonies, caves that experience a local extinction are unlikely to be naturally re-colonized. These results suggest that failure to protect a maternity site may result in the loss of genetic variation.

Climate change could have a significant impact on all temperate region bats, including the Ozark big-eared bat. Projected changes in climate could impact bats by adversely affecting their food supply and the internal roosting temperature of caves (Bogan 2003). The Ozark big-eared bat preys on a wide diversity of moth species, but most of the moth species are dependent upon woody forest plants as a host. Climate change may affect the Ozark big-eared bat by impacting plant resources which could alter the timing and abundance of moth prey. Ozark big-eared bats have specific cave microclimate requirements. Only those caves with appropriate microclimates are used as maternity roosts and hibernacula. Changes in the internal roosting temperature of caves may change the suitability of certain caves. Changes in food resources and cave microclimates may affect hibernation periods, and the birth and survival of pups.

Disease and predation were not considered major factors for the endangered status of the Ozark big-eared bat. There was little information available on disease. Likely predators of the Ozark big-eared bat include wildlife known to prey on other bat species such as snakes, owls, raccoons, bobcats, and feral house cats. Predation currently is not considered a significant threat.

White-nose syndrome and the fungus which causes the disease, as previously discussed, has recently been confirmed within the range of the Ozark big-eared bat. The fungus has been detected from several caves within the range of the Ozark big-eared bat in Arkansas between 2012 and 2015. The first record of WNS in a cave known to be used by Ozark big-eared bats occurred during January of 2014 when the Service documented the occurrence of the fungus from three tri-colored bats (*Perimyotis subflavus*) in Delaware County, Oklahoma during the winter of 2015.

The potential impact of WNS on Ozark big-eared bats is unknown, although evidence to date suggests that WNS may not pose a significant threat to big-eared bats (*Corynorhinus* spp.). The Virginia big-eared bat (*C. t. virginianus*), a closely related subspecies, has not shown any evidence of WNS even though WNS has caused mortality in several bat species hibernating in the same caves used by the Virginia big-eared bat.

Analysis of the species habitat likely to be affected

The Ozark big-eared bat potentially will be affected by loss and degradation of habitat. Critical habitat has not been designated for the Ozark big-eared bat. Therefore, none will be affected.

Species Description and Life History—Interior Least Tern

Species and Critical Habitat Description

The interior least tern, *Sterna antillarum athalassos*, was federally listed as endangered on May 28, 1995 (50 FR 21784). Critical habitat has not been designated. Least terns within the Interior Basin of North America were described as *Sterna antillarum athalassos* (Burleigh and Lowery 1942). In 2006, the American Ornithologist's Union recognized least terns under a previously published genus (*Sternula*) based on mitochondrial DNA phylogeny (Bridge *et al.* 2005).

The least tern is the smallest of the North American terns, growing to a length of 21 to 23 centimeters (8 to 9 in) and a wingspan of 48 to 53 centimeters (10 to 21 in) (Thompson *et al.* 1997). Their plumage and coloration is similar for both sexes and all ages. Interior least terns are the inland reproductive population of least tern that nests on or adjacent to the major rivers of the Great Plains and the Lower Mississippi Valley. The listed range of interior least tern is defined as the Mississippi River and tributaries north of Baton Rouge, Louisiana; and all drainages in Texas more than 80 km (50 miles) inland from the coast (50 FR 21789). This portion of the range is only used for nesting and foraging during the spring/summer reproductive season (May – August). Interior least terns are strong fliers, migrating as far as 3,218 km (2,000 miles) between their summer nesting habitats and winter habitats in Central and South America (Thompson *et al.* 1997).

Life History

Interior least terns generally nest on the ground, in open areas, and near appropriate feeding habitat (Lott and Wiley 2012, Lott *et al.* 2013). Terns nest in small colonies and prepare nests by

making small scrapes in the sand where two or three eggs are usually laid. Both parents feed the young, which are fairly mobile upon hatching. Terns prey on small fish, crustaceans, and insects. They prefer to forage in shallow water habitats on small surface schooling fish (2.0 to 9.0 cm long for adults and 1.5 to 4.0 cm long for chicks) (Atwood and Minsky 1983, Wilson *et al.* 1993, Schweitzer and Leslie, Jr. 1996). They are considered "surface plungers" (Ericksson 1985) because they hunt for prey while hovering five to ten meters (16 to 33 feet) above the surface of water bodies, and plunge into the water to capture the fish. Distance to water bodies having available food highly influences reproductive success. In the Lower Mississippi River, foraging terns have been observed feeding in a variety of habitats within 3 km (2 mi) of colony sites (Jones 2012). Density of surface schooling fish and aquatic vegetation, and water transparency affect the suitability of an area for this species (Schweitzer and Leslie, Jr. 1996).

Interior least terns are long-lived, with records of recapture more than 20 years following banding (Thompson *et al.* 1997); however, the average life span is probably less. Least terns spend about 4-5 months at their breeding sites. They arrive at breeding areas from late April to early June (Youngworth 1930, Hardy 1957, Wycoff 1960, Faanes 1983). Courtship occurs at the nesting site or at some distance from the nest site (Tomkins 1959). Courtship display includes the fish flight, an aerial display involving pursuit and maneuvers culminating in a fish transfer on the ground between two displaying birds. Other courtship behaviors include nest scraping, copulation and a variety of postures and vocalizations (Hardy 1957, Wolk 1974, Ducey 1981). Breeding season home ranges for interior least tern can be variable and have been documented ranging from 11 to 1,015 hectares (Talent and Hill 1985).

Most begin breeding at two or three years of age, and breed annually throughout their lives (Thompson *et al.* 1997). Productivity (generally measured as fledgling success per breeding adult pair) considered necessary to maintain stable or increasing populations of interior least terns has been estimated at 0.51 fledglings/pair or higher (Kirsch and Sidle 1999). However, estimates of productivity have been highly variable within and between drainages used by interior least tern populations (Kirsch and Sidle 1999, Dugger *et al.* 2000), and do not appear sufficient to support observed increases in local or range-wide populations (Kirsch and Sidle 1999).

Breeding-site fidelity for interior least terns appears to vary in different populations and breeding areas. Thompson *et al.* (1997) summarized reports of return rates of banded adults to sites where banded as 42 percent on the Mississippi River and 81 percent at Quivira National Wildlife Refuge in Kansas and on the Cimarron River in Oklahoma. Fidelity to natal site is also difficult to estimate because re-sightings or recaptures of terns banded as chicks have been limited. Site fidelity in least terns may be affected by physical habitat variables or the extent and type of predation (Atwood and Massey 1988). As noted above, least terns are strong fliers and can re-locate if conditions on natal or previous year nesting grounds become unfavorable.

Little is known of least tern winter habitats (i.e., Gulf of Mexico, Caribbean islands, Central and South America). Fall interior least tern migrants are believed to generally follow major river basins to their confluence with the Mississippi River and then south to the Gulf of Mexico, however, late summer observations of least terns more than 150 km (93 mi) from major river drainages suggests some birds migrate cross-country (Thompson *et al.* 1997).

Habitat

The interior least tern nests on sand and gravel bars and sandy islands of major rivers and sandy shorelines of reservoirs. Sandbar location, size and elevation can be dynamic, however there are static variables known to influence tern nesting habitat selection that can be used to predict the location of tern colonies (Jorgensen *et al.* 2012). For example, Jorgensen *et al.* (2012) documented that interior least tern nesting incidence increased with increasing river channel width, and that interior least terns avoid nesting on sandbars located in narrow river channels. Nesting sites are characterized by coarser and larger substrate materials, more debris, and shorter and less vegetation compared to surrounding areas (Smith and Renken 1991, Stucker 2012). Vegetation free sand or gravel islands are preferred for nesting, although, sand banks, point bars, and beaches may also be utilized (Lott *et al.* 2013). Interior least tern nesting habitat availability and quality are maintained and influenced by magnitude and timing of riverine flood events (Sidle *et al.* 1992, Renken and Smith 1995, Pavelka 2012). Productivity peaks also may be influenced by stochastic drought events or cycles in some drainages (*e.g.*, Pavelka 2012). However, flooding was historically, and remains a primary cause of interior least tern nest failure in both unregulated and regulated river channels (*e.g.*, Sidle *et al.* 1992, Szell and Woodrey 2003). The interior least tern prefers areas remote from trees or other vegetation that may hide or support predators (Lott *et al.* 2013). Least terns also will nest on anthropogenic sites (Jackson and Jackson 1985, Lott 2006) near water bodies with appropriate fish species and abundance, including industrial sites (Ciuzio *et al.* 2005, Mills 2012), dredged-material deposition sites (Ciuzio *et al.* 2005); sand pits (Smith 2008), created habitats (Stucker 2012), and rooftops (*e.g.*, Boylan 2008, Watterson 2009). Nesting site conditions (*e.g.*, habitat suitability, flood cycles, forage fish abundance, predation pressure) can vary significantly year to year in all drainages, resulting in wide fluctuations in bird numbers (Jones 2012) and/or nesting success (*e.g.*, Smith and Renken 1993, Lott *et al.* 2013). However, least terns may re-nest, or relocate and re-nest if nests or chicks are destroyed early in the season (Massey and Fancher 1989, Thompson *et al.* 1997).

Within the project area in Oklahoma, interior least terns forage and nest along the South Canadian, North Canadian/ Beaver and Cimarron Rivers from April through late August to early September. Within the project area in Arkansas, interior least terns forage and nest along the Arkansas and Mississippi Rivers during the same time period.

Reasons for Decline and Threats to Survival

Reasons for the decline of this species include anthropomorphic causes such as channel engineering practices, impoundments and irrigation, overgrowth of vegetation, the recreational use of sandbars by humans, and flooding of nesting areas caused by unpredictable water discharge patterns below reservoirs (Service 1993). Low river flows that result in a land bridge between river islands and the streambank also can adversely impact terns by facilitating predator and human access to nesting sites. Location and size of nesting colonies also has a significant influence on degree of predation. In several studies interior least tern reproductive success has been higher on island colonies versus connected sandbar colonies, and when water levels maintained isolation of islands and nesting bars from mammal predators (Smith and Renken 1993, Szell and Woodrey 2003). Burger (1984) found significantly higher rates of predation in larger colonies compared to smaller least tern colonies in New Jersey.

Population Status and Distribution

The historical distribution and abundance of the interior least tern is poorly documented. The interior least tern is migratory and historically bred along the Mississippi, Missouri, Arkansas, Red, Rio Grande and Ohio river systems (Coues 1874, AOU 1957, Hardy 1957, Burroughs 1961, Youngworth 1930, 1931, Anderson 1971, Ducey 1981). The range extended from Texas to Montana and from eastern Colorado and New Mexico to southern Indiana. Hill (1992, 1993) reported extensive observations of interior least terns from the Southern Plains, particularly from the Arkansas, Cimarron, Canadian, and Red Rivers.

The least tern currently breeds along the lower Mississippi River, the Missouri River and many of its major tributaries in Kansas, Nebraska, South Dakota, North Dakota, and Montana, the Arkansas River in Oklahoma and Arkansas, the Cimarron and Canadian Rivers in Oklahoma and Texas, and the Red and Rio Grande Rivers in Oklahoma and Texas (Service 1990). However, its distribution is generally restricted to less altered river segments (Service 1990). They nest on a variety of habitats, but prefer sandbars and islands in major rivers. The number of adult least terns has increased in most areas since the species was listed in 1985.

In 2005, Lott (2006) coordinated the only simultaneous survey to date of the geographic range of the interior least tern during a two-week window of the breeding season. Summarized counts from this survey indicated a minimum adult population size of about 17,500, with nesting occurring in over 480 colonies spread across 18 states (Lott 2006). The majority of least terns were counted on the lower Mississippi River (62 percent), while the Arkansas River system had 11.6% and the Red River system had 10.4% of birds counted (Lott 2006). Least terns were identified at rivers, sand pits, reservoirs, salt flats, industrial sites and rooftops. Lott (2006) also provided counts for 21 populations or population segments unknown at the time of listing, which collectively supported over 2,000 interior least terns.

There has not been a complete or organized range-wide count since 2005; however, a number of geographic segments have been annually monitored. Available monitoring data compiled for 2010-2012 show that the combined partial counts of interior least tern continue to exceed the range-wide population recovery criteria by a factor of two or three (see annual totals for 2010-2012 in Table 2; Service 2013b).

The Interior Least Tern Recovery Plan established a goal of 7,000 terns rangewide maintained for 10 consecutive years. While the 2005 count of over 17,000 terns greatly exceeds this goal, the recovery plan also set goals for drainages. The goals for least terns in all drainage basins have not been reached and most areas have not been monitored for 10 years. The recovery plan has not been revised since it was written in 1990 and recovery goals may need to be updated.

At least some proportion of interior least tern range-wide improvement is due to increased awareness, survey efforts, management, and protection. Interior least terns have colonized numerous anthropogenic sites (about 15 percent of sites throughout their range, *e.g.*, sand pits, rooftops, reservoirs, industrial sites), and the persistence of some of these are reliant upon aggressive management (*e.g.*, predator or vegetation control) and protection (*e.g.*, seasonal avoidance) (Service 2013b). However, interior least terns also have expanded significantly in range and numbers in flowing portions of the Mississippi, Red, and Arkansas River channels over the past three decades (Lott 2006), even in the absence of aggressive management in many of these areas.

Table 2. Interior least tern population targets and counts in the Action Area, 1985 to present by drainage (Excerpt from Service 2013b).

Drainage (1990 Recovery Target)	1985 Listing Data	1990 Recovery Plan (1988 Data)	1994/95 (Kirsch & Sidle 1999)	2005 (Lott 2006)	2010 Partial	2011 Partial	2012 Partial
TOTAL (7,000)	**1,970**	**5,099**	**7,430***	**17,591***	**21,855**	**15,403**	**12,935**
Mississippi and Ohio River Population Target (2,500)							
Mississippi River **(2,500)**	350-450	2,356	**4,283***	**10,960***	**18,419***	**12,315***	**10,150***
Arkansas River System Population Targets							
Arkansas River **(400)**	30	319	**505***	**931***			
AR **(150)**			104		**417***	**504***	**523***
OK **(250)**		210	**401***	**205**	**693***	**561***	
Cimarron **(400)**	150	132	280	**428***			
Canadian **(300)**	80	62	152	**590***	Incl in OK	Incl in OK	
Beaver/North Canadian **(100)**		38	24	6			
Salt Plains NWR **(300)**	180-300	210	161	90	65	23	28
Quivara NWR **(100)**	50	54	53	40			
Other							
Adobe Creek		10					
3 Upper AR Valley Res				44	26		
Arkansas River System (1,600)							
Total	**610**	**825**	**1,175**	**2,129***	**1,201**	**1,088**	**551**
	1985	**1990**	**1995**	**2005**	**2010 Partial**	**2011 Partial**	**2012 Partial**
RANGE-WIDE TOTAL (7,000)	**1,970**	**5,099**	**7,430***	**17,591***	**21,855**	**15,403**	**12,935**

Geographic recovery segments from the Recovery Plan can be identified by numerical recovery targets enclosed in parentheses; * indicates achievement of annual numerical recovery targets; *italics* indicates new population or population segments identified since 1985.

In the Mississippi River valley, the current breeding range extends from Madison County, Illinois to Madison Parish, Louisiana, on the Lower Mississippi River (Rumancik 1988). Interior least terns are common in Tennessee and Arkansas in counties along the Mississippi River (Figure 5). During years with extreme flow (high or low) individuals frequently travel up streams, rivers, and reservoirs to interior portions of the state. Large, year-round, resident populations persist in Shelby and Tipton Counties, Tennessee. Individuals of this species are observed foraging in the Mississippi River daily, and nesting or roosting on sandbars and abandoned parking lots. Though the checklists submitted to eBird from this vicinity observe individuals of this species regularly, the state natural heritage program has only captured a fraction of these records. Another location for interior least terns is at TVA's Allan Fossil Plant in Memphis, where interior least terns regularly nest in the parking lot and ash flats (Chuck Nicholson & Peggy Shute, pers. com. 2014).

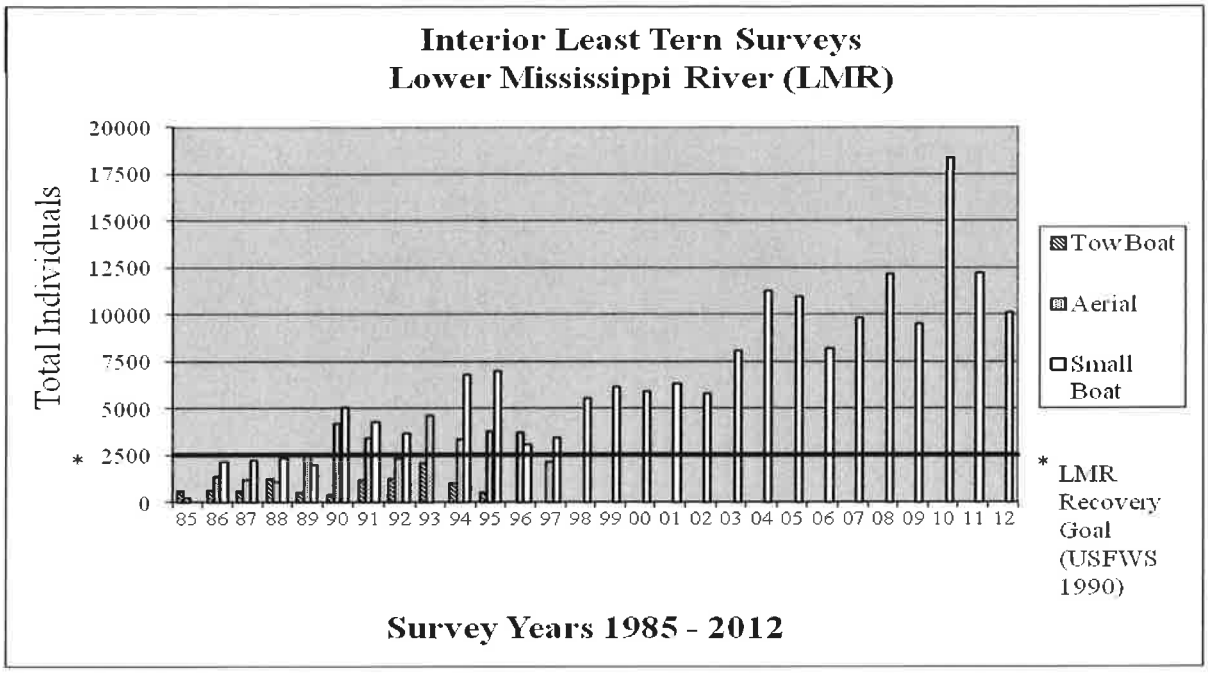

Figure 5. Interior least tern Population Survey Results in the Lower Mississippi River 1985-2012 (Mississippi Valley Division, U.S. Army Corps of Engineers).

Arkansas River System

Breeding least terns occur along the Arkansas River system in Colorado, Kansas, Oklahoma, Arkansas and Texas. Least terns occur on several tributaries of the Arkansas River in Oklahoma (Figure 6). These include the Salt Fork, Beaver River and Cimarron River (Boyd 1987). Additional information regarding the status of the species can be found in the species 5-year review (Service 2013b).

Analysis of the species habitat likely to be affected

The interior least tern potentially will be affected directly by collision with transmission lines and support structures and by electrocution. Construction and maintenance of lattice steel and guyed support structures may result in habitat loss and any alteration of suitable habitat also would impact the interior least tern. Critical habitat has not been designated for the interior least tern. Therefore, none will be affected.

Species Description and Life History—Piping Plover

Species and Critical Habitat Description

The piping plover, *Charadrius melodus*, was federally listed as endangered in the Great Lakes watershed and as threatened throughout the remainder of its range, including migratory routes outside of the Great Lakes watershed and wintering grounds on January 10, 1986 (50 FR 50726). Critical habitat has been designated for the Great Lakes breeding population (66 FR 22938), the northern Great Plains breeding population (67 FR 57637), and for wintering piping plovers (66 FR 36038, 73 FR 62816, and 74 FR 23476). There is no designated critical habitat for piping plovers in Oklahoma, Arkansas or Tennessee.

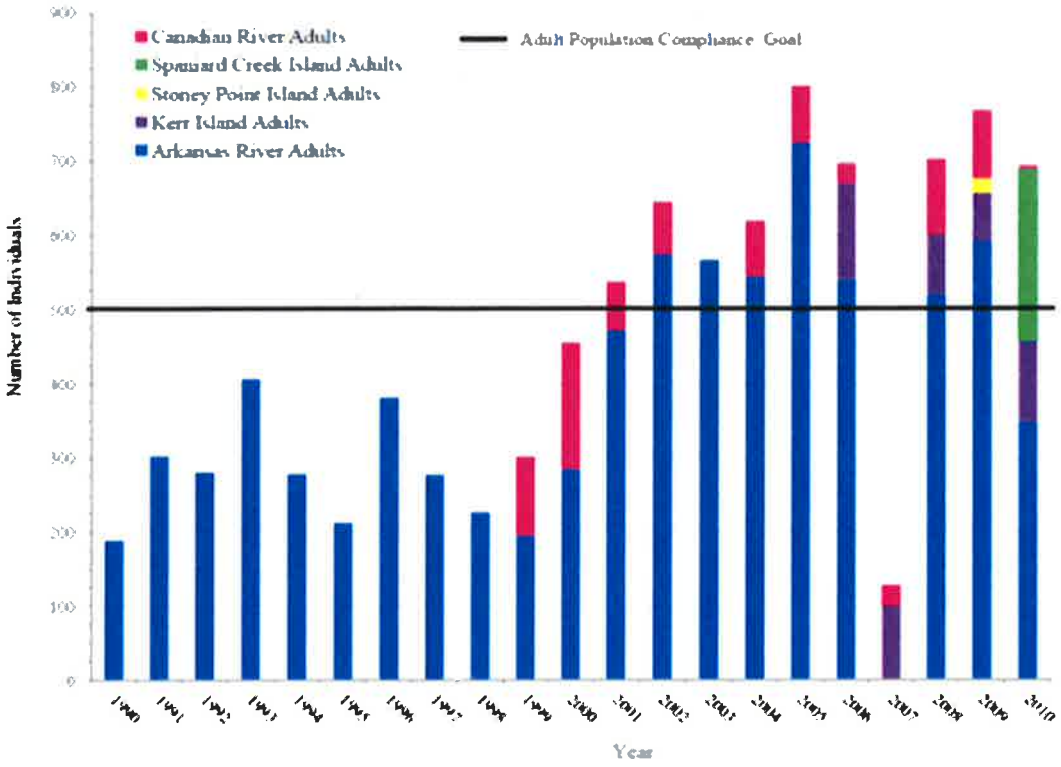

Figure 6. Survey results for adult interior least terns along the Arkansas River, Oklahoma, from Kaw Reservoir to the Oklahoma/Arkansas state line, including the Canadian River below Eufaula Dam to MKARNS. (No surveys were conducted from Kaw to Keystone in 1991, 1993, and 1997. Due to high flows the entire nesting season, no surveys were conducted from Tulsa to Muskogee in 1999. High flows limited surveys to Kerr Island and the Canadian River below Eufaula Dam in 2007. Figure from U.S. Fish and Wildlife Service (2012b).)

The piping plover is a small, pale sand-colored shorebird, about 18 cm (7 in) long with a wingspan of about 38 cm (15 in) (Palmer 1967). Piping plovers were listed principally because of habitat destruction and degradation, predation, and human disturbance. Reduction in suitable nesting habitat due to a number of factors remains a major threat to the species (Service 2009b). Three separate breeding populations have been identified, each with its own recovery criteria: the northern Great Plains (threatened), the Great Lakes (endangered), and the Atlantic Coast (threatened). The piping plover winters in coastal areas of the U.S. from North Carolina to Texas, and along the coast of eastern Mexico and on Caribbean islands from Barbados to Cuba and the Bahamas (Haig and Elliott-Smith 2004). Piping plover subspecies are phenotypically indistinguishable, and most studies in the nonbreeding range report results without regard to breeding origin. Although a recent analysis shows strong patterns in the wintering distribution of piping plovers from different breeding populations, partitioning is not complete and major information gaps persist. Therefore, information within this BO pertains to the species as a whole (*i.e.*, all three breeding populations), except where a particular breeding population is specified.

Life History

Piping plovers live an average of 5 years, although studies have documented birds as old as 11 to 15 years (Wilcox 1959). Plovers are known to begin breeding as early as 1 year of age (MacIvor

1990, Haig 1992); however, the percentage of birds that breed in their first adult year is unknown. Piping plover breeding activity begins in mid-March when birds begin returning to their nesting areas (Coutu *et al.* 1990, Cross 1990, Goldin 1990, MacIvor 1990, Hake 1993). Piping plovers generally fledge only a single brood per season, but may re-nest several times if previous nests are lost. The loss and degradation of suitable nesting habitat likely limits reproductive success and future recruitment into the population (Service 2009b).

Behavioral observation of piping plovers on the wintering grounds suggests that they spend the majority of their time foraging (Nicholls and Baldassarre 1990, Drake 1999a, 1999b). Plovers forage on moist substrate features such as intertidal portions of ocean beaches, washover areas, mudflats, sand flats, algal flats, shoals, wrack lines, sparse vegetation, and shorelines of coastal ponds, lagoons, ephemeral pools and adjacent to salt marshes (Service 2001). Wintering plovers primarily feed on invertebrates such as polychaete marine worms, various crustaceans, fly larvae, beetles, and occasionally bivalve mollusks (Bent 1929, Cairns 1977, Nicholls 1989, Zonick and Ryan 1996). They peck these invertebrates on top of the soil or just beneath the surface.

Piping plovers migrate through and winter in coastal areas of the U.S. from North Carolina to Texas, and along the coast of eastern Mexico and on Caribbean islands from Barbados to Cuba and the Bahamas (Haig and Elliott-Smith 2004). Piping plovers may spend up to 10 months of their life cycle on their migration and winter grounds, generally from July 15 through as late as May 15. Piping plover migration routes and habitats overlap breeding and wintering habitats, and, unless banded, migrants passing through a site usually are indistinguishable from breeding or wintering piping plovers. Migration stopovers by banded piping plovers from the Great Lakes have been documented in New Jersey, Maryland, Virginia, and North Carolina (Stucker and Cuthbert 2006). Migrating breeders from eastern Canada have been observed in Massachusetts, New Jersey, New York, and North Carolina (Amirault *et al.* 2005). As many as 85 staging piping plovers have been tallied at various sites in the Atlantic breeding range (Perkins 2008 pers. com.), but the composition (*e.g.*, adults that nested nearby and their fledged young of the year versus migrants moving to or from sites farther north), stopover duration, and local movements are unknown. In general, distance between stopover locations and duration of stopovers throughout the coastal migration range remains poorly understood.

Plovers depart their breeding grounds for their wintering grounds from July through late August, but southward migration extends through November. While piping plover migration patterns and needs remain poorly understood and occupancy of a particular habitat may involve shorter periods relative to wintering, information about the energetics of avian migration indicates that this might be a particularly critical time in the species' life cycle. More information about the three breeding populations of piping plovers can be found in the following documents:

a) Piping Plover, Atlantic Coast Population: 1996 Revised Recovery Plan (Service 1996);
b) 2009 Piping Plover (*Charadrius melodus*) 5-Year Review: Summary and Evaluation (Service 2009b);
c) 2003 Recovery Plan for the Great Lakes Piping Plover (*Charadrius melodus*) (Service 2003);
d) Questions and Answers about the Northern Great Plains Population of Piping Plover (Service 2002).

Habitat

The piping plover is a shorebird that utilizes aquatic and shoreline habitats. They migrate through Oklahoma each spring and fall and largely are considered a transient species in the state. The breeding range of the piping plover includes the Atlantic Coast, the Northern Great Plains of the United States and Canada, and around the Great Lakes (Andrews and Righter 1992, Service 2009b). Breeding habitat consists of sparsely vegetated, sandy shores of lakes, ponds, and rivers and coastal beaches. The plover winters along the southern Atlantic and Gulf coasts, and in the Bahamas and West Indies (Service 2009b). Non-breeding habitats include ocean beaches and sand, mud, and algal flats. Piping plovers use sandy rivers, reservoir beaches and mudflats during migration (Haig 1992, Haig and Plissner 1993, Service 2009b). The threatened northern Great Plains population migrates through the Action Area in Oklahoma, Arkansas and Tennessee each spring and fall.

Population Status and Distribution

The piping plover breeds in the northern Great Plains and Canada (Figure 7). Review of published records of piping plover sightings throughout North America by Pompei and Cuthbert (2004) found more than 3,400 fall and spring stopover records at 1,196 sites. Published reports indicated piping plovers do not concentrate in large numbers at inland sites and they seem to stop opportunistically. In most cases, reports of birds at inland sites were single individuals.

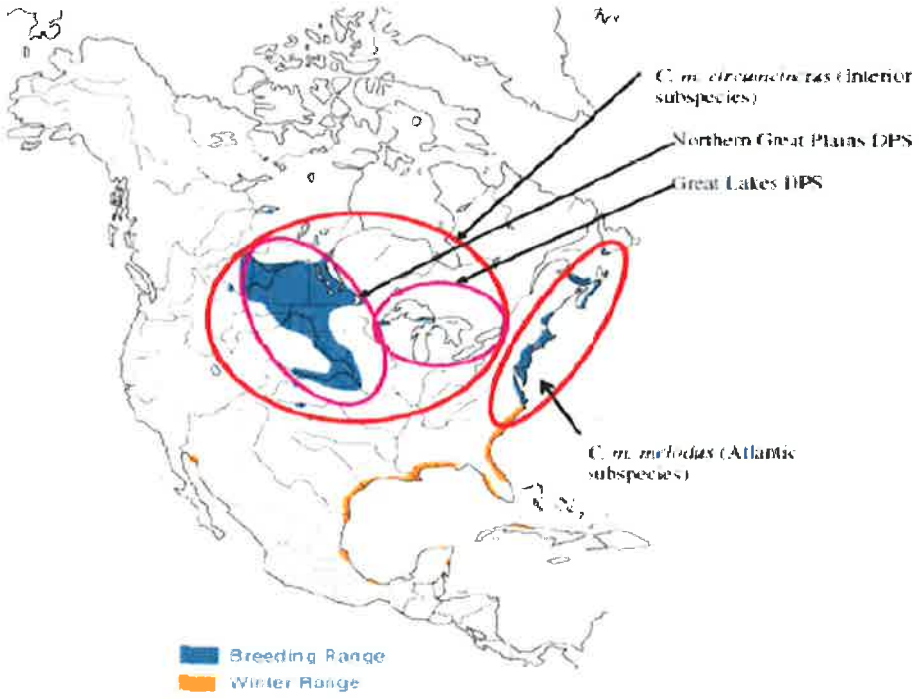

Figure 7. Distribution and range of *C. m. melodus*: Great Lakes DPS of *C. m. circumcinctus*, Northern Great Plains DPS of *C. m. circumcinctus* (base map from Elliott-Smith and Haig 2004 by permission of Birds of North America Online, http://bna.birds.cornell.edu/bna, maintained by the Cornell Lab of Ornithology). Note that this map is a conceptual presentation of subspecies and DPS ranges, and is not intended to convey precise boundaries.

Total numbers have fluctuated over time, with some areas experiencing increases and others decreases. Regional and local fluctuations may reflect the quantity and quality of suitable foraging and roosting habitat, which vary over time in response to natural coastal formation processes as well as anthropogenic habitat changes (*e.g.*, inlet relocation, dredging of shoals and spits). See, for example, discussions of survey number changes in Mississippi, Louisiana, and Texas by Winstead, Baka, and Cobb, respectively, in Elliott-Smith *et al.* (2009). Fluctuations may also represent localized weather conditions (especially wind) during surveys, or unequal survey coverage. For example, airboats facilitated first-time surveys of several central Texas sites in 2006 (Cobb *in* Elliott-Smith *et al.* 2009). Changes in wintering numbers also may be influenced by growth or decline in the particular breeding populations that concentrate their wintering distribution in a given area.

The piping plover is rare in Oklahoma, Tennessee, and Arkansas. In Oklahoma, the majority of the records represent fewer than five birds, and these records are almost always located at or near a reservoir. Nesting plovers were recorded in the Oklahoma panhandle in 1988 and 1989, but there are no records prior to or since that date. Arkansas has had approximately one recorded plover per year since 2000, all in counties near the Mississippi River. A small number of piping plovers (<10) are regularly seen along the Mississippi River in Tennessee in late summer, with numbers recorded increasing slightly in recent years.

The International Piping Plover Breeding Census is conducted throughout the breeding grounds every 5 years by the Great Lakes/Northern Great Plains Recovery Team of the U.S. Geological Survey (USGS). The most consistent finding in the various population viability analyses conducted for piping plovers (Ryan *et al.* 1993, Melvin and Gibbs 1996, Plissner and Haig 2000, Wemmer *et al.* 2001, Larson *et al.* 2002, Amirault *et al.* 2005, Calvert *et al.* 2006, Brault 2007) indicates even small declines in adult and juvenile survival rates will cause increases in extinction risk (Ryan *et al.* 1993, Melvin and Gibbs 1996, Plissner and Haig 2000, Wemmer *et al.* 2001, Larson *et al.* 2002, Amirault *et al.* 2005, Calvert *et al.* 2006, Brault 2007). Several studies suggest maximizing productivity does not ensure population increases (Amirault *et al.* 2005, Cross 1996, Loegering 1992, Melvin and Gibbs 1996). However, other studies suggest that survivability is good at wintering sites (Drake *et al.* 2001). See the Piping Plover 5-Year Review: Summary and Evaluation for additional information on survival rates at wintering habitats. Efforts to partition survival within the annual cycle are beginning to receive more attention, but current information remains limited. Thus, survival during migration and on the wintering grounds remains an important concern for the stability of piping plover breeding populations. A detailed status of each breeding population can be found in the Service's 2009 species status review (Service 2009b); however, some information is provided here for clarity regarding overall population stability.

Great Plains

The 2006 International Piping Plover Breeding Census (IPPC), the last comprehensive survey published throughout the breeding grounds, documented 3,497 breeding pairs with a total of 8,065 birds throughout Canada and U.S (Elliott-Smith *et al.* 2009). Of those breeding ground totals, 1,212 pairs and 2,959 adults were reported from U.S. Northern Great Plains (Elliot-Smith *et al.* 2009). Prairie Canada reported 1,703 adult birds in 2006, well short of the Recovery Plan goal of 2,500 adult piping plover (Service 1988) but the highest count since the IPPC began in 1991 when 1,437 adult birds were counted. Preliminary results from the 2011 IPPC indicate that the Bahamas also are an important wintering area for piping plovers; however, those results have not yet been

finalized. The status of the Great Plains population is unknown, primarily due to the complexity of gathering complete population metrics and the variation in data collected. A model developed for the Great Plains population in 2008 suggests some population increases occurreed between 2001 and 2006 but concluded that population was unlikely to have grown to the extent indicated by the 2006 IPPC.

Great Lakes

The Recovery Plan set a population goal of at least 150 pairs (300 individuals), for at least 5 consecutive years, with at least 100 breeding pairs (200 individuals) in Michigan and 50 breeding pairs (100 individuals) distributed among sites within other Great Lakes states (Service 2003). In 2008, the current Great Lakes piping plover population was estimated at 63 breeding pairs (126 individuals). Of these, 53 pairs were found nesting in Michigan, while 10 were found outside the state, including six pairs in Wisconsin and four in Ontario, Canada. Although there are some fluctuations in the total population from 2002-2008, the overall increase from 51 to 63 pairs combined with the increased observance of non-breeding individuals indicates the population is increasing.

Atlantic Coast

The New England recovery unit population of piping plovers has consistently been within three pairs, or has exceeded its 625-pair abundance goal annually since 1998. This population attained a post-listing high of 711 pairs in 2008. The New York-New Jersey recovery unit reached 586 pairs in 2007, surpassing its 575-pair goal for the first time. However, in 2008 abundance dipped to 554 pairs. The Southern recovery unit, which attained 333 pairs in 2007 and 331 pairs in 2008, has not yet reached its 400-pair goal. The Eastern Canada recovery unit has experienced the lowest population growth (9% net increase between 1989 and 2008), despite higher overall productivity than in the U.S. The highest post-listing abundance estimate was 274 pairs in 2002, and the 2008 estimate was 253 pairs, placing this recovery unit furthest from its goal (400 pairs).

Reasons for Decline and Threats to Survival

Primary threats include the loss and degradation of summer and winter habitat, human disturbance of nesting and foraging birds, predation, unfavorable water management and the modification of riverine habitat through channelization and the construction of dams (Service 2009b). Most of the natural and manmade threats outlined in the recovery plan, including human disturbance and small population size, continue to threaten the piping plover's long term viability.

Predation remains one of the most significant threats to all piping plover populations, especially in breeding habitats. Predation has been identified as a major factor limiting piping plover reproductive success at many Atlantic Coast sites and substantial evidence shows that human activities are affecting types, numbers, and activity patterns of predators, thereby exacerbating natural predation (Service 1996).

Habitat loss and degradation on winter and migration grounds also is a primary threat, principally through shoreline and inlet stabilization efforts and residential and commercial development along private beaches. Additionally, human activities such as illegal off-road vehicle usage, unleashed pets, bike riding, bonfires, horseback riding, camping, and beach walking, have all been shown to disturb piping plover nesting habitat and behaviors (Cuthbert and Roche 2008). Loss of habitat

due to development pressure and disturbance also occurs to a limited degree on federal lands, which currently support approximately 55 percent of the breeding sites.

Two new threats, wind power and climate change, have recently emerged. As the pressure to produce energy from alternative sources increases, the potential for wind farm construction will also increase. Wind turbines can be detrimental to local and migrating populations of birds. Wind turbine generators pose a threat to piping plovers in the foreseeable future, but the magnitude of this threat cannot be assessed without better information about piping plover movements. Information needs include migration routes and altitude, flight patterns associated with breeding adults and post-fledged young of the year foraging at nearby sites that are not contiguous with nesting habitats, and avoidance rates under varying weather conditions. Overhead power lines have been documented to kill large numbers of birds, including records of a few plovers (Service 2004, M. Shriner in litt. 2007).

Analysis of the species habitat likely to be affected

The piping plover potentially will be affected directly by collision with transmission lines and support structures and by electrocution. Construction and maintenance of lattice steel and guyed support structures may result in some habitat loss. Critical habitat has not been designated for the piping plover in Oklahoma, Arkansas or Tennessee. Therefore, none will be affected.

ENVIRONMENTAL BASELINE

The environmental baseline, as defined in 50 CFR §402.02, focuses on the action area and includes past and present impacts of all Federal, state, or private actions in the action area; the anticipated impacts of all proposed Federal actions in the action area that have already undergone formal or early section 7 consultation; and the impact of state and private actions within the action area which are contemporaneous with the consultation in progress. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action.

Status of Species within the Action Area

American Burying Beetle

Oklahoma counties with confirmed ABB sightings since 1992 include Atoka, Bryan, Cherokee, Choctaw, Coal, Craig, Creek, Haskell, Hughes, Johnston, Latimer, LeFlore, Marshall, Mayes, McCurtain, McIntosh, Muskogee, Okfuskee, Okmulgee, Osage, Pittsburg, Pontotoc, Pushmataha, Rogers, Seminole, Sequoyah, Tulsa, Wagoner, and Washington (29 counties). Additional counties with ABB habitat and potential occurrence due to the proximity to the above counties include: Adair, Carter, Cleveland, Delaware, Garvin, Kay, Lincoln, Love, McClain, Murray, Nowata, Ottawa, Pawnee, Payne, and Pottawatomie. In Arkansas, the current ABB range includes portions of Crawford, Sebastian, Logan, Franklin, Clark and Scott counties. Yell and Johnston counties also have favorable habitat for the ABB. Most of the known ABB range in Arkansas lies south of the proposed transmission line. Of the known range in Arkansas, only Crawford, Franklin and Johnson counties are encompassed by the Action Area. In Oklahoma within the Action Area, the proposed Project would cross six counties (Payne, Lincoln, Creek, Okmulgee, Muskogee, and Sequoyah) within the current range of the ABB. The most current information for ABBs in

Oklahoma can be found at the Service website:
http://www.fws.gov/southwest/es/Oklahoma/ABB_Add_Info.htm.

The population size of the ABB within the Action Area is unknown. Although the ABB is relatively easy to capture, obtaining precise estimates of absolute or even relative densities is difficult because the trappable ABB population experiences a relatively rapid turnover rate due to a variety of factors (Service 2008a). Captures of ABB typically fluctuate on an annual or biennial basis, but in general ABB numbers appear stable or perhaps increasing within the Action Area.

The proposed route consists of a mosaic of suitable and unfavorable habitat for the ABB. The proposed Project would traverse 336.3 km (209 miles) of ABB range in Oklahoma and Arkansas. Only 14.5 km (9 miles) of the proposed route within the range of the ABB did not contain favorable habitat for the species. Estimates of suitable ABB habitat in the Action Area were provided in the BA and are based on a desktop analysis conducted by Smith (2014). Using a 366 meter (1,200 foot) wide corridor to account for minor changes to the proposed route and additional disturbance areas such as access roads and multi-use construction yards, an estimated 5,851 hectares (14,458.2 acres; 49.7 percent of 29,090 acres) of habitat was classified as suitable for the ABB. Therefore, ABB presence is assumed in nearly 50% of the 1,200-foot wide Project Study Area used by Smith (2014) in the ABB desktop analysis. However, the Service anticipates that additional suitable habitat likely exists within the portions of the proposed transmission line route which have yet to be surveyed.

Factors Affecting Species' Environment within the Action Area—American Burying Beetle

Adequately evaluating the effects of project implementation on the ABB requires that the Service considers not only the impacts from the proposed Project, but the context in which they would likely occur. This context includes ongoing effects to ABB from current activities as well as anticipated effects from projects likely to occur in the foreseeable future. The primary threats and causes of decline for the ABB, as previously discussed, continue to occur and apply within the Action Area. In addition, the following section 7 consultations and section 10 permits, and their cumulative impacts, are evaluated in assessing the status of the ABB within the Action Area.

Research and Recovery Permits

Currently over 100 entities or individuals in Oklahoma and Arkansas possess valid section 10(a)(1)(A) scientific research permits under which some authorized take of ABBs can occur. Most of these permits authorize surveys, which contribute to our understanding of ABB distribution, but do not have an associated research component. Any research conducted under these permits must further conservation efforts for the species. The loss of some individual ABBs over the short-term from research is allowed as the research, when applied to conservation efforts, should provide long-term benefits. The Service requires that every available precaution be implemented to reduce and/or eliminate authorized take associated with research activities.

Habitat Conservation Plans

A HCP and related 10(a)(1)(B) incidental take permit was issued in 1996 to Weyerhaeuser for ABBs on their lands in southeast Oklahoma. While not in the Clean Line Action Area, take of the ABB was authorized and forms part of the baseline. The Weyerhaeuser HCP is valid for 35 years (1996-2031) and identifies the following as foreseeable activities likely to be implemented by

Weyerhaeuser over that period: 11,331 hectares (28,000 acres; average of 800 acres per year) of forest will potentially be harvested; 16 ponds constructed; 10 or fewer food plots planted; Environmental Protection Agency-approved application of pesticides for control of pales weevil (*Hylobius pales*) damage to planted pine seedlings; ROW vegetation control; 3.2 km (2 miles) of road construction; 8 hectares (20 acres) of mineral, oil or gas exploration; and no more than 243 hectares (600 acres) of cattle grazing. Minimization and mitigation measures included: a research program to study the habitat affinities of the ABB; baseline surveys of the area for the ABB; incorporation of strategies developed from research in Weyerhaeuser's forest management strategy; minimization of pesticide use and utilization of pesticides approved by the EPA; and minimize the disturbance associated with logging activities. From 1997 to 2006, Weyerhaeuser lands were surveyed annually for the ABB, and habitat sampling was conducted to determine effects from timber management on ABBs. From 1997 to 2006, the following numbers of ABBs were captured: 106, 64, 26, 41, 16, 25, 85, 19, 0, and 0, respectively. The population is potentially extirpated from this area (Schnell *et al.* 2011), but survey effort has been limited since 2006.

The TransCanada Keystone Gulf Coast Pipeline (Keystone) Habitat Conservation Plan (HCP) was issued in 2012 for the Keystone XL pipeline project, including approximately 780.5 km (485 mi) of 0.9-meter (36-inch) diameter crude oil pipeline from Cushing, Oklahoma to near Nederland, Texas. The Keystone HCP is valid for 50 years and covers both construction and maintenance of the pipeline. Permanent and temporary impacts to ABB habitat and individuals were identified in Creek, Okfuskee, Seminole, Hughes, Coal, Atoka, and Bryan counties, Oklahoma. Anticipated effects include temporary impacts of to up to 176 hectares (435 acres) and permanent impact to 6.9 hectares (17 acres) of potential ABB habitat by construction, impact to approximately 13.4 hectares (33 acres) of potential ABB habitat by fragmentation due to the permanent alteration of existing cover type (from forest to grassland) in areas that are not already fragmented, and an additional 26.3 hectares (65 acres) of impacts to ABB habitat during operations and maintenance of the project (in addition to the 196 hectares of impacts described above). Keystone has contracted with two companies, Common Ground Capital, LLC and WLLL, LLC, to develop a Permittee Responsible Conservation Project Site. These two companies will manage the 865-acre "Keystone McAlester Conservation Area".

An Industry Conservation Plan (ICP) for Oil and Gas related industries was issued in 2014. The Oil and Gas Industry Conservation Plan (ICP) was prepared to support incidental take permits for the ABB)) resulting from activities associated with geophysical exploration (seismic), development, extraction, transport, and/or distribution of crude oil, natural gas, and/or other petroleum products and maintenance, operation, repair, and decommissioning of oil and gas pipelines and well field infrastructure (referred to as covered activities) in Oklahoma. The ICP is an HCP prepared by the Service for covered activities within the subject proposed Planning Area, in which federally listed or protected species are known, or are likely to occur. Individual oil and gas companies would apply for a section 10(a)(1)(B) permit, pursuant to the Act, for incidental take of the ABB associated with activities covered in the ICP and agree to comply with the terms and conditions of the ICP. In the ICP, the Service has defined incidental take in terms of the number of acres of occupied ABB habitat disturbed by covered activities. Oil and gas industry activities described in the ICP will be covered for a period of 2 years for construction activities and up to 20 years for operation and maintenance.

The ICP Planning Area consists of 45 counties in Oklahoma. They are as follows: Adair, Atoka, Bryan, Carter, Cherokee, Choctaw, Cleveland, Coal, Craig, Creek, Delaware, Garvin, Haskell,

Hughes, Johnston, Kay, Latimer, Le Flore, Lincoln, Love, Marshall, Mayes, McClain, McCurtain, McIntosh, Murray, Muskogee, Noble, Nowata, Okfuskee, Okmulgee, Osage, Ottawa, Pawnee, Payne, Pittsburg, Pontotoc, Pottawatomie, Pushmataha, Rogers, Seminole, Sequoyah, Tulsa, Wagoner, and Washington. The Planning Area covers approximately 9,250,370 hectares (22,858,163 acres) or 92,504 square km (35,716 square miles). A maximum of 13,234 hectares (32,234 acres) of occupied ABB habitat within the ICP Action Area, in the form of harm, harassment, and/or mortality will be authorized by the ICP.

Section 7(a)(2) Consultations

The Service consults on many proposed actions potentially impacting the ABB. Project types evaluated included pipelines, roads, quarries, communication towers, residential housing development, bridges, mining, petroleum exploration/extraction/production, commercial development, recreational development, transmission lines, and water and waste water treatment facilities. Impacts from these activities vary in size and duration, with projects such as quarries being hundreds of acres and having permanent impacts, to water treatment facilities of a few acres with both permanent and temporary impacts. Most of these consultations are informal and do not result in take of the ABB. However, there are several existing and multiple pending formal consultations that would include some level of incidental take of ABBs. Most take is related to temporary actions with soil disturbance.

There are several biological opinions with incidental take statements issued for the ABB in Oklahoma and Arkansas that are currently in effect:

• Department of Defense pertaining to Camp Gruber near Braggs, Oklahoma; 1993, in need of re-initiation; 35 ABBs/year;

• U.S. Forest Service regarding the Ouachita National Forest in southeast Oklahoma; September 22, 2005; 2,871 hectares (7,095 acres) of permanent habitat loss; 36,300 hectares (89,700 acres) of temporary habitat loss;

• U.S. Forest Service Nation-wide programmatic consultation regarding the continued aerial application of fire retardants on National Forest System (NFS) Lands; 2008; no specific estimates of take were provided but the ABB would be adversely affected by the application of fire retardant in the Ouachita National Forest in Oklahoma due to possibility of fire retardant coating the ABB and thereby, blocking the spiracles and prohibiting breathing; some take could occur if ABBs were indirectly affected by consumption of animals killed and contaminated with the fire retardant;

• Natural Resources Conservation Service for the Oklahoma Healthy Forests Reserve Program; issued September 14, 2010; 2,023 hectares (5,000 acres) of habitat;

• Bureau of Land Management for Wild Horse and Burro Program; April 1, 2010; 80,937 hectares (200,000 acres) of habitat;

• Rural Utility Service (RUS) for a KAMO Power transmission project; June 9, 2011; 11 hectares (28 acres) of habitat;

• RUS for Broadband Initiative Program; July 7, 2011; 607 hectares (1,500 acres);

• U.S. Army Corps of Engineers regarding operation of multiple reservoir and navigation projects in Kansas, Oklahoma, and Texas; April 2013, 43,297 hectares (106,990 acres) of habitat, 445 hectares (1,100 acres) potentially permanent and 42,852 hectares (105, 890 acres) of temporary or periodic (flood pool acres) habitat loss;

• U.S. Army Corps of Engineers and Bureau of Indian Affairs for the construction stage on the Flanagan South Pipeline Project; July 24, 2013; a nearly 966-km (600-mile), 0.9-meter (36-inch) diameter interstate crude oil pipeline that would originate in Pontiac, Illinois, and terminate in Cushing, Oklahoma; 83.2 hectares (205.5 acres) of ABB habitat – 46.7 hectares (115.5 acres) during construction, and 36.4 hectares (90 acres) during operation and maintenance activities;

• Muddy Boggy Conservation Bank regarding establishment, management and operation of a Conservation Bank for ABB, September 25, 2013, up to 478 hectares (1,180 acres) of temporary impacts that will result in overall beneficial effects;

• ABB Conservation Bank regarding establishment, management and operation of a Conservation Bank for ABB, March 17, 2014, up to 117 hectares (289.6 acres) annually during management that will result in overall beneficial effects;

• Southwestern Power Administration programmatic consultation for powerline maintenance, 2008, 1,965 hectares (4,855 acres) currently in the process of reinitiation;

• Oil and Gas Industry Conservation Plan Biological Opinion; issued May 21, 2014; no more than 13,044 hectares (32,234 acres) of ABB habitat impacted over a two year period, for which mitigation will be implemented;

• Federal Highway Administration for Oklahoma Department of Transportation activities; March 26, 2015; 2,337 hectares (5,777 acres) of habitat; and,

• Bureau of Land Management for Oil and Natural Gas Development in Western Arkansas; October 22, 2015; up to 40 hectares (100 acres) annually for 10 years (2016-2026).

Other ABB Conservation Efforts Ongoing Within the Action Area

Two ABB Conservation Banks (currently about 3,600 acres) have been approved in Oklahoma to help provide mitigation opportunities for section 10 or 7 related impacts and more are anticipated.

Gray Bat

Within the Action Area in Oklahoma, the gray bat is known or suspected from Muskogee and Sequoyah counties and adjacent counties do support known maternity colonies. However, there are no known or suspected hibernacula or maternity sites in Muskogee or Sequoyah counties. Gray bat summer colonies typically use caves located within a home range area along a stream, river, or reservoir. In Oklahoma, sizeable maternity colonies currently are known to utilize eleven caves during the spring and summer. Most of these caves are located near Grand, Tenkiller, and Ft. Gibson reservoirs and are located adjacent to, but outside of, the Action Area to the north. The gray bat population in Oklahoma currently is estimated to consist of about 140,000 bats.

In Arkansas, the Action Area encompasses eight counties where the gray bat is known or suspected to occur: Crawford, Franklin, Johnson, Pope, Van Buren, Cleburne, White and Jackson counties. The majority of gray bats in Arkansas hibernate in four caves: Bonanza Cave and a small nearby cave and Blanchard Springs Caverns, all managed by the U.S. Forest Service and Cave Mountain Cave managed by the National Park Service (Harvey 1994b). The remainder of the hibernating gray bats in Arkansas consists of small hibernating colonies of a few hundred individuals or less in a few additional caves. During the summer, about 150,000 gray bats occupy 40 caves scattered throughout the Arkansas Ozarks (Harvey 1984). Ten larger maternity colonies are known in Arkansas, nine of which are on private lands. According to the Gray Bat Recovery Plan, there are no priority 1 or 2 gray bat caves within the counties encompassed by the Action Area in Arkansas. However, as provided in the BA, there are two gray bat caves, Lands End Cave in Pope County and Shirley Bat Cave in Van Buren County, known from counties within the Action Area. These two caves are primarily used by bachelor colonies during the summer.

Factors Affecting Species' Environment within the Action Area—Gray Bat

The Action Area in east-central Oklahoma represents the western edge of the gray bat's range. No hibernating colonies are known from Oklahoma with most gray bats that summer in Oklahoma migrating to northern Arkansas and southern Missouri for the winter.

The Ozark Plateau National Wildlife Refuge (NWR) (previously known as the Oklahoma Bat Caves NWR) currently provides protection for three important gray bat maternity caves and surrounding foraging habitat. The Service approved expansion of the Ozark Plateau NWR in 2005. The refuge was approved to expand up to an additional 4,856 hectares (12,000 acres; 15,000 total acres) within Adair, Delaware, Ottawa, Sequoyah, Craig, Mayes, and Cherokee counties in Oklahoma. Protection of additional caves and foraging habitat is possible as the refuge expands. However, because most surface foraging habitat occurs on private land, and the protection of all properties necessary through fee title acquisition and/or conservation easements would not be possible due to the large area used by gray bats (up to 20 km from a cave), working with private landowners within the Action Area will continue to be an important recovery tool.

Sasse *et al.* (2007) analyzed data from 48 gray bat maternity sites in the western portion of the species' range involving three subpopulations in Missouri, Arkansas, and Oklahoma between 1978 and 2002. The analysis indicated that 79 percent of the colonies in the western portion of the range were stable or increasing, while 86 percent of the Oklahoma colonies were stable or increasing. Based on review of more recent data (1978-2007), there appears to be no change in the trends identified by Sasse *et al.* (2007) for the Oklahoma gray bat colonies.

In 2012, the Service confirmed the presence of WNS in gray bats from Tennessee. Scientists are concerned that additional gray bat populations may be infected and that significant impacts could occur during future hibernation seasons. A large percentage of the gray gat population hibernates in a limited number of caves and disease transmission could occur rapidly throughout the species.

Clean Line, in their BA, estimated the extent of perennial streams and other waterbodies and wetlands within a 4.0 km (2.5 mile) buffer of the proposed transmission line. Information was provided for the counties within the Action Area where gray bats are known or suspected to occur. This information was provided as a measure of potential foraging habitat for the gray bat. There are about 1,232.5 km (765.9 miles) of perennial streams, 4,731.4 hectares (11,691.6 acres) of perennial waterbodies and 5,685.4 hectares (14,048.9 acres) of wetlands larger than 0.4 hectares (1

acre). Additionally Clean Line surveyed 41 percent of the proposed route (anticipate line placement plus a 300 foot wide corridor) for caves, sinkholes and other subterranean features that could be used by bats. The survey found 30 features of which 7 could provide suitable conditions to support hibernating gray bats or maternity colonies and six could provide temporary roosting habitat.

In addition, the following section 7 consultations and section 10 permits, and their cumulative impacts, are evaluated in assessing the status of the gray bat within the Action Area.

Research and Recovery Permits

Currently ten entities or individuals possess valid section 10(a)(1)(A) scientific research permits under which some authorized take of gray bats can occur in Oklahoma (four permits) or Arkansas (six permits). Most of these permits authorize surveys which typically do not result in mortality of the organism. Occasionally research is associated with these permits but the research must further conservation efforts for the species. The Service requires that every available precaution be implemented to reduce and/or eliminate authorized take associated with any research activities.

Section 7(a)(2) Consultations

The Service consults on relatively few proposed actions potentially impacting the gray bat in Oklahoma or Arkansas. However, there are two existing and no pending formal consultations in effect that include some level of incidental take of gray bats. One of the existing consultations addresses the implementation of the Healthy Forests Reserve Program (HFRP) by the Natural Resources Conservation Service in five northeastern Oklahoma counties. The HFRP is a voluntary program administered by the U.S. Department of Agriculture in coordination with the Secretaries of Interior and Commerce. The purpose of this program is to assist landowners in restoring and enhancing forest ecosystems for the purposes of promoting the recovery of threatened and endangered species, improving biodiversity and enhancing carbon sequestration. Under this consultation, the Service could not estimate the precise number of gray bats that would be taken due to demographic and environmental stochasticity and uncertainty inherent in predicting a specific increase in population above the baseline as the result of voluntary management efforts to benefit the targeted species. However, the only habitat that may be lost due to incidental take is habitat that has been enhanced or restored above baseline conditions and, as such, does not currently exist, or is unoccupied by the species at the time a landowner enrolls in the program.

The second consultation, dated March 26, 1992, concerns the relicensing of the Pensacola Hydropower Project by the Federal Energy Regulatory Commission. Operation of the Pensacola Reservoir (Grand Lake), under certain power and flood pool conditions, impacts gray bats know to use Beaver Dam Cave along Drowning Creek in Delaware County, Oklahoma. This maternity colony consists of approximately 13,000 gray bats. Over the 30-year life of project operation, flooding of the cave is expected to occur three to five times, resulting in the complete loss of the maternity population each time the cave is flooded. Overall, the project is expected to result in the take of 39,000 to 65,000 gray bats.

We are not aware of any existing HCPs or conservation banks for the gray bat in the Action Area.

Indiana Bat

Within the Action Area in Oklahoma, the Indiana bat is known or suspected from Sequoyah County, primarily as potential foraging range during migration when Indiana bats will forage in mature riparian and upland forest. There is one known Indiana Bat hibernaculum in Oklahoma (Saugey *et al.* 1989, Saugey *et al.* 1990) but no summer roost records exist. This hibernaculum occurs in southern LeFlore County and is at least 65 km (40 miles) south of the Action Area. However males may forage in appropriate habitats a short distance from the hibernacula during the summer. The number of Indiana bats observed in this hibernaculum typically number less than 15 individuals (Martin *et al.* 2000). Very few caves have the suitable temperature and moisture attributes and appropriate lack of human disturbance needed by wintering Indiana bats.

In Arkansas, Indiana bats are found primarily in the Ozark Mountains region. The Action Area encompasses seven counties where the Indiana bat is known or suspected to occur: Crawford, Franklin, Johnson, Pope, Van Buren, Cleburne, and Jackson counties. Harvey and McDaniel (1986) estimated that the Indiana bat population in Arkansas numbered about 2,630 individuals. Current population size is estimated at 1,389 individuals (Service 2015b). Harvey and McDaniel (1986) reported only six known hibernacula in Arkansas that supported 30 or more Indiana bats. One of these cave sites (Edgemon Cave) is located on the Buffalo National River and three more are located on the Ozark National Forest. These four hibernacula are located in northwestern Arkansas and are adjacent to, but outside of, the Action Area. There are two caves in Franklin County that have been known to be inhabited by hibernating Indiana bats. Additionally, Brandebura *et al.* (2011) reported on the occurrence of a single maternity roost site in Clay County, Arkansas. This site also is located in northern Arkansas and is outside of the Action Area.

In Tennessee, Indiana bats may be found in Shelby and possibly Tipton counties but they occur primarily in the central and eastern portions of the state. The Tennessee population is estimated at less than 400,000 individuals, with the majority (85 percent) hibernating in only seven caves in the state.

Factors Affecting Species' Environment within the Action Area—Indiana Bat

Like other bats, the Indiana bat is impacted by habitat destruction and degradation and disturbance at hibernacula and roosting sites. Additionally, WNS likely contributes to mortality and reduced fitness in Indiana bat populations in Arkansas and Tennessee.

Clean Line, in their BA, estimated the extent of perennial streams and other waterbodies within a 4.0 km (2.5 mile) buffer of the proposed transmission line. Information was provided for the counties within the Action Area where Indiana bats are known or suspected to occur. This information was provided as a measure of potential foraging habitat for the Indiana bat within the Action Area. Clean Line also estimated the amount of deciduous, coniferous and mixed forest within this same area, again as a measure of potential foraging habitat. There are about 672.9 km (417.9 miles) of perennial streams and 2,691.1 hectares (6,650.0 acres) of perennial waterbodies. Extent of forested area was determined to be 62,973.1 hectares (155,609.7 acres) of deciduous forest, 32,729.5 hectares (80,876.4 acres) of coniferous forest and 12,145.8 hectares (30,012.8 acres) of mixed forest within the above defined Action Area buffer.

Additionally Clean Line surveyed 35.5 percent of the proposed route (anticipated line placement plus a 300 foot wide corridor) for caves, sinkholes and other subterranean features that could be used by bats. The survey identified 22 features of which 6, all located in Arkansas, could provide temporary roosting habitat. However none of these features provided suitable habitat to support hibernacula. During this field effort, Clean Line also assessed the availability of summer roosts within the corridor study area. They found 409 trees that could provide potential roosts, the majority being in Oklahoma and Arkansas. Only 6 potential roost trees were located in Tennessee. However, according to information in the BA, the surveys only counted potential roost trees that were 20.3 centimeters (8 inches) in diameter at breast height (dbh) or larger. Suitable roosting habitat for the Indiana bat is defined as trees of 12.7 centimeters (5 in) dbh or larger, although they will roost in trees having less than less than 12.7 cm (5 in) dbh (Service 2015a). Consequently additional suitable roost trees may exist within the ROW beyond the number of trees indicated within the BA.

Additionally, the Service evaluated the following section 10 permits and section 7 consultations, and their cumulative impacts, in assessing the status of the Indiana bat within the Action Area.

Research and Recovery Permits

Currently ten entities or individuals possess valid section 10(a)(1)(A) scientific research permits under which some authorized take of Indiana bats can occur in Oklahoma (three permits) or Arkansas (seven permits). Most of these permits authorize surveys which typically do not result in mortality of the organism. Occasionally research is associated with these permits but the research must further conservation efforts for the species. The Service requires that every available precaution be implemented to reduce and/or eliminate authorized take associated with any research activities.

Section 7(a)(2) Consultations

The Service conducted a National consultation regarding certain transportation (highway and railroad) projects with the Federal Highway Administration and Federal Railroad Administration. This consultation was not expected to adversely affect the NLEB or the Indiana bat and no incidental take was anticipated.

In 2013, the Service concluded a formal consultation on the Flanagan South Pipeline. This pipeline was a new 0.9-meter (36-inch) diameter pipeline that traversed approximately 954 km (593 miles) through portions of Illinois, Missouri, Kansas and Oklahoma. When operational, the pipeline will transport crude oil from the Western Canadian Sedimentary Basin and the Williston Basin in North Dakota to refineries in the Midwest and the U.S. Gulf Coast. In our BO, the Service concluded that the pipeline will likely modify 621 acres of Indiana bat habitat and potentially kill 19 non-reproductive or migratory individuals that may be roosting in felled trees during the active Indiana bat season. The loss of two active (*i.e.*, occupied in the summer) maternity roost trees and/or their 100-ft buffer during the inactive season is anticipated. This will result in harm and harassment of no more than 120 reproductive female Indiana bats. However, impacts to maternity colonies are expected. The Service estimated that these 120 females that may be harmed and harassed will return to hibernacula in the fall, and the potential loss of 19 individuals is not likely to impact the hibernating populations. Because maternity colony and hibernaculum impacts are not anticipated, the Project was not expected to result in a loss of fitness at the population level or recovery unit level. In addition, Enbridge (parent company of Flanagan

South Pipeline), committed to mitigating the loss of all occupied and presumed occupied Indiana bat habitat. For these reasons, the anticipated effects from this pipeline will not affect the likelihood of achieving the recovery needs of the species, and therefore, is not likely to appreciably reduce the survival and recovery of the Indiana bat. The vast majority of this take was not anticipated to occur in Oklahoma.

In 2008, the Service concluded a nationwide programmatic formal consultation with the U.S. Forest Service on the continued aerial application of fire retardants on National Forest System (NFS) Lands. Fire retardants are typically used under emergency conditions (*i.e.*, fire), a situation commonly addressed under emergency consultation procedures, which then provide for a site-specific consultation on actual application. The consultation did not address the application of fire retardant foams or other methods of application of any fire retardant chemicals. The Service determined that the action was not likely to jeopardize the continued existence of the gray bat, Indiana bat or Ozark big-eared bat. Because this was a programmatic consultation, no specific estimates of take were provided.

We are not aware of any existing HCPs or conservation banks for the Indiana bat in the Action Area.

Northern Long-eared Bat

Assessing the number of NLEB within the Action Area is difficult for two main reasons: (1) the location of every occupied hibernacula is unknown and the number of NLEB utilizing the known hibernacula have not been adequately determined; and (2) the location of occupied maternity roost trees are largely unknown. However, suitable habitat for the NLEB occurs in or near sections of the proposed Action Area in eastern Oklahoma and in Arkansas. Within the Action Area the NLEB is known or suspected from Muskogee, Okmulgee and Sequoyah counties in Oklahoma. In Arkansas the NLEB is known or suspected from Crawford, Franklin, Johnson, Pope, Conway, Van Buren, Cleburne, White, Jackson, Poinsett, Cross and Mississippi counties. In Tennessee, the NLEB is known or suspected from Shelby and Tipton counties.

The NLEB is known to occur in seven counties along the eastern edge of Oklahoma, based on counts at caves and from mist netting observations (Stevenson 1986). The species is known from nine hibernacula, including Sequoyah County, where typically they are observed in low numbers (*e.g.,* 1 to 20 individuals). As discussed in the final listing rule, a larger colony uses a cave on the Ouachita National Forest in southern Leflore County during the fall (9 to 463 individuals) and winter (9 to 96 individuals). Northern long-eared bats have been recorded from 21 caves (7 of which occur on the Ozark Plateau National Wildlife Refuge) during the summer. The species has regularly been captured in summer mist-net surveys at cave entrances in Adair, Cherokee, Sequoyah, Delaware, and LeFlore Counties, and are often one of the most common bats captured during mist-net surveys at cave entrances in the Ozarks of northeastern Oklahoma (Clark and Clark 1997). Small numbers of NLEB (typical range of 1 to 17 individuals) also have been captured during mist-net surveys along creeks and riparian zones in eastern Oklahoma (Clark and Clark 1997). The fungus that causes WNS was detected in Oklahoma in 2015. Considering the maximum known movements of NLEB during migration (55 miles), at least 16 additional counties in Oklahoma may be occupied by the NLEB.

In Arkansas, NLEBs are known from 41 hibernacula, although there are typically few individuals (*e.g.,* fewer than 10 individuals) observed (see final listing rule). Saugey *et al.* (1993) reported the

NLEB to be rather common during fall swarming at abandoned mines in the Ouachita Mountains. Additionally, Heath *et al.* (1986) found 57 pregnant females roosting in a mine in Polk County during the spring of 1985. Summer surveys in the Ouachita Mountains of central Arkansas from 2000–2005 tracked 17 males and 23 females to 43 and 49 day roosts, respectively (Perry and Thill 2007). In 2013 summer surveys in the Ozark-St. Francis National Forest, the NLEB was the most common species captured (Service unpublished data provided in final listing rule). The fungus that causes WNS was first detected in Arkansas in the winter of 2011–2012. However, WNS was not confirmed until 2014 and has since been documented at additional sites. Mortality of NLEBs from WNS was observed in the State's largest hibernacula in 2015; 2015 surveys found 120 northern long-eared bats in that hibernacula, where counts in recent years often numbered 200 to 300 (see final listing rule).

Factors Affecting Species' Environment within the Action Area—Northern Long-eared Bat

Clean Line, in their BA, estimated the extent of perennial streams within a 8.0 km (5.0 mile) buffer of the proposed transmission line within those counties within the Action Area where NLEB are known or suspected to occur. This information was provided as a measure of potential summer and winter habitat that may be used, primarily for foraging, by the NLEB within the Action Area. Clean Line also estimated the amount of deciduous, coniferous and mixed forest within this same area, again as a measure of potential foraging habitat. There are about 2,836.6 km (1,762.6 miles) of perennial streams within this buffer area. Extent of forested area was determined to be 223,282.2 hectares (551,741.6 acres) of deciduous forest, 88,466.4 hectares (208,720.8 acres) of coniferous forest and 35,198.0 hectares (86,976.1 acres) of mixed forest within the above defined Action Area buffer.

Additionally Clean Line surveyed about 39.0 percent of the proposed route (anticipated line placement plus a 300 foot wide corridor) for caves, sinkholes and other subterranean features that could be used by bats. The survey identified 30 features of which 7 could potentially provide winter habitat, all in White County, Arkansas and 6 that could provide temporary roosting habitat, all located in Arkansas (Crawford, Franklin and Cleburne counties). During this field effort, Clean Line also assessed the availability of potential summer roosts within the corridor study area. They found 607 trees that could provide potential roosts, the majority being in Oklahoma and Arkansas. Only 6 potential roost trees were located in Tennessee. However, according to information in the BA, the surveys only counted potential roost trees that were 20.3 centimeters (8 inches) in diameter at breast height (dbh) or larger. Suitable roosting habitat for the NLEB is defined as trees of 7.6 centimeters (3 in) dbh or larger (Service 2015a). Consequently additional suitable roost trees may exist within the ROW beyond the number of trees reported within the BA.

The Service also considered the following section 10 permits and section 7 consultations, along with their cumulative impacts, in assessing the status of the NLEB within the Action Area.

Research and Recovery Permits

Currently two entities or individuals possess valid section 10(a)(1)(A) scientific research permits under which some authorized take of NLEB can occur in Oklahoma (one permit) or Arkansas (one permit). These permits authorize surveys which typically do not result in mortality of the organism. Occasionally research is associated with these permits but the research must further conservation efforts for the species. The Service requires that every available precaution be implemented to reduce and/or eliminate authorized take associated with any research activities.

Section 7(a)(2) Consultations

The Service consults on a few proposed actions potentially impacting the NLEB in Oklahoma and Arkansas. Project types evaluated included pipelines, roads, railroads, mines, and military activities. Most of these consultations are informal and do not result in take of the NLEB. The Service has conducted a National programmatic consultation regarding certain transportation (highway and railroad) projects with the Federal Highway Administration and Federal Railroad Administration. This consultation was not expected to adversely affect the NLEB or the Indiana bat and no incidental take is anticipated. The Service also conducted a National programmatic consultation regarding specific Military operations and activities on Army National Guard installations. This consultation also was not expected to adversely affect the NLEB and no incidental take was anticipated.

There are at least two National formal programmatic consultations that would include some level of incidental take of NLEB. These include continued implementation of U.S. Forest Service (USFS) Land and Resource Management Plans and certain surface coal mining and reclamation activities approved through the U.S. Office of Surface Mining (OSM). The USFS BO was a non-jeopardy opinion with estimated take of 25,735 volant adult and juvenile NLEB in the form of harassment, all within roosting areas and mostly resulting from prescribed burning. Additionally, the USFS action was expected to harm up to 5,666 non-volant NLEB pups, all within maternity roosting areas, and mostly resulting from prescribed burning. The OSM consultation was a non-jeopardy opinion. However the BO determined that the amount of take for all affected species was unquantifiable.

The Service expects to reinitiate consultation in the near future with the Natural Resources Conservation Service on implementation of the Healthy Forests Reserve Program (HFRP) in Oklahoma to address the NLEB.

The Service recently consulted formally on the Shady Point Mine, Leflore County Oklahoma under the OSM National programmatic consultation. No take of NLEB was anticipated.

Ozark Big-eared Bat

The range of the Ozark big-eared bat is limited and includes only nine counties in Oklahoma and Arkansas. The Action Area in Oklahoma only includes one of these counties, Sequoyah County, where one known maternity site persists. Within the project area in Arkansas, the Ozark big-eared bat is known or suspected to occur in Crawford, Franklin, Johnson and Pope counties. Crawford and Franklin counties within the Action Area contain the only confirmed records of the Ozark big-eared bat from Arkansas. The most significant Ozark big-eared bat habitat in Arkansas lies outside of the Action Area. However, in 2015, as reported in the BA, the Arkansas Game and Fish Commission located a hibernaculum near the proposed Project footprint. Currently the entire Ozark big-eared bat population is estimated to consist of about 1,800 individual bats with about 400 in Arkansas and 1,400 in Oklahoma.

The Ozark Plateau NWR was established April 1, 1986, in Oklahoma to provide long term habitat protection to help assure the continuing existence, and aid in recovery of the Ozark big-eared bat and other listed and at-risk cave species. The refuge currently consists of nine units, totaling 1,699

hectares (4,200 acres) in Adair, Cherokee, Delaware, and Ottawa counties, but no units exist within the Action Area.

Other limited-use caves also occur within the Action Area including sites on the Ozark Plateau NWR, other public lands, and private property. Data on all known limited-use sites including the protective status (e.g., gated, cooperative agreement, etc.) and location has not been compiled to date. Sites on public land are protected by management and cave gates. Several private sites are protected by gates and landowner agreements, but many private land sites are not yet afforded protection.

Factors Affecting Species' Environment within the Action Area—Ozark Big-eared Bat

The occurrence of WNS and the fungal agent known to cause the disease have been confirmed within the range of the Ozark big-eared bat. The potential impact of WNS on Ozark big-eared bats is unknown although the disease may not be as significant a threat as initially thought.

Although seventy-five percent of the known essential caves in Oklahoma currently are protected by conservation measures such as cave gates, fee title acquisition, and conservation easements, adequate protection measures are still needed at three essential sites and numerous limited-use caves that occur on private property. The bat colonies and solitary individuals that use these caves therefore are still at high risk of human disturbance. Bats that roost in non-gated caves that occur on protected tracts also are at risk of disturbance because the properties/caves cannot be monitored at all times. Even bats that roost in caves where cave gates have been constructed also continue to be at risk of human disturbance because cave gates annually are vandalized.

Clean Line, in their BA, estimated the amount of deciduous, coniferous and mixed forest within a 7.2 km (4.5 mile) buffer/corridor along the proposed transmission line route within the counties believed to be occupied by the Ozark big-eared bat. These values are intended to serve as a measure of potential Ozark big-eared bat foraging habitat. Extent of forested area was determined to be 88,652.6 hectares (219,065.4 acres) of deciduous forest, 50,467.5 hectares (124,708.0 acres) of coniferous forest and 13,629.9 hectares (33,680.4 acres) of mixed forest within the above defined Action Area buffer.

Additionally, Clean Line surveyed 41 percent of the proposed route (anticipate line placement plus a 300 foot wide corridor) for caves, sinkholes and other subterranean features that could be used by bats within the range of the Ozark big-eared bat. The survey identified 21 features of which five, all located in Arkansas, could potentially provide temporary roosting habitat. However none of these features provided suitable habitat to support hibernacula or maternity colonies.

In conducting our assessment of the status of the Ozark big-eared bat within the Action Area, the following section 10 permits and 7 consultations, along with their cumulative impacts, were evaluated by the Service.

Research and Recovery Permits

Currently nine entities or individuals possess valid section 10(a)(1)(A) scientific research permits under which some authorized take of Ozark big-eared bat can occur in Oklahoma (four permits) or Arkansas (five permits). These permits authorize surveys which typically do not result in mortality of the organism. Occasionally research is associated with these permits but the research

must further conservation efforts for the species. The Service requires that every available precaution be implemented to reduce and/or eliminate authorized take associated with any research activities. We are not aware of any Ozark big-eared bat mortalities associated with these permits.

Section 7(a)(2) Consultations

The Service consults on relatively few proposed actions potentially impacting the Ozark big-eared bat. However, there is one existing and no pending formal consultations in effect that would include some level of incidental take of Ozark big-eared bats. The existing consultation addresses the implementation of the Healthy Forests Reserve Program (HFRP) by the Natural Resources Conservation Service in five northeastern Oklahoma counties. The HFRP is a voluntary program administered by the U.S. Department of Agriculture (USDA) in coordination with the Secretaries of Interior and Commerce. The purpose of this program is to assist landowners in restoring and enhancing forest ecosystems to for the purposes of promoting the recovery of threatened and endangered species, improving biodiversity and enhancing carbon sequestration. Under this consultation, the Service could not estimate the precise number of Ozark big-eared bats that would be taken due to demographic and environmental stochasticity and uncertainty inherent in predicting a specific increase in population above the baseline as the result of voluntary management efforts to benefit the targeted species. However, the only habitat that may be lost due to incidental take is habitat that has been enhanced or restored above baseline conditions and, as such, does not currently exist, or is unoccupied by the species at the time a landowner enrolls in the program.

As previously discussed, the Service concluded a Nationwide programmatic formal consultation with the U.S. Forest Service on the continued aerial application of fire retardants on National Forest System (NFS) Lands in 2008. The Service determined that the action was not likely to jeopardize the continued existence of the gray bat, Indiana bat or Ozark big-eared bat. Because this was a programmatic consultation, no specific estimates of take were provided.

Conservation Needs of Listed Bats Within the Action Area

Conservation needs of the listed bats included in this BO are provided in the appropriate recovery plan, provided one has been prepared and will not be provided in detail within this document. In general, conservation needs define requirements in terms of reproduction, numbers, and distribution to ensure the affected species are no longer in danger of extinction.

For all listed bats, with the possible exception of the Ozark big-eared bat, the primary conservation need is to avoid or minimize impacts to habitats used by the species, both as hibernacula and maternity sites and to reduce the threat of WNS. This includes minimizing mortality in WNS-affected areas, and slowing the rate of spread into currently unaffected areas. By reducing the extent of habitat loss and degradation, listed bats are more likely to survive and reproduce in the face of WNS. Such efforts to reduce ongoing threats will help to stabilize and ultimately increase existing populations. Specific efforts would include protection of known hibernacula from disturbance and conserving maternity sites, particularly those trees known to support maternity colonies of Indiana bats and NLEB. Swarming and staging habitats around known occupied caves should be protected or restored where degraded. Known maternity habitat should be maintained, and the removal of known roost trees, particularly when pregnant females and/or young are present should be reduced.

Removal of living trees or snags which have the potential to serve as roosts for maternity colonies or individual bats, reduction of density of mature trees, and reduction of overstory canopy could result in the loss or alteration of the summer (roosting and foraging) and pre-hibernation (fall foraging) habitat.

Climate change may indirectly affect bats, particularly considering their specific microclimate requirements during hibernation, through increasing surface temperatures caused by changing climates. Additionally changes in food availability and the timing of hibernation and reproductive cycles may be altered by climate change.

Interior Least Tern

Within the Action Area, interior least terns (ILT) are known to feed and nest on the Cimarron, Arkansas, and Mississippi rivers. The proposed transmission line would cross the Cimarron River at two locations in Oklahoma, one in Major County and the other in Payne County. Interior least terns may occur at both of these crossing locations. Nesting observations are not well known from sites near the proposed Cimarron River crossings but potentially may occur, particularly in Major County. Within the Arkansas River, the crossing would occur within an area that is part of the McClellan-Kerr Arkansas River Navigation System (MKARNS). The MKARNS is a 716 km (445 mi) inland waterway system consisting of 18 locks and dams beginning near at the Port of Catoosa near Tulsa, Oklahoma and running southeast through Oklahoma and Arkansas to the confluence of the Mississippi in southeastern Arkansas. Flows throughout the MKARNS are strongly affected by dam releases. The proposed transmission line crosses the Arkansas River at approximately navigation mile 366 south of Muskogee, Oklahoma and immediately downstream of the Webbers Falls Lock and Dam and associated hydroelectric power plant. The water releases involved in the generation of hydropower may be highly variable hourly, daily, or seasonally. This variation in water releases result in highly variable sandbar exposure in the course of a day (Lott *et al.* 2013). The timing of hydropower releases in relation to the life history and interior least tern breeding cycle may also affect flooding mortality risk (Lott *et al.* 2013). Impoundments have reduced or eliminated the habitat forming floods that have occurred on many rivers in the pre-dam era (Service 2005) and the project area immediately downstream of Webbers Falls is unlikely to contain suitable nesting habitat for interior least tern. However, interior least terns do nest on Kerr Island, about 11 km (7 miles) upstream of the proposed Arkansas River crossing location.

Current regulation of Arkansas River dam discharges pose additional problems for interior least terns nesting in remaining habitats (Nebraska Game and Parks Commission 1985, Schwalbach *et al.* 1988). Before regulation of river flows, summer flow patterns were more predictable. Peak flow occurred in spring from local runoff and flows then declined during the rest of the summer allowing least terns to nest as water levels dropped and sandbars became available (Stiles 1939, Hardy 1957). Currently, the main stem system is regulated for hydropower, navigation, water quality and supply, flood evacuation, irrigation, fish and wildlife conservation, and public recreation. However, system releases are designed to provide equitable service to power and navigation demands, except when they conflict with flood control functions of the system (Service 1990). The demands are unpredictable and flows can fluctuate greatly. Flow regimes differ greatly from historic regimes. High flow periods may now extend into the normal nesting period, thereby reducing the quality of existing nest sites and forcing least terns to initiate nests in poor quality locations. Extreme

fluctuations can flood existing nests, inundate potential nesting areas, or dewater feeding areas.

The Arkansas River is considered one of the 17 major river segments with nesting populations of interior least terns and was estimated in 2005 to contain approximately 319 adult terns as 1.8 percent of the total interior least tern population or 4.8 percent of the total interior least tern population excluding the Lower Mississippi River (Service 2005). The population of interior least tern from Tulsa to Muskogee (94 km) was found to be 125-166 breeding pairs in 1992 and 212-299 breeding pairs in 1993. The estimates (averages) of existing numbers of adult and fledgling terns by river reach for 2006-2011 are: Arkansas River, Oklahoma, Kaw Reservoir to Oklahoma/Arkansas state line (excluding created islands in the navigation system), including the lower Canadian River below Eufaula Reservoir –415 adults and 163 fledglings annually (Service 2013c). The proposed transmission line also crosses the Cimarron River near Ripley, OK. The Cimarron River is known to have breeding and feeding interior least tern populations as well (see Table 2). These populations will be considered as part of the Arkansas River population.

Interior least terns have been noted annually on surveys approximately 1.6 km (1 mile) south of the proposed Mississippi River crossing on the large sand bars near Deans Island between 1985 and 2012 (the most recent survey results available). The sandbars in this section of river are relatively stable. Two to four colonies are noted within three miles of the proposed project river crossing with minor annual variation in location and colony size. The five year average for interior least terns in a three mile radius around the proposed river crossing was 113 adults (Jones 2008, 2009, 2010, 2011, 2012). The population in the three mile radius varied between a low of 103 and a high of 549 during this time period. During the same time period (2008-2012), the total interior least tern count averaged 1960 with an average of 11 colonies between Osceola, Arkansas and Helena, Arkansas. In 2012, the annual population monitoring survey from Cape Girardeau, Missouri to Baton Rouge, Louisiana, counted 1,187 predominantly adult interior least terns in 13 colonies in the 120 river miles between Osceola, Arkansas and Helena, Arkansas (Jones 2012). Most recently, the two colonies in closest proximity to the proposed crossing were recorded at river km 1,223.1 (river mile 760) and river km 1,215.0 (river mile 755) with interior least tern counts of 42 and 61, respectively (Jones 2012). Colonies are consistently noted between river km 1,227.9 (river mile 763) and river km 1,213.4 (river mile 754) during surveys.

Factors Affecting Species' Environment within the Action Area – Interior Least Tern

Habitat loss and alteration, caused by factors such as channelization, flow regulation and construction of flood control impoundments, have eliminated or altered much of the nesting habitat preferred by least terns. Suitable least tern nesting habitat is anticipated to continue to decline in quantity and suitability within the Action Area as sandbar habitat is modified or lost, such as from invasion by woody vegetation. In addition, the following section 7 consultations and section 10 permits, and their cumulative impacts, have been evaluated in our assessment of the status of the least tern within the Action Area.

Research and Recovery Permits

Approximately ten research and recovery permits have been issued primarily in association with monitoring surveys and research. There are no existing Habitat Conservation Plans for the interior least tern in the Action Area.

Section 7(a)(2) Consultations

The Service consults on proposed actions potentially affecting the interior least tern. Project types evaluated included boat dock and ramp installation, sand and gravel mining, dredge and fill operations, and barge loading facility construction. Effects from these activities vary in size and duration, with projects such as extensive channel deepening projects having permanent impacts, to boat ramps with both permanent and temporary impacts. Most of these consultations are informal and do not result in take of the interior least tern. However, there are several existing and multiple pending formal consultations that would include some level of incidental take of interior least terns. Most take is related to U.S. Army Corps of Engineer activities on the McClellan Kerr Arkansas River Navigation System (MKARNS) and Mississippi River.

The Service completed a BO on June 16, 2012, regarding the joint U.S. Army Corps of Engineers and Southwestern Power Administration action involving the operation of multipurpose projects on the Red River from Lake Texoma to Index, Arkansas, the Canadian River from Eufaula Lake to the Arkansas River confluence, and all of the MKARNS excluding Grand Lake and Hudson Lake, and U.S. Army Corps of Engineer reservoirs in Kansas, Oklahoma and Texas that have operational releases into the MKARNS and Red River are also included. Authorized take of up to 1,500 interior least tern eggs and chicks is possible in some years with take of at least 300-600 eggs and chicks are expected in most years. The BO assumes all adults in the Action Area (1,989 is the highest count to date) could be harmed or harassed by flooding and other effects associated with the proposed action. The BO is currently being revised but not to address impacts to interior least terns.

Other Conservation Efforts Ongoing Within the Action Area

On the Mississippi River, channel training structures (dike fields) and their potential to lead to vegetation establishment on interior least tern sandbar habitat were considered causes of decline and imminent threats to the species (*e.g.*, Smith and Stuckey 1988). However, this population has increased from fewer than 500 birds occupying a short reach of the river to averaging over 10,000 nesting birds/year along over 1,287 km (800 miles) of river channel. Most interior least tern colonies on the Mississippi River are associated with dike fields, which create higher sandbars with less exposure to flooding during the summer nesting season. Current management practices on the Mississippi River include new dike designs incorporating notches toward the landward end, allowing flow to isolate nesting bars through most of the nesting season (Smith and Stuckey 1988, Service 2012). Additionally, there is an aggressive program to build notches into existing dikes during maintenance activities (DuBowy 2011).

In other navigation systems that require maintenance dredging (*e.g.*, lower Ohio, Red, and Arkansas rivers), use of dredged material to build or replenish islands used by interior least tern for nesting (*e.g.*, Ciuzio *et al.* 2005, Fischer 2012) and managing flow releases below dams to benefit interior least tern (U.S. Army Corps of Engineers 2002) is becoming standard practice.

The 2013 Conservation Plan for the Interior Least Tern, Pallid Sturgeon, and Fat Pocketbook Mussel in the Lower Mississippi River (pursuant to section 7(a)(1) of the Act) was developed between the U.S. Army Corps of Engineers and the Service. The conservation plan outlines the programmatic mechanisms by which the channel improvement program of the Mississippi River and Tributaries project is being utilized to implement conservation measures that maintain and

improve habitat values within the Lower Mississippi River for recovery of federally-listed and other trust species inhabiting the river channel.

At the time of listing and recovery plan development, interior least tern nesting colonies were primarily known from jurisdictional waters with a strong Federal nexus, *i.e.*, navigation systems, reservoirs, national wildlife refuges, national scenic river reaches, etc. Since listing, these interior least tern habitats have to various degrees been considered, managed, protected, and/or monitored under the conservation (section 7(a)(1)) and/or consultation (section 7(a)(2)) provisions of the Act. For example, management guidelines, monitoring and conservation strategies, and operating plans in the Missouri, Loup, Platte, Arkansas, and Red rivers have been developed and implemented following formal consultation under section 7(a)(2) of the Act.

Conservation Needs of Interior Least Tern Within the Action Area

The species' conservation needs define what is needed in terms of reproduction, numbers, and distribution to ensure the species is no longer in danger of extinction. The conservation needs should be defined in the species' recovery outline or plan. The interior least tern population as it relates to the 1990 recovery goals was discussed in the interior least tern *Population Status and Distribution* section of this biological opinion.

Although not anticipated in the recovery plan, one of the current primary conservation needs of interior least terns is the creation of dredge spoil island habitat during the operations and maintenance of the navigation channel in the Arkansas and Mississippi rivers by the U.S. Army Corps of Engineers. During dredge and disposal activities, creation of new sandbar and gravel bar habitat using dredge spoil material and vegetation removal on those created islands should be considered. In a river system dominated by locks and dams and maintained primarily for navigation, scouring floods and deposition often occur infrequently or are entirely lacking. Consequently, habitat creation is important in the recovery of the interior least tern. Awareness of the life history needs and avoidance of disturbance during critical nesting periods is also a conservation need of interior least tern in the Action Area.

Piping Plover

Sightings of piping plover, within the majority of the Action Area, are rare and infrequent. Observations typically occur briefly during the spring and fall migrations from central Oklahoma eastward to the Mississippi River. Individuals sighted within the Action Area may originate from both the Great Lakes-Big River and the Atlantic Coast populations. Habitats selected during stopovers include sand bars and broad open shorelines. In Oklahoma, most of the records are of three birds or less and most of the observations occur at larger, flood control impoundments. Nesting is not believed to occur in either State. However, there are two records of nesting piping plovers at Optima Reservoir in Texas County during 1987 and 1988 (Boyd 1991). Optima Reservoir has never filled and surface water is rare except after periods of heavy rainfall. Additional records from Oklahoma within the action area include Creek, Payne and Sequoyah counties (Wood and Schnell 1984). Additionally the Service is aware of one additional record for Woodward County in 2006.

Records are relatively scarce for much of Arkansas and Tennessee as well. However, the Mississippi River serves as a major migration route for many species of migratory birds and the occurrence of the piping plover in eastern Arkansas and western Tennessee is more frequent. Up

to ten piping plovers are regularly seen along Mississippi River, in July/August of each year. These numbers were derived from random sightings only. Additionally, a review of published records of piping plover sightings throughout North America by Pompei and Cuthbert (2004) indicate that piping plovers do not concentrate in large numbers at inland sites and seem to stop opportunistically. Therefore, the actual number of individuals transiting the proposed Project area each year is likely much larger. These sightings have become more consistent in recent years, which may not be surprising considering that recent data has suggested that piping plovers do exhibit some inter- and intra- annual fidelity to migration and winter sites as described in the Atlantic Coast and Great Lakes Recovery Plans.

Factors Affecting Species' Environment within the Action Area – Piping Plover

Overhead power lines have been documented to kill large numbers of birds, including records of a few plovers (Service 2004, M. Shriner in litt. 2007), so individuals could be affected by collision with transmission lines and support structures and by electrocution. Construction and maintenance of lattice steel and guyed support structures may result in habitat loss and alteration of suitable habitat also would impact the piping plover. There is no designated critical habitat within the Action Area, so none will be affected.

EFFECTS OF THE ACTION

"Effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR §402.02). Direct effects are considered immediate effects of the project on the species or its habitat. Indirect effects are those caused by the proposed action and are later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consultation. The effects of the action, combined with the environmental baseline discussed above, are used to determine the future baseline and to form the basis for the determination in this opinion.

American Burying Beetle

This section provides an analysis of any direct and indirect effects of the proposed action on the ABB and any designated critical habitat, including all relevant interrelated and interdependent activities.

Direct Effects

Currently, ABB presence is assumed in nearly 50 percent of the 1,200-foot wide Study Area used by Smith (2014) in the ABB desktop analysis. Anticipated construction activities associated with the proposed Project, such as vegetation removal, heavy equipment operation, soil contamination, grading of rough terrain, excavation and filling and re-vegetation of disturbed areas will disturb soils. Soil disturbance has the potential to harm, harass or kill individual ABBs. Direct impacts to the ABB, either during their inactive or active periods, may result from any of these project-related construction activities.

Clearing and grubbing, as well as grading and other earthmoving activities, displaces soil that could uncover ABBs. Uncovered ABBs could be exposed to predation, adverse environmental

conditions or be crushed by equipment. If construction occurs during the active season, ABB broods could be displaced by soil disturbance and adults could be separated from larvae/eggs and/or crushed by equipment. When construction takes place during the winter season, adult individuals could be crushed and/or ABB re-emergence in late spring or early summer could be prohibited. Post construction re-vegetation activities could result in further disturbance.

Use of heavy construction equipment, such as bulldozers, excavators, cranes, track hoes, and back hoes, could compact soils. Equipment operation could result in destroying ABB brood chambers, including adults and larvae, and preventing use by ABBs for carcass burial during the reproductive season. The accidental spilling of petroleum products and chemicals onto the ground surface could contaminate the soil, creating unsuitable habitat and directly killing individuals and/or broods, or displacing individuals to less suitable areas. The Environmental Protection Measures proposed in the BA will help minimize, but not eliminate the potential for these impacts to occur.

Direct adverse impacts also are likely to occur when the proposed Project becomes operational. As the ROW is restored following construction, ABBs likely will use suitable habitat within the ROW and could be impacted by operation and maintenance activities. Vegetation management within the ROW (*i.e.*, clearing, mowing, etc.) results in heavy equipment travel along the permanent ROW, and this also may crush ABBs or their brood chambers. However, the operational impacts will be much reduced in comparison with initial impacts during construction because the amount of heavy equipment use and required soil disturbance will be greatly reduced during operation relative to initial construction.

The majority of the anticipated impacts will be temporary in nature. Clean Line will use existing highways, local public roads, and existing local private roads to the extent practicable. However Clean Line will repair or improve certain private roads as needed to improve access for heavy equipment. No upgrades of existing public roads are anticipated. Improvement and widening of existing private roadways may result in additional soil disturbance and loss of ABB habitat. Where existing roads do not provide sufficient or safe access and as local conditions allow, Clean Line will use a range of access road options, such as overland (off-road) travel or building new roads, which will further affect ABB and its habitats.

Clean Line will conduct construction activities during daylight hours to the extent practicable. However, if night construction activities are utilized, artificial lighting could have direct impacts on ABBs by decreasing nocturnal activity (Sikes and Raithel 2002). Should night construction be necessary, Clean Line will adhere to the species-specific measures outlined in the BA to avoid or minimize impacts. Night lighting impacts would be short-term, lasting only as long as night work occurs in a specific area.

Long-term effects will result from direct habitat loss due to conversion of habitat to developed areas around converter stations and around transmission line support structures, and from compaction associated with travel corridors, cross country/overland travel, and in areas of improvements to existing private roadways.

Indirect Effects

The ABB can be indirectly affected by a reduction in available carrion; harassment during breeding, brood rearing or overwintering; or the loss, fragmentation, and alteration of suitable habitat. Although the ABB appears to use various habitat types, the role of vegetation

composition and soil type as limiting factors is unclear. Habitat fragmentation reduces habitat connectivity and creates edge habitat and travel corridors that may be used by scavengers (Wilcove *et al.* 1986), resulting in unsuitable conditions for the ABB and potentially facilitating increased competition for prey resources. Predators, such as feral and domestic dogs (*Canis familiaris*) and cats (*Felis domesticus*), crows (*Corvus* spp.), coyotes (*Canis latrans*), foxes, skunks, opossums (*Didelphis virginiana*) or raccoons (*Procyon lotor*) are opportunistic feeders that have been shown to either compete with the ABB for available carrion or prey directly upon the ABB. These species thrive in edge habitats and use these habitat edges as travel corridors. Furthermore edge habitat alters the microenvironments, which potentially affect the ABB. Placement of ROW developments within native, intact habitats, results in increased edge habitat and habitat fragmentation. This is likely to result in take of ABBs, in the form of harm, by lowering the availability of appropriately sized carrion for ABBs (Oxley *et al.* 1974), thereby reducing reproduction. New roadway construction will remove vegetation further fragmenting habitat, which can result in increased edge habitat used by scavengers as travel corridors and may lead to increased mortality caused by vehicle strikes.

Vegetation removal causes habitat degradation and alters soil moisture that may reduce breeding and sheltering habitat and lead to a change in vertebrate species composition, altering the small animal community that ABBs rely on for reproduction (Grant *et al.* 1982). The ABB is sensitive to soil moisture conditions and die quickly when desiccated (Bedick *et al.* 2006). Additionally, the anticipated construction activities increase the potential for introduction of non-native or invasive species (Marvier *et al.* 2004) once vegetation is removed. Vegetation removal is expected to alter leaf litter and may uncovered ABBs. Once exposed, the ABB may be injured or killed from exposure to adverse weather conditions or crushed by equipment during vegetation removal. Increased competition for prey resources from increasing scavenger populations also is expected.

Estimate of Impact to ABB Habitat

The proposed Project would traverse 336.3 km (209 miles) through six counties in the ABB's current range in Oklahoma (Payne, Lincoln, Creek, Okmulgee, Muskogee, and Sequoyah) and three counties (Franklin, Crawford, and Johnson) in Arkansas. The proposed Project also traverses Conservation Priority Areas (CPA) identified by the Service in Muskogee and Sequoyah counties, Oklahoma. Conservation Priority Areas are defined as "areas where conservation efforts should be focused and where higher ratios of mitigation for impacts to ABBs should occur" (Service 2015b). About 62.7 km (39 miles) of the proposed transmission line route lies within the identified CPA. Only 14.5 km (9 miles) of the route are composed entirely of unfavorable habitat (100% unfavorable).

Some of the route crosses sections of the Action Area that are unfavorable for ABB use (i.e., areas that are developed, have unfavorable soils, lack or have minimum native vegetation, or contain permanent waters). Because these areas are unsuitable for the ABB, no impacts to the ABB are expected to occur in these areas. Clean Line did not determine the actual extent of suitable and unsuitable habitat within the proposed transmission line route. Instead Clean Line used a ratio of favorable to unfavorable habitat to estimate how many acres of potentially suitable ABB habitat within the Action Area may be impacted by the project. Favorable and unfavorable habitats were determined using information provided by the Service (2015a). The analysis was then conducted using a spatial desktop model (Smith 2014) that evaluated current land cover as depicted in the 2011 National Land Cover Database.

Based on this desktop analysis, as much as 49.5 percent of the habitat within a 61 meter (200 feet) wide corridor along the proposed route was determined to be suitable for the ABB. The initial 61-meter wide corridor was then buffered by an additional 500 feet on both sides of the corridor (total corridor of 1,200 feet) in an effort to capture all potential work areas, work roads, temporary holding yards, and similar features that were likely to occur outside the proposed Project's maximum ROW corridor. Within this expanded/buffered corridor, as much as 49.7 percent of the area within the corridor contains favorable ABB habitat. Most of the proposed route (200 miles) consists of a mosaic of favorable and unfavorable habitats. In estimating the area that would be impacted by the proposed Project, the Service assumed that all ROW and work staging areas will be contained within the buffered, 365.8 meter (1200-foot) wide corridor. The total area within this corridor, subtracting out the length that was 100 percent unsuitable (9 miles), is 11,772.7 hectares (29,091 acres). As discussed above, approximately 49.7 percent or 5,851 hectares (14,458.2 acres) were considered favorable ABB habitat and approximately 50.3 percent or 5,921.3 hectares (14,632.8 acres) was considered unfavorable ABB habitat according to the model used by Smith (2014).

Although it is likely that some additional lands within described buffered corridor may not be occupied or favorable for the ABB (based on vegetation type and land management practices), because the species likely does not occupy all favorable habitats, the Service does not currently have the data necessary to determine the potential suitability of the entire Action Area using these additional factors. Clean Line committed to conducting ABB surveys prior to construction that could aid in refinement of the estimated extent of favorable habitat within the buffered corridor. Additionally, projections for the amount of impacts that will occur within ABB habitat from ongoing operations and maintenance (O&M) over the life of the project were not provided. While O&M was described in the Project Description, sufficient information to accurately determine the impacts was not available. Lacking more detailed information, and based on the desktop model developed by Smith (2014), for the purpose of the Service's analysis the Service assumed that about 50 percent of the buffered corridor may be favorable for the ABB. Thus, the Service estimates that 5,886.4 hectares (14,545.5 acres) of suitable/favorable ABB habitat would be impacted by the proposed Project.

Additionally, Clean Line committed, in their BA, to compensate for impacts to ABB habitat, such as through an established conservation bank. However, the BA did not provide any details on how this would be accomplished. The Service has guidelines on the use of compensatory mitigation for the ABB (Service 2015d) and used this information to estimate compensation needs for the ABB for the anticipated impacts of this project. If Clean Line conducts additional surveys prior to project implementation, compensatory mitigation would only be applied to those areas with positive occurrences of the ABB.

Temporary, Permanent Cover Change, and Permanent Impacts

Projects that would disturb habitat within the ABB range may assume that ABBs are present in all favorable habitats that will be disturbed, and mitigate accordingly. The mitigation ratios were previously established by the Service (2015b). Impacts to ABB habitat are categorized as presented in Table 3.

Table 3. Mitigation Ratios (acres of impact : acres of offset) for impacts to the ABB.

Impact Type/ Duration	**Location of impact**		
	ABB Range (but outside of CPA)	Conservation Priority Area (CPA)	Mitigation Land*
Temporary	1:0.25	1:0.5	1:1.5
Permanent Cover Change	1:0.5	1:1	1:2
Permanent	1:1	1:2	1:3

*Mitigation Land ratio= CPA ratio plus replacement of lost mitigation value.

Temporary Impacts

Temporary impacts are defined as areas of ground disturbance resulting from project activities restored to a condition suitable for ABB use within 5 years of the impact with similar vegetative cover. The restoration timeframe of 5 years is based on the amount of time in which the Service expects most grass and shrub dominated cover types could be re-established to their previously undisturbed state based on the climate and vegetation types within the Action area. The ABB is a habitat generalist and specific vegetation types required for the ABB have not been identified, but they have been documented within grassland cover types and native grasses and shrubs are a component of most areas that support ABBs in Oklahoma. Native warm season grasses can take several years to become established, but previous research suggests that 5 years is a realistic timeframe for restoration of these areas within an action area (ODOT 2011, USDA 2009).

Permanent Cover Change Impacts

Permanent cover change impacts are defined here as altering a vegetative cover type to a different cover type (*e.g.*, forest or shrubland to grassland), resulting in increased fragmentation of habitat (Oxley *et al.* 1974, Kozol 1995, Ratcliffe 1996, Amaral *et al.* 1997, Bedick *et al.* 1999, Trumbo and Bloch 2000, Marvier *et al.* 2004). Similar to temporary impacts, these areas are expected to be restored to a condition suitable for ABB use within 5 years. If these areas will be purposefully maintained (through vegetation control) as a different land cover type other than that which existed prior to project implementation, the Service considers the vegetation cover of the area to have a permanent cover change. Man-made changes to land cover types can create intense, sudden contrast between land cover types (i.e., a grassland ROW fragmenting a contiguous stand of forest habitat), compared to natural patchy landscapes. These cover type conversions often occur within the ROWs of linear infrastructure, including transmission line corridors. Evidence suggests that permanent change in cover types, even if these cover types are both native to the area, can increase threats to ABBs (Trumbo and Bloch 2000) by increasing the number of invasive plant species present (Marvier *et al.* 2004), reducing the carrion prey base of the appropriate size for ABB reproduction (Oxley *et al.* 1974), increasing predation (Jurzenski and Hoback 2011) or increasing the scavenger competition for carrion necessary for ABB reproduction (Kozol 1995, Ratcliffe 1996, Amaral *et al.* 1997, Bedick *et al.* 1999). Additionally, changing the vegetation cover type from forest to grassland often promotes increased access, which may increase human use and presence (including use of vehicles) in the area. Impacts within new ROWs that have a permanent change in cover and are immediately adjacent and parallel to existing ROWs, may be considered temporary impacts because they do not increase habitat fragmentation. Co-locating

ROWs along existing ROWs, roads, or other interruptions in habitat does not contribute to further fragmentation or edge effect and is preferable to crossing previously undisturbed areas.

Permanent Impacts

Permanent impacts are those that eliminate ABB habitat (i.e., buildings, roads, new ROW not adjacent to existing ROWs), as well as any impact to habitat that requires more than 5 years for restoration. Permanent impacts to ABB habitat are expected to result in the greatest amount of take of individuals of the species.

Total ABB Impact Estimates within Action area

Although it is difficult to accurately predict the total impacts from the Project, the Service developed an estimate, as discussed above, of the total impacts within the Action Area. As reflected in the above analysis, about 50 percent of the Action Area within ABB range contained favorable ABB habitat. Generally, ABBs do not occupy all favorable habitats. Therefore presence/absence surveys may be performed just prior to disturbance, which may delineate a smaller subset of acres that are occupied by the ABB, and can then be used to refine the required compensatory mitigation needs. However, Clean Line did not analyzed the anticipated impacts by impact type (temporary, permanent cover change, permanent) and therefore the Service is unable to assign impact types to the various components of the Project. Consequently, the Service will conservatively assume all impacts from the Project to be permanent. All impacts should be offset accordingly. Clean Line can refine their required compensatory mitigation needs by working with, and approval from, the Service to more accurately determine take levels by impact type (Table 3) before Project implementation.

Because the ABB is a highly mobile, annual species, potentially moving throughout its habitats during its active period, ABB occupation of the Action Area is difficult to ascertain prior to the year the action takes place. The Service's impact analysis provides a maximum amount of take that could occur and any refinements (surveys) indicating ABB is absent from the trapping radius will effectively reduce the amount of compensatory mitigation. Once ABB surveys have been performed during the year the action takes place and the amount of actual incidental take can be provided, the Service will adjust the required mitigation amount accordingly.

Considering take can only be minimized and cannot be completely avoided, Clean Line will address such impacts with habitat offsets. The Service recommends Clean Line conserve an amount of habitat proportional to the impacts on ABB habitat resulting from Project actions. This can be easily accomplished through a one-time purchase of ABB Conservation Credits from an established Conservation Bank. Purchasing Conservation Credits is the Service's preferred mitigation option. Project proponents can visit **http://geo.usace.army.mil/ribits/index.html**, the Regulatory In-lieu Fee and Bank Information and Tracking System (RIBITS), for information on existence of Service-approved conservation banks with available credits. Other available mitigation options include Permittee-Responsible Mitigation. For more information about these options refer to *American Burying Beetle Conservation Strategy for the Establishment, Management, and Operations of Mitigation Lands* (Service 2014b) and *Mitigation Recommendations for the American Burying Beetle (ABB) in Oklahoma* (Service 2015d) for habitat offset ratios.

Based on the Service's analysis provided above, the estimated impacts to suitable/favorable ABB habitat would be 5,886.4 hectares (14,545.5 acres). Considering the proposed route would cross portions of CPAs in Muskogee and Sequoyah counties, Oklahoma, additional compensation would be required for these lands. Established offsets from impacts in a CPA have a higher mitigation ratio such that each acre of permanent impacts results in 2 acres of required offsets (Service 2015d). The total area of estimated impact for the entire 62.8 km (39 mile) distance would be 2,295.8 hectares (5,673 acres). Considering about 50 percent of this segment contains favorable habitat, the estimated impact to ABB habitat is 1,147.9 hectares (2,881.5 acres). When added to the previous estimate of impacts, the total compensation/offset required would be 7,034.3 hectares (17,427.0 acres). This amount of required offset is based on permanent impacts for habitat outside the CPAs, but within the consultation range for ABB, at an established ratio of 1 acre of offsets for each acre of impacts. Similarly, permanent impacts within the CPA are calculated at 2 acres of offsets for each acre of impact.

The Service recognizes that the total estimated offset acres likely over-estimates the required offsets for the proposed Project but is based on the best information that was available to the Service. The Service anticipates that this estimated offset also will provide adequate compensation from recurring O&M activities over the life of the project, based on information available to us. Considering the ABB is highly mobile while they are active and above ground surveys for the presence of ABB must be conducted during the year in which impacts are expected to occur. This will allow Clean Line to more accurately assess the impacts of their proposed Project on the ABB and aid the Service in determining habitats that are occupied and developing a more accurate estimate of incidental take. Clean Line intends to develop appropriate mitigation offsets based on the actual incidental take once these surveys and other delineations of impacts are submitted to the Service for review and approval. The amount of incidental take provided should allow for O&M activities without the need for re-initiation of this consultation. However, if the actual take differs from the estimated take provided in this BO, DOE re-initiation will be required.

Gray, Indiana, Northern Long-eared and Ozark Big-eared Bats

This section includes an analysis of the direct and indirect effects of the proposed action on the gray bat, Indiana bat, northern long-eared bat, and Ozark big-eared bat and any designated critical habitat, including all relevant interrelated and interdependent activities. Our analysis of the effect of the Clean Line project considers that all four bat species likely occur within portions of the Clean Line Transmission route and construction workspaces. However, the Action Area includes a relatively small fraction of the overall known range of gray bat, Indiana bat and northern long-eared bat but includes a significant portion of the known range of the Ozark big eared bat. Any indirect impacts to these bats would be expected if any karst-like subterranean features or roost trees are occupied during construction. Noise from construction activities could indirectly cause the bats to abandon their roost sites. However, as explain below, we do not have any information on occupancy of these structures within the proposed transmission line route and any potential roost trees would not be removed during the active season of these bats.

Despite the implementation of conservation measures by Clean Line, direct impacts to federally-listed bats may result in direct mortality or injury to individuals or small groups of tree roosting bats when trees that may harbor undetected roosts are cut or accidentally damaged during construction and planned O&M activities. Construction of the proposed transmission line will result in deforestation and vegetation removal within the proposed transmission line ROW and construction workspaces. Deforestation can result in removal of maternity and non-maternity

summer roosting habitat for the Indiana bat and the northern long-eared bat. Removal of roost trees while Indiana bats or northern long-eared bat are present may result in direct effects by killing, injuring, or otherwise harming individuals or a maternity colony. Clearing during the active season may impact both reproductive and non-reproductive individuals.

The likelihood of felling a tree containing a maternity colony or individual roosting bats, however, is anticipated to be extremely low because of the planned conservation measures, such as removal of trees during the inactive season, the overall rarity of the species within the Action Area, and the fact that there are currently no known maternity colonies believed to occur within the proposed ROW. However, construction of the proposed transmission line will result in the removal of all suitable roost trees, even if completed outside of the active season, within the ROW. Loss of these trees could impair the ability of bats to locate suitable maternity roost sites or roost sites for bachelor males. Once these areas are deforested, it is unlikely that bats will continue to use these areas, forcing them to expend energy searching for alternative roosting sites when they return in the spring. Additional energy expenditures by pregnant females could reduce viability of offspring or otherwise impair reproductive success, particularly when bats may be in poor condition after emergence from hibernation.

Additionally, foraging habitat for the gray bat, Indiana bat, northern long-eared bat, and Ozark big-eared within the proposed ROW and construction areas will be permanently altered. Where the removal of foraging and roosting habitat results in substantial degradation of habitat quantity or quality, an Indiana bat or northern long-eared bat maternity colony may be harmed via a significant impairment of behavioral patterns, including breeding, feeding, and/or sheltering. Such alteration may not be significant for the Ozark big-eared bat that often may forage in edge habitats. However, the impact may be more significant for Indiana and northern long-eared bats that forage within forested areas. Reductions in the extent of foraging habitat can affect energy expenditures by bats or impair ability to store adequate amounts of fat prior to hibernation. The extent of these losses are difficult to evaluate because the BA did not provide information on the extent of forested habitat within the ROW and only a portion of the proposed route was examined for occurrence of suitable habitats.

In addition to impacts on roost sites, the Service considered the effects of permanent habitat removal on foraging and traveling behaviors of northern long-eared bat and Indiana bat. Both species demonstrate a preference for contiguous tracts of forest cover (rather than fragmented or wide open landscapes) for foraging or traveling and, different forest types interspersed on the landscape increased likelihood of occupancy for both species (Yates and Muzika 2006, Menzel *et al.* 2005). Similarly, in West Virginia, female northern long-eared bat spent most of their time foraging or travelling in intact forest, diameter-limited harvests (70–90 year-old stands with 30–40 percent of basal area removed in the past 10 years), and road corridors, with no use of deferment harvests (similar to clearcutting) (Owen *et al.* 2003). In Alberta, Canada, northern long-eared bat avoided the center of clearcuts and foraged more in intact forest than expected (Patriquin and Barclay 2003). On Prince Edward Island, Canada, female northern long- eared bats preferred forested areas more that open areas, with foraging areas centered along forest-covered creeks (Henderson and Broders 2008). In general, northern long-eared bat prefer intact mixed-type forests with small gaps (*i.e.,* forest trails, small roads or forest covered creeks) in forest with sparse or medium vegetation for forage and travel rather than fragmented habitat or areas that have been clearcut. The impact of fragmentation can by reduced by avoiding and/or minimizing impacts to large continuous tracks of forest. However, the Service did not have sufficient information to accurately determine the extent of fragmentation of intact parcels.

Riparian zones have been documented to be an important food/water source for all bat species. Indiana bats are known to utilize bottom land and riparian zones for maternity roost sites (Gardner *et al.* 1991, and Callahan *et al.* 1997) and gray bats use riparian zones as foraging sites. The clearing of vegetation through construction and during ROW maintenance will impact the amount of foraging/roosting habitat and possibly affect the amount of available prey. Application of herbicides also poses a risk to bats and the insects they consume. Clean Line committed to selectively using herbicides within streamside management zones.

According to information provided in the BA, construction within a 91.4 meters (300 foot) buffer of the proposed route will result in the removal of 409 potential roost trees that could be used by Indiana bats. Only about 35.5 percent of the proposed route, including buffered corridor, was surveyed. A similar survey for potential roost trees that could be used by northern long-eared bat within 39.0 percent of the proposed route found 607 trees that could provide potential roosting sites. Based on information regarding the suitability of trees as roost sites for the Indiana bat and northern long-eared bat (Service 2015a), additional potential roost sites may occur within the proposed ROW. Although, the removal of these trees is anticipated to occur during the inactive season when bats would not be expected to be roosting, foraging or swarming, the loss of these trees potentially will impact viability of maternity colonies for both species should these roost sites actually be used as maternity sites. Currently no information on whether these trees are actually used is available.

The proposed transmission line generally follows a route that lies south of the primary karst regions in Oklahoma and Arkansas. Much of the route occurs in areas that are primarily composed of sandstone where suitable hibernacula or maternity sites are rare. However, features are present which may be used as day roost sites by bats. Clean Line conducted a survey of a portion (35.5 percent) of the route for caves, sinkholes and other subterranean features that could be used by bats. Within the proposed route, including the buffered area (300 foot corridor), 22 features, of which six, all located in Arkansas, could provide temporary roosting habitat for Indiana bats. However none of these features provided suitable habitat to support hibernacula. Similarly, Clean Line surveyed about 39.0 percent of the proposed route, and buffered area, for caves, sinkholes and other subterranean features that could be used by northern long-eared bats. The survey identified 30 features of which 7 could potentially provide winter habitat, all located in White County, Arkansas and 6 sites that could provide temporary roosting habitat, all located in Arkansas (Crawford, Franklin and Cleburne counties). However, no information on actual use of these features by bats was provided.

The Service does not currently anticipate any direct adverse impacts to caves or cave-like features due to lack of known gray bat, Indiana bat, northern long-eared bat, or Ozark big-eared bat hibernaculum or summer limited use sites located in the proposed Action Area. Although portions of the proposed route were determined to have cave-like structures that could be suitable for summer roost sites or wintering sites, implementation of proposed conservation will greatly reduce the potential for direct adverse effects to these sites. However, considering only a portion of the proposed route was surveyed due to access limitations, there is a possibility of a currently unknown site being utilized as a hibernaculum or summer roost site within the Action Area.

The influence of the electromagnetic field (EMF) generated by the transmission line on bats and their ability to echolocate are unknown. However bats may avoid areas of high EMF exposure and have been shown to avoid radar installations (Nicholls and Racey 2007).

Interior Least Tern

Clean Line has not yet developed the avian protection plan (APP) for the interior least tern and other avian species for the project. The APP should contain specific measures essential to the minimization of project related effects, particularly the risk of avian mortality due to collision with the proposed transmission lines. The plan and included mitigation measures are instrumental in reaching the determination for interior least tern in the BA and without these documents, the Service could not accurately assess the project related effects and any offsetting measure to interior least terns. As explained in the BA, DOE concluded that the risk of collision is highly unlikely and that measures in the BA are sufficient to avoid or minimize the risk of collision. Although the risk of collisions for these species is low, the Service could not reasonably conclude that the risk of a collision with the transmission lines or the associated towers and structures is avoided and thus no take would occur. Although collisions are relatively rare, interior least terns are vulnerable to power line collisions that can result in mortality. The most substantial adverse effect of the proposed action to interior least terns occurs during the breeding and nesting season and is caused by collisions with power lines near breeding and feeding habitat occurring within the Action Area. Anticipated effects to the interior least tern are discussed below.

Direct Effects

Collision and Electrocution

Interior least terns may be expected to suffer mortality or crippling injury through either collision with power lines or, less commonly, electrocution. Birds have been documented to suffer electrocution from contact with electrical lines since power lines first appeared on the landscape in the early 1900s (Avian Power Line Interaction Committee [APLIC] 2006). Electrocution tends to be associated with the risers or connectors at pylons where birds may attempt to perch (Fiedler and Wissner 1980, Orloff *et al.* 1992). Although collisions may occur anywhere along spans of wires or with pylons, most studies have found that the majority result from contact with the highest earth wire (Meyer 1978, James & Haak 1979, Beaulaurier 1981, Faanes 1981). Birds may hit the earth wire by trying to avoid the more visible groups of conducting wires below (Faanes 1987).

Through the years, studies have documented bird mortality from collisions with power lines and line support structures for over 350 species of birds (Manville 1999). Bayle (1999) found that 61.6 percent of bird collisions with very high voltage distribution lines (>150 kV) were gulls and terns (Laridae), while gulls and terns made up only 15.9 percent of the electrocutions and collisions on medium voltage (<60 kV) distribution lines. The Clean Line transmission line is in the category of very high voltage line. In a 2014 quantitative review, avian mortality was estimated at 23.2 fatal collisions/km/pole for all bird species (Loss *et al.* 2014).

Factors that affect avian collision risk include location, structural attributes such as height and the use of lighting, weather conditions, and bird morphology and behavior (Drewitt and Langston 2008). The location/siting of a powerline is instrumental in the reduction or avoidance of avian collisions (APLIC 1994, Henderson *et al.* 1996). Powerlines have an increased probability of being encountered by a species in habitats or local areas frequented by that species (Janss 2000). With two to four colonies within a three mile radius of the proposed Mississippi River crossing, the interior least tern will have an increased probability of encountering the proposed transmission line. Bevanger (1994) noted that birds that spend a relatively large proportion of their time in the

air would seem to be vulnerable to wire strikes as a consequence of spending increased time in the same spatial plane as wires. Laridae, such as gulls and terns, spend much of their time in the air. In a study comparing birds based on wing morphology and grouped by aerodynamic performance, gulls (Laridae) are frequent collision victims and an exception to the wing morphology prediction of the study (Bevanger 1998).

Specific behavioral ecology of avian species may make them more vulnerable to collisions with power lines. Relevant behavioral ecology for interior least terns includes both feeding and breeding behaviors. During feeding, interior least terns hover 5-10 meters over water then plunge, but do not submerge. In the Missouri River drainage, interior least terns have been documented foraging for fish in shallow water habitats and within 12 km (7 mi) of a colony site (Stucker 2012). In the Lower Mississippi River, foraging terns have been observed feeding in a variety of habitats within 3 km (2 miles) of colony sites (Jones 2012). The distance to food has been shown to influence reproductive success in interior least terns.

During the phases of a breeding season (*e.g.*, courtship, incubation, nestling, and juvenile), the risk of collision with power lines varies in relation to the specific activity exhibited by birds (*e.g.*, see Henderson *et al.* (1996) for observations related to common terns). Upon arrival at a nesting site, interior least terns begin to engage in aerial courtship displays. Interior least terns are likely less attentive to their surroundings during the aerial chase portion of the pair forming breeding behavior and potentially more susceptible to collisions (Faanes 1987). When preoccupied with landing, hunting or fighting, birds often hit wires (Willard 1978). Presumably, interior least terns may be similarly preoccupied during courtship. The nestling phase of the breeding season is energetically demanding of the parents and a 3 fold increase in the frequency of journeys was noted in comparison to the courtship phase with adult terns flying under or between power lines. Both the increased amount of time in the air and the near misses may increase the risk of collision. This energy conservation measure ended immediately after the young became independent. Juvenile terns also were noted flying much closer to power lines than adults, presumably from lack of flight experience (Henderson *et al.* 1996).

Several authors have suggested that birds strike power lines most frequently when engaged in takeoff and landing activities (Willard 1978, Brown *et al.*1987, Scott *et al.* 1972), while others have cited the simple relationship between strike frequency and the frequency of crossing lines. However, a few studies noted species specific strike and fatality frequencies that would not be predicted given local abundance (McNeil *et al.* 1985, Rusz *et al.* 1986). Birds that engage in high-speed, low-altitude flights are more susceptible to wire strikes (Brown 1993). A significant behavioral factor influencing strike potential is flocking or congregation near transmission lines as might be seen in a nesting colony (*e.g.*, Brown 1993, James and Haak 1979, Malcolm 1982).

One documented interior least tern mortality occurred on a transmission line supported by tall, steel H-frame structures, and having five individual lines all marked with yellow, spiral bird flight diverters (APLIC 1994) spaced approximately 15 meters apart in a staggered pattern over the entire river crossing (485 m) and with nine aerial marker spheres (Dinan *et al.* 2012). This mortality occurred in one of the widest channels in the lower Platte River. Least tern nesting incidence is correlated with increasing channel width and interior least terns appear to avoid nesting on sandbars located in narrow river channels (Jorgensen *et al.* 2012).

Migrating least terns fly during daylight hours (Thompson *et al.* 1997) and often follow rivers that present opportunities to feed (shallow and backwater areas) and rest (sand and gravel bars).

Migrating birds generally benefit from flying at higher elevations that provide greater protection from predators, and potentially stronger tail winds, reduced air density, and less exposure to turbulence, all resulting in more efficient use of energy (Liechti 2006); however, terns following river systems may be flying much lower to take advantage of feeding and resting sites. Terns also are a small, agile species and have shown ability to successfully avoid transmission lines (Henderson *et al.* 1996). These characteristics may make them somewhat less vulnerable to collisions or electrocution by power lines than larger or nocturnal species (Henderson *et al.* 1996).

Interior least terns have been found to have varying degrees of site fidelity. Lott *et al.* (2013) used data from published mark/recapture studies (*e.g.*, Atwood and Massey 1988, Akcakaya *et al.* 2003) and a large number of unpublished band recovery records to assess least tern dispersal and site fidelity. This analysis suggested that most birds show a high degree of adult site fidelity and natal site philopatry (fidelity to their point of origin), rarely dispersing far from nesting areas. However, most banding study designs focus recapture or re-sighting efforts at or near banding locations, and have a low probability of documenting long distance dispersal. Even so, long distance dispersal (up to 1,000 km) has been documented (*e.g.*, Renken and Smith 1995, Boyd and Sexson 2004, Lott *et al.* 2013). Burger (1984) considered site fidelity to be high if it is considered that least terns respond appropriately to environmental cues by returning to a previous nesting site and then changing sites if the old site is unsuitable. Birds using unpredictable and variable environments such as sand and gravel bars within a river may be expected to show little site fidelity. Results for interior least tern in the Lower Mississippi River support this assertion in that birds may not return to the precise colony site, but the majority of birds will attempt to nest or renest in a river section that has previously supported that individual (Renken and Smith 1995). Approximate 97 percent of adult terns moved only 9.1 km (5.6 mi) from their original colony. Widespread dispersal (300-1000 km) was also noted in this study (Renken and Smith 1995).

Interior Least Terns have been noted annually on surveys approximately 1 mile south of the proposed Mississippi River crossing on the large sand bars near Deans Island between 1985 and 2012 (the most recent survey results available). The sandbars in this section of river are relatively stable. Interior least tern colonies in a three mile radius around the transmission line crossing are expected to be most affected since interior least terns forage most often within two miles of the nest site and have a home range during the breeding season of up to 4 mi^2 (Talent and Hill 1985). Two to four colonies are noted within three miles of the proposed project river crossing with minor annual variation in location and colony size. The five year average for ILTs in a three mile radius around the proposed river crossing was 113 adults (Jones 2008, 2009, 2010, 2011, 2012). The population in the three mile radius varied between a low of 103 and a high of 549 during this time period. During the same time period (2008-2012), the total interior least tern count averaged 1,960 with an average of 11 colonies between Osceola, AR and Helena, AR. In 2012, the annual population monitoring survey from Cape Girardeau, Missouri to Baton Rouge, Louisiana, counted 1,187 predominantly adult ILTs in 13 colonies in the 120 river miles between Osceola, AR and Helena, AR (Jones 2012). Most recently, the two colonies in closest proximity to the proposed crossing were recorded at river mile 760 and 755 with interior least tern counts of 42 and 61, respectively (Jones 2012). Colonies are consistently noted between river mile 763 and 754 on surveys.

Construction

Construction activities near nesting sandbars can disrupt interior least tern nesting activities. Terrestrialization of islands and sandbars associated with dike fields has been identified as a

negative factor affecting interior least terns. Jurisdictional agencies have utilized dike notch construction where feasible and practical to sever land-based routes used by all-terrain vehicle recreationists and terrestrial predators to access interior least tern nesting colonies. The U.S. Army Corps of Engineers has plans in action to protect, create, and enhance interior least tern habitat quantity and quality throughout the Lower Mississippi River.

The siting of the intermediate Arkansas substation in Pope or Conway County is not included in the BA, therefore, adverse effects from this aspect of the project cannot be adequately addressed. Interior least terns are known from Pope County near the Arkansas River. Adverse effects from transmission lines in or near suitable habitat for interior least tern feeding or breeding are expected to include collision with transmission lines. The risk of collision increases with the proximity of the transmission lines to the breeding or feeding habitat of interior least tern in Pope County (Janss 2000).

Fledgling to Breeding Pair Ratio

The least tern has maintained a relatively stable fledgling to breeding pair ratio in most of the Action Area, but a degree of variability is to be expected due to fluctuations in river flows and flood control operations. Productivity (generally measured as fledgling success per breeding adult pair) considered necessary to maintain stable or increasing populations of interior least tern has been estimated at 0.51 fledglings/pair or higher (Kirsch and Sidle 1999). There is strong evidence that interior least tern productivity naturally varies dramatically by year, and between sites within years (*e.g.*, Sidle *et al.* 1992, Dugger *et al.* 2000). Factors other than fledgling success affecting long-term productivity include post-fledging juvenile survival, adult survival, longevity, and/or emigration and immigration (Kirsch and Sidle 1999), all of which are poorly documented for least terns. In 2012, the average fledgling to breeding pair ratio for the Arkansas River in Oklahoma has been near 0.7. The highest fledgling per breeding pair ratio reported is 1.46 (2011) for the Arkansas River, Oklahoma, river segment, including the lower Canadian River below Eufaula Reservoir. A New Jersey study determined a fledgling rate of 0.48 young/pair (Burger 1984). Based on these estimates, an average fledgling to breeding pair ratio for interior least terns in the Action Area may be 0.7. Adult interior least terns lost from the breeding population due to collision or electrocution will not support the fledgling ratio, thus increasing the anticipated effect to the population.

Summary

Based on the available habitat and monitoring survey information, the effects to interior least terns on the Arkansas and Cimarron River crossings in Oklahoma will be related to transmission line collisions during feeding, and possibly breeding, activities and the effects to interior least terns on the Mississippi River crossing in Arkansas/Tennessee will be primarily related to transmission line collision during breeding, nesting, and feeding.

Indirect Effects

Many raptor species and common ravens use structures associated with electrical distribution and transmission lines for nesting and perching (APLIC 2006, Lammers and Collopy 2007). Transmission lines and support lattice towers in or near rivers and along the associated right-of-way are attractive to avian predators as additional perching locations from which to hunt. For example, red-tailed hawks are more common along powerlines than in areas without powerlines

because of the presence of superior perch and next sites (Knight and Kawashima 1993). Towers may increase hunting efficiency (*e.g.*, greater chance of prey detection and attack success) of avian predators because the elevated perches provide increased visibility of the surrounding area (Worley 1984, Sonerud 1992, APLIC 1996, Leyhe and Ritchison 2004). This predator presence may deter nesting or increase predation, reducing nesting success. Interior least terns may renest in a season if the first nest fails (*e.g.*, predation, flooding), but this is an additional energetic expenditure and may result in decreased fitness. Power lines have been suggested as causing indirect negative effects on other species within their area of influence (Slater and Smith 2010).

Fragmentation of the habitat in an area such as that caused by right-of-way creation causes a decrease of indigenous species and a corresponding increase in mesocarnivores that thrive in areas disturbed by humans such as: American crow (*Corvus brachyrhynchos)*, raccoon, red fox (*Vulpus fulva)*, opossum, striped skunk (*Mephitis mephitis)*, coyotes, feral cats and other opportunistic predators (Wilcove *et al.* 1986). A number of these species, especially the raccoon and striped skunk, have undergone dramatic population increases over the last century (Garrott *et al.* 1993), and the coyote and opossum have expanded their range. The creation of the right-of-way for the transmission line may contribute to loss of nests and eggs from predators with easier access due to the increase in mesocarnivores in the habitat. During low flows, access to the nesting sites, eggs, and chicks would be possible through land bridging or connected sand bars.

The routine maintenance and monitoring of the transmission lines and associated structures could result in disturbance to nesting birds if performed during the breeding season resulting in an adverse effect on interior least terns. While monitoring least terns nesting on the Arkansas River in Oklahoma and Arkansas, Service and Corps biologists have witnessed the apparent abandonment of least tern nesting colonies with relatively high levels of human disturbance. Other studies have noted that human disturbance of nesting colonies may reduce reproductive success (Burger 1984) and may result in eventual abandonment of the site (Kotliar and Burger 1986). Disturbance includes evidence of predation, cattle trampling, and human disturbance.

Any structures constructed in or near a river has the potential to impact flows and sediment transport. If support towers and necessary support structures are placed in or near the river, the presence of these obstacles may change water flow, current, and sediment deposition. The presence of suitable habitat near the transmission line crossing of the Mississippi River has been relatively stable over the last two decades (dependent on water flow) and terns reliably use these sites for nesting colonies (Jones 1999-2012). Alteration of water flow and deposition of sediment on these bars may change the suitability of the sand bars for tern colonies.

The presence of the transmission lines and support structures have the potential to act as a deterrent to the return of interior least terns to the same river segment to nest or disruption to cause the birds to renest. Although interior least terns may have limited site fidelity to specific colonies (Renken and Smith 1995; Burger 1984), the majority of birds will attempt to nest or renest in a river section that has previously supported that individual. Placement of the proposed transmission line and support structures could indirectly have an adverse impact on breeding, nesting and feeding activities.

Piping Plover

The proposed Clean Line high voltage DC transmission line will traverse through known migratory corridors for the piping plover. The Mississippi Flyway is a migratory route used by

approximately 40 percent of migratory waterfowl and shorebirds in North America including the interior subspecies of the piping plover. The proposed transmission line is proposed to traverse the Mississippi River which encompasses a large percentage of the Mississippi Flyway and contains nearly all of the known records for piping plover in Arkansas and Tennessee. Piping plovers from both the Great Plains and Great Lakes breeding populations likely use the Mississippi Flyway as a major migration route between their breeding and wintering grounds.

As proposed, the transmission line would intersect the heavily used Mississippi Flyway corridor which increases the collision risk for piping plover. Consequently, placement of the line across the Mississippi River is anticipated to impact the piping plover. Although construction of the transmission line could occur outside of the migration period for piping plover, once completed, the transmission line will exist for many years and pose a collision risk to piping plover. The duration of the effects to piping plover are expected to be long-term. Initial construction will occur over a multi-year period but the likely lifespan of the project is expected to be at least 30 years. When erected, the transmission line will pose a collision risk to piping plover annually during spring and fall migration.

Although the overall intensity of the disturbance may be low (*i.e.*, few individuals injured as a result of the project), the Service currently lacks sufficient bird strike/collision data in this area that would allow us to better understand the potential severity of this project to migrating piping plovers. However, adverse effects to individuals from the endangered Great Lakes population of piping plovers may be significant.

Direct Effects

Direct long-term effects to piping plovers may occur during or post-construction of the transmission line. These effects would most likely be in the form of injury/mortality due to collision with the wires. Sporer *et al.* (2013) collected a dead piping plover in a powerline collision study near the Audubon National Wildlife Refuge in North Dakota. Any mortality to an individual would be an adverse effect to the species, however the loss of even one individual from the Great Lakes population (about 110 individuals) of piping plover could have a significant impact to the species.

Direct effects may occur during (dependent on time of year) and following construction of the proposed transmission line by killing, injuring, or otherwise harming individuals migrating between the breeding and overwintering areas due to collision with the transmission wires. The removal of one or more individuals from either of the breeding areas on an annual basis may have a significant impact to the species. As mentioned above, we lack bird strike/collision data specific to this action area. The Service recommends Clean Line work with the Service to create a post-construction monitoring plan in order to fully assess the potential direct effects of this project. This data is necessary to ensure that the take limit is not exceeded for the project and will also provide needed information that may assist in recovering the species.

Indirect Effects

Piping plovers will spend little time in the action area each year and most of this time will be spent passing through during spring and fall migration. Therefore, indirect effects are unlikely for this species. However, should construction occur during either the spring or fall migration period,

noise and related disturbances during construction could cause piping plovers to avoid the immediate Action Area.

Interrelated and Interdependent Actions

An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. Development of wind energy within the Oklahoma and Texas panhandle regions is interrelated with this action. A thorough discussion regarding anticipated wind power development related to the proposed Project is provided in Clean Line (2014b). With the possible exception of the piping plover, none of the species addressed in this BO occur within the area proposed for wind power development. Although records for piping plovers exist within the proposed wind power development area, the occurrence of the species in this region is extremely rare, based on the known observations of piping plovers.

Cumulative Effects

In the context of a consultation, cumulative effects are the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the Action Area. Future federal actions that are unrelated to the proposed action are not considered, because they require separate consultation under section 7 of the Act.

Considering the scope of the proposed Project, there are a number of future actions that could occur within the project area. Documenting and describing all of these actions at length would be almost impossible considering the scope of the action area. The BA and the draft EIS (DOE 2014) both describe a number of possible future actions that are reasonably certain to occur within the project area. However many of these are transportation projects that likely will involve some federal funding through the Federal Highway Administration and thus will require separate consultation under section 7. The BA and draft EIS (DOE 2014) should be reviewed for a list of the anticipated transportation actions. The draft EIS (DOE 2014) also includes a discussion of cumulative effects of the proposed action and should be consulted for additional information. The Service attempted to consider all of these cumulative effects in reaching our conclusion.

Several petroleum pipelines are anticipated in the near future, and are presumed to be non-Federal, provided these pipelines do not transport natural gas. One of particular note is the proposed Diamond Pipeline Project, which is being developed through collaboration between Valero Energy Corporation and Plains All American Pipeline Company. This proposed crude oil pipeline project is within the same general area as the Clean Line Project and will follow a similar route to the Clean Line Project. The proposed Diamond Pipeline Project would involve construction of approximately 682 km (424 miles) of 51-centimeter (20-inch) pipeline between Cushing, Oklahoma, and Memphis, Tennessee. The project is currently being evaluated, including route selection. Finalization of engineering plans and permits and rights-of-way acquisition are planned in 2015 with initiation of construction to follow. This pipeline has an anticipated in-service date of 2016.

The Cherokee Nation has proposed a new hydropower plant on the Arkansas River at the existing W.D. Mayo Lock and Dam in Oklahoma (DOE 2014). The project is currently in the early planning stages and no firm plans have yet been developed. The Water Resources Reform and Development Act of 2014, passed on June 10, 2014, authorizes the Cherokee Nation of Oklahoma

to design and construct one or more hydroelectric generating facilities at the W.D. Mayo Lock and Dam and to market the electricity generated from any such facility. The proposed hydropower plant site is approximately 19 km (12 miles) south of the Applicant Proposed Route for the transmission line near Fort Smith. The Service anticipates that, should this project move forward, a federal nexus would exist and consultation under section 7 would occur.

In Arkansas, Entergy Arkansas, Incorporated has plans to rebuild the 161kV transmission line from Trumann to Trumann West by replacing the current wooden structures with steel monopoles (DOE 2014). This transmission line runs generally north-south compared to the east-west direction of the proposed Clean Line Project. The nearest segment of the Trumann to Trumann West transmission line is approximately 16 km (10 miles) north of the Applicant Proposed Route. This transmission line replacement is proposed for 2021. The Service is unclear whether a federal nexus would exist for this project.

Portions of the Action Area have been converted to row-crop agriculture, intensively managed timber lands, or have undergone extensive urban or industrial development. The Service expects these activities will continue to occur although we lack specific information related to the location and timing of these activities. However we anticipate that some of these activities may impact federally-listed species.

BIOLOGICAL OPINION CONCLUSION

After reviewing the current status of each affected species, the environmental baseline for the Action Area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that implementation of the proposed action is not likely to jeopardize the continued existence of the affected species. To jeopardize the continued existence of a species is defined as an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing reproduction, numbers, or distribution of that species (50 CFR §402.02). However, the proposed action likely will result in incidental take of these species. No critical habitat has been designated, or if designated, critical habitat does not occur in the Action Area; therefore, none would be affected. The Service's conclusion for each species is provided in the sections that follow and is based on the analyses provided in those sections. Additionally, the conclusions of this biological opinion are based on full implementation of the project as described in the "Description of the Proposed Action" section of this document, including any Conservation Measures that were incorporated into the project design.

American burying beetle

After reviewing the current status of the American burying beetle, the environmental baseline for the Action Area, the effects of the proposed Clean Line Transmission Project and the cumulative effects, it is the Service's biological opinion that the Clean Line Transmission Project, as proposed, is not likely to jeopardize the continued existence of the American burying beetle and is not likely to destroy or adversely modify any designated critical habitat.

The proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the ABB because the minimization and avoidance measures included in the BA will minimize overall impacts to the species, reduce the level of take, and result in long-term mitigation for impacts by preserving ABB habitat in perpetuity.

The Service's determination is based on the following primary factors:

- Since the Recovery Plan was approved in 1991, numerous other ABB populations have been discovered, and the recovery objective of reducing the immediate threat of extinction through discovery or establishment of new populations has been met (Service 2008a).

- Activities covered under this BO likely would cause take of ABBs in the form of killing, harming, and harassment within Oklahoma and Arkansas. However, most of these losses constitute a one-time or short-duration pulse effect to the ABB populations in Oklahoma and Arkansas, so they will have only minor adverse effects to ABB populations long-term.

- Loss of habitat is spread over approximately 5,886.4 hectares (14,545.5 acres) of ABB habitat within the known range in Oklahoma and Arkansas. Because permanently lost acres of ABB habitat will be mitigated at a 1:1 ratio or higher, newly fragmented acres of ABB habitat will be mitigated at a 1:0.5 ratio or higher, and temporarily lost acres of ABB habitat will be restored and mitigated at a 1:0.25 ratio or higher, the protection and management in perpetuity of ABB conservation areas is expected to fully mitigate for the effects of the habitat loss during construction.

- Methods used to determine the amount of ABB habitat within the Action Area in Oklahoma and Arkansas has not been applied to other states within the ABB range. However, given that ABB range does exist in other states, the Service anticipates that the overall percentage of range wide ABB habitat that may be impacted by the proposed action is small when compared to the overall range of the species.

- Mortality of the ABB that occurs as a result of project implementation and continued operation would constitute a short-term effect to populations. Additionally, the proposed mitigation is anticipated to provide secure areas for ABB and offsets for these short-term effects and would have positive impact on the species as a whole.

With respect to the ABB, the conclusions of this biological opinion are based on full implementation of the project as described in the "Description of the Proposed Action" section of this document, including any Conservation Measures that were incorporated into the project design.

Bats

After reviewing the current status of the gray bat, Indiana bat, northern long-eared bat, and Ozark big-eared bat, the environmental baseline for the Action Area, the effects of the proposed Clean Line Transmission Project and the cumulative effects, it is the Service's biological opinion that the Clean Line Transmission Project, as proposed, is not likely to jeopardize the continued existence of the gray bat, Indiana bat, northern long-eared bat, or Ozark big-eared bat, and is not likely to destroy or adversely modify any designated critical habitat. With the exception of the Ozark big-eared bat, the Action Area impacts only a small portion of the range of these bats. The Ozark big-eared bat, although its range is very restricted, does not occur in large numbers within the areas impacted by the proposed action. However, deforestation associated with this proposed action

will remove potential roost trees and foraging habitat for all four species of bats but the extent of that deforestation is a relatively small percentage of the foraging and roosting habitat available throughout the range of these species. We currently lack information on the occurrence of cave-like subterranean features within the entire proposed ROW and are unable to determine if such features are occupied and would be impacted by the proposed action.

The conclusions of this biological opinion are based on full implementation of the project as described in the "Description of the Proposed Action" section of this document, including any Conservation Measures that were incorporated into the project design. Species specific conservation measures for bats provided in the BA include mitigating for impacts to occupied habitat, limiting tree clearing to the period between November 1 and March 31 if a roost tree if found to be occupied, conducting surveys prior to construction according to current guidelines, and providing buffers around occupied maternity roost trees. Specific details on the species specific measures are provided in the BA.

Interior Least Tern

After reviewing the current status of the interior least tern, the environmental baseline for the Action Area, the effects of the proposed Clean Line Transmission Project and the cumulative effects, it is the Service's biological opinion that the Clean Line Transmission Project, as proposed, is not likely to jeopardize the continued existence of the interior least tern and is not likely to destroy or adversely modify any designated critical habitat.

The most substantial adverse effect of the proposed action is to interior least terns during the breeding and nesting season and is caused by collisions with power lines near the breeding and feeding habitat in the Action Area.

Interior least terns typically follow river corridors during migration because these rivers often provide suitable loafing, nesting and feeding habitat. Where suitable habitat is present, waterways provide opportunities for interior least terns to reproduce and complete their life cycle. The Clean Line transmission line crosses three rivers in the Action Area with known interior least tern populations. Interior least terns use sand and gravel bars in or near these rivers and colony sites are consistently noted in portions of the Action Area. The Cimarron River population will be considered with the Arkansas River population for this opinion. The Mississippi River population will be considered separately.

With respect to the interior least tern, the conclusions of this biological opinion are based on full implementation of the project as described in the "Description of the Proposed Action" section of this document, including any Conservation Measures that were incorporated into the project design.

Piping Plover

After reviewing the current status of the piping plover, the environmental baseline for the Action Area, the effects of the proposed Clean Line Transmission Project and the cumulative effects, it is the Service's biological opinion that the Clean Line Transmission Project, as proposed, is not likely to jeopardize the continued existence of the piping plover, and is not likely to destroy or adversely modify designated critical habitat.

The interior subspecies of the piping plover uses the Mississippi Flyway as a migratory corridor when moving between breeding grounds in the interior of the United States and wintering areas along the coastline. The Mississippi River is a significant aquatic feature within the Action Area and is used by plovers during migration. However the overall intensity of the disturbance is expected to be low, particularly if an Avian Protection Plan is developed to help minimize the risk of collision with the proposed transmission line.

With respect to the ABB, the conclusions of this biological opinion are based on full implementation of the project as described in the "Description of the Proposed Action" section of this document, including any Conservation Measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the DOE so that they become binding conditions of any grant or permit issued to Clean Line, as appropriate, for the exemption in section 7(o)(2) to apply. The DOE has a continuing duty to regulate the activity covered by this incidental take statement. If the DOE fails to assume and implement the terms and conditions or DOE fails to require Clean Line to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, Clean Line or DOE must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Use of Habitat Impacts as a Proxy for Take

The use of habitat as a proxy for take of individuals of a species is consistent with existing case law. Courts have recognized that as a general matter Congress intended incidental take to be stated in numbers of animals, where practical, not in terms of habitat markers. However, courts also have explained that although Congress indicated its preference for a numerical value; it anticipated situations in which impact[s] could not be contemplated in terms of a precise number. In the absence of a specific numerical value, however, the Fish and Wildlife Service must establish that no such numerical value could be practically obtained (see Arizona Cattle Growers' Association v. U.S. Fish and Wildlife Service, 273 F.3d 1229, 1249-50 [9th Cir. 2001]). For purposes of this biological opinion, the Service defines incidental take in terms of the number of acres impacted.

The Service considers using acres of habitat disturbed as an appropriate surrogate, because habitat disturbance is the primary cause of take associated with the project.

Amount or Extent of Take Anticipated—American Burying Beetle

The Service anticipates incidental take of ABBs will occur as a result of the proposed action in the form of harm, harass, and/or mortality. Estimating the number of ABBs that will be taken is difficult because the population size is unknown and estimates of ABB density within the Action Area are not available. Take of individual ABBs also is difficult to quantify because: 1) individuals of the species are small in size, making them difficult to locate, which makes encountering dead or injured individuals unlikely; 2) ABB losses may be masked by temporal fluctuations in numbers; 3) ABBs spend a substantial portion of their lifespan underground; and, 4) the species is primarily active at night. Although we cannot estimate the number of individual ABBs that will be incidentally taken, the Service is providing a mechanism to quantify take levels and define when take would be considered to be exceeded. For purposes of this BO, the Service defines incidental take in terms of the extent of favorable habitat that is expected to be impacted by the proposed action. The Service used estimates provided in the BA and supporting documents, as explained in this BO, information exchange between DOE representatives and Service staff, and a review of publicly available information and scientific literature to determine the extent of habitat that would be taken. Based on these calculations, the Service anticipates that incidental take of ABBs may occur, in the form of harm, harassment, and/or mortality, within a maximum of 5,886.4 hectares (14,545.5 acres) of presumed occupied ABB habitat within the Action Area. Therefore, the amount of incidental take for the ABB authorized by this BO includes all individual ABBs within an area of no more than 5,886.4 hectares (14,545.5 acres) of ABB habitat that occurs within the Action Area.

Amount or Extent of Take Anticipated—Bats

The Service anticipates that incidental take of the gray bat, Indiana bat, northern long-eared bat, and Ozark big-eared bat will occur as a result of the proposed action. However that take will be difficult to detect because: 1) individual bats are small and active at night but may occupy a large range of habitats that are common and extensive in the area making them generally difficult to find; 2) variability in demographic and environmental conditions; 3) corpses are small and generally preyed upon by birds and mammals or quickly rot making finding dead or injured specimens during or following project implementation very unlikely; 4) implemented actions will not affect all available habitat within the project area or within the adjacent forest, providing injured bats opportunities to escape detection; and, 5) most incidental take will be non-lethal and/or undetectable. The Service also lacks accurate information on the abundance, distribution and occupancy of bats and cave-like subterranean features within the Action Area, making estimating take of gray bat, Indiana bat, northern long-eared bat, and Ozark big-eared bat extremely difficult.

However, the Service anticipates incidental take of gray bats, Indiana bats, northern long-eared bat, and Ozark big-eared bat, can be expected, in the form of harm and harassment because the proposed action will result in habitat loss and disturbance/noise that likely will cause stress or possible injury to individual bats. Additionally the loss, modification or alteration of suitable habitat from deforestation and smoke produced during burning of brush piles may cause stress and related biological effects associated with the proposed action.

However, because we lack specific information on the distribution, abundance and occupancy of bats and the number and occupancy of cave-like subterranean features within the Action Area, the Service is unable to estimate the amount of take of individual bats. Instead the Service used information on the amount of area within the proposed ROW and associated buffer to estimate the amount of habitat that would be impacted by the proposed action. Take, as expressed by the extent of habitat impacted, was then determined for gray bats (GB), Indiana bats (IBAT), northern long-eared bat (NLEB), and Ozark big-eared bat (OBEB). Clean Line provided a shape file of the proposed route that was used to determine the amount of potential habitat that will be affected for each species within a 91.4 meter (300 foot) wide corridor along the proposed route. The resulting area within the ROW and buffered corridor were multiplied by the percent of the proposed route that was surveyed, giving the resulting impacted acres. The Service did not calculate the impacted area for the entire route within the known range of each species because information for the entire route was unavailable. The Service, in conducting this analysis, then assumed that the land area within the defined impacted acres was comprised of entirely suitable habitat. Because we lacked this information for the entire length of the proposed route within the range of the species, we did not assume the entire length was suitable. The information on the extent of impacted habitat is provided in Table 4.

Table 4. Extent of impacted area within ROW for each species of bat.

Species	Area Within ROW and Buffer (Acres)	Percent of Route Surveyed	Impacted Acres
NLEB	16,542	39.0	6,451.3
GB	12,193	41.0	4,999.0
OBEB	6,385	41.0	2,618.0
IBAT	10,360	35.5	3,677.8

Because the Service lacks information on the actual extent or suitability of the impacted acres to gray bat, Indiana bat, northern long-eared bat, and Ozark big-eared bat, our estimates likely are not accurate. Although the extent of the area that would be impacted by the permanent ROW can be estimated, we do not believe the entire route within the ranges of these species provides suitable habitat. We also do not have information on the extent to which the identified roost trees or cave-like features are occupied. Additionally, information on these features throughout the proposed route is unavailable. The Service also lacks solid information on the number of suitable roost trees that may occur within the ROW. The count provided in the BA likely underestimates the number of potential roost trees for the Indiana and northern long-eared bats. Lacking specific information that the Service can use to estimate take, the Service assumes that all impacted acres within the range of each species is suitable habitat. Based on the assumption that this habitat is suitable and occupied, the loss of habitat, as provided in Table 4, will be used as an estimate of the extent of take for each species. Accordingly, 6,451.3 acres of habitat for the northern long-eared bat, 4,999.0 acres of habitat for the gray bat, 2,618 acres for the Ozark big-eared bat and 3,677.8 acres for the Indiana bat are authorized to be taken by the proposed action.

Amount or Extent of Take Anticipated—Interior Least Tern

The Service anticipates incidental take of interior least terns will occur as a result of the proposed action, primarily in the form of harm, harass, and/or killing. However, estimating the amount or extent of incidental take is difficult to enumerate in the form of individual least terns. The incidental take occurs in many direct and indirect forms that cannot be easily measured with

existing or proposed levels of monitoring based on the locations of the proposed transmission line river crossings.

The Service expects incidental take of least tern will occur due to collision with or electrocution by power lines or support structures. The exact numbers of interior least terns within a colony may vary annually based on the total population of interior least terns, weather conditions, and other factors outside the control of Clean Line. The most recent available population estimates and average fledgling rates for interior least terns will be used to estimate the amount or extent of take. Additionally take of eggs, chicks and adults by factors influenced by, but not directly attributable to the proposed action are expected to occur. An unknown number of eggs and chicks may be lost due to predation, weather, alterations in hydrology and habitat, disturbance due to construction, maintenance and operation of the transmission line, and other factors that are influenced by, but not directly attributable to Clean Line activities. Based on available estimates of interior least tern population size, fledgling to adult ratios and anticipated collision frequency, the Service estimates that an incidental take of 21 interior least terns will occur annually, with a total take of up to 630 interior least terns over a thirty year life of the project. The methods for estimating this take is provided below.

Population estimates

The estimates of incidental take in this opinion are therefore based on averages of existing tern population levels and reproductive success, with the assumption that the proposed action should be able to maintain the number of adults and fledglings that have been documented in recent years. These measures of tern population levels and reproductive success for the existing population's status are used as a surrogate measure of incidental take and a way to measure the effects of the proposed action. The direct and indirect take (in all forms) cannot be precisely determined, but can be estimated through least tern population numbers and breeding success.

All existing tern populations within the proposed action area were used to estimate potential incidental take. For the action area encompassing the Mississippi River, the 2008-2012 period is used to represent existing conditions as this is the current available data. For the action area encompassing the Arkansas River, the 2006-2011 data is used. The estimates (averages) of existing numbers of adult and fledgling terns on Oklahoma by river reach for 2006-2011 are approximately 415 adults and 163 fledglings annually in the 342 mile reach between the Arkansas River, Oklahoma, Kaw Reservoir and Oklahoma/Arkansas state line (excluding created islands in the navigation system), including the lower Canadian River below Eufaula Reservoir.

As discussed previously, a reasonable estimate of fledgling to breeding pair ratio for the Action Area is 0.7 based on the best available information.

Collisions

Generalizations about avian collision frequency and mortality from past studies must be used in the absence of site specific data with the realization that location specific circumstances exist at the project site. Even within a site, variations exist based on migration timing, breeding success, local weather conditions and even topography.

Estimates of avian collision statistics vary widely among surveys. Barrientos (2012) found an average of 8.2 collisions/month for all birds in the study area; with approximately 61.6 percent of

these strikes being gulls and terns (Laridae). With these estimates over a three month nesting period, the Laridae mortality would be approximately 15 birds/breeding season. A study of two common tern nesting colonies 100m and 200m from transmission lines noted collision mortality of 0.5% of the colony population (approximately 500 terns) during one breeding season (Henderson *et al.* 1996).

A 2014 quantitative review estimated avian mortality at 23.2 fatal collisions/km/pole for all bird species (Loss, Will and Marra 2014), while other studies have estimated mortality at between 0.02 and 7.14 birds/km (Brown et al. 1987, Faanes 1987, Ward and Anderson 1992). In a study in the prairie region encompassing two spring and two fall migrations, a total kill estimate of 1,332 birds beneath a total of 9.6 km (5.96 mi) of power lines over lakes, wetlands, and riparian areas. Of this mortality, gulls made up 23 percent of the total (Faanes 1987), for an estimate of 51 gull mortalities/mi/yr.

The estimate of bird collisions affecting 0.5 percent of the colony population will be used to estimate incidental take for colonies within close proximity to the transmission lines and the estimate of 50 bird collisions/mi/yr used to estimate take for the transmission line in the interior least tern migration path with the recognition that these two estimates are not mutually exclusive.

Recognizing that a subset of interior least terns (e.g., those nesting in colonies in closer proximity to the transmission lines) will be affected to a greater extent in the Mississippi River crossing with suitable habitat for breeding and feeding than known colonies than in the Arkansas River crossing in Oklahoma with very limited suitable habitat. For the Mississippi River, in the 120 river mile section between Osceola and Helena, AR, the average population (2008-2012) count of ILT was 1,960 adults in 11 colonies. One half of one percent of this population equals ten interior least terns expected collide with the transmission lines annually.

For the Arkansas River crossing, the population estimate of 415 adults will be used to determine the amount of take of interior least terns. One half of one percent of this population equals two interior least terns that may collide with the transmission lines annually, for a two river total of 12 interior least terns annually.

If each of these birds is assumed to have a fledgling to breeding pair ration of 0.7, then an additional nine fledglings will be lost for a total incidental take of 21 ILT annually.
Over the thirty year life of the project, incidental take of up to 630 interior least terns is anticipated.

Clean Line must reinitiate consultation with the Service if direct and indirect take occurs to the degree that the number of adults and fledglings, for the Action Area, average (over a five year period) is greater than 105 interior least terns (one-sixth of the total take for the 30 year project).

Amount or Extent of Take Anticipated—Piping Plover

The Service anticipates incidental take of piping plover, in the form of harm and killing, can be expected based on the volume of literature suggesting large numbers of birds, including migratory shorebirds, collide with transmission lines. However, the Service anticipates incidental take of the piping plover will be difficult to detect for the following reasons: 1) individuals are small and may occupy a large range of habitats that are common and extensive in the area making them generally difficult to find; 2) variability in demographic and environmental conditions; 3) corpses

are small and generally preyed upon by birds and mammals or quickly rot; and, finding dead or injured specimens during or following project implementation is unlikely unless post-construction monitoring is accomplished.

The Service's take assessment is based on current literature and the limited information provided by Clean Line in the BA and supporting materials. Take of 15 piping plovers over a 30 year life of the project was determined for piping plover in the form of mortality resulting from collision with the proposed transmission line. The following analysis was used to estimate the amount of incidental take provided for piping plover.

Approximately 27.8 million breeding shorebirds occur in northern North America (Brown *et al.* 2000) and approximately 5,945 piping plovers exist and breed in northern North America (Morrison *et al.* 2006). However, for this analysis we will only consider plovers from the Great Plains and Great Lakes breeding populations. Therefore, the maximum number of piping plovers assumed to migrate through the Mississippi Flyway are approximately 3,063 (Morrison *et al.* 2006). These numbers suggest that piping plovers make up about 0.01% of the total number of breeding shorebirds in North America.

Faanes (1987) estimated 200 avian fatalities per mile per year in a study conducted in North Dakota. Of the birds killed, Faanes found that 8% of them were shorebirds. Other studies, such as Koops (1987) and Erickson *et al.* (2005), estimated 261 avian fatalities per mile per year in the Netherlands. However, we believe that numbers observed from the North Dakota study are a better representation of conditions within the Action Area. Therefore, we assume that:

1. 8% (shorebirds) of 200 avian fatalities per mile per year = 16 shorebird fatalities per mile per year.

There are approximately 300 miles of transmission line proposed to traverse the Mississippi Flyway. Therefore,

2. 300 miles x 16 shorebird fatalities = 4,800 shorebird fatalities per year in the Mississippi Flyway.

3. 4,800 shorebird fatalities per year x 30 year lifespan = 144,000 shorebird fatalities over 30 years

4. 0.01% (percentage of piping plovers out of total shorebirds) of 144,000 shorebird fatalities = 14.4.

5. Conservatively, 14.4 rounds up to 15 piping plover fatalities over the 30 year life of the project.

Effect of the Take

American Burying Beetle

In the accompanying biological opinion, the Service has determined that this level of anticipated take is not likely to result in jeopardy of the ABB due to the fact that most of the impacts associated with the action are temporary in nature, the permanent minimization of take, and the

effects of conservation of large blocks of habitat. No critical habitat has been designated for the ABB; therefore, none will be affected.

Bats

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the gray bat, Indiana bat, Northern long-eared bat, or Ozark big-eared bat, or destruction or adverse modification of critical habitat.

Interior Least Tern

In the accompanying biological opinion, the Service has determined that the level of anticipated take is not likely to result in jeopardy to the interior least tern. Using existing estimates of interior least tern density and mortality/injury rates, the total number of ILTs injured or killed is not expected to exceed 21 birds annually or 630 birds over the 30 year life of the project.

Piping Plover

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the piping plover, or destruction or adverse modification of critical habitat.

Important considerations regarding take estimates

The information presented in the BA is inadequate to accurately estimate take for any of the species addressed within this BO. Information on habitats impacted for the entire route of the proposed transmission line is unavailable and won't be available until a final action alternative is selected and Clean Line has the ability to survey the entire route. Consequently, we based our estimates of take on the information available in the BA. These estimates likely in some cases underestimate and in others overestimate the take that would occur, but we are unable to reasonably determine, based on the information provided, the take that would occur. We anticipate that DOE will need to reinitiate consultation on this proposed action once more detailed information on the impacts of the proposed transmission line is obtained.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

Pursuant to section 7(b)(4) of the Act, the following reasonable and prudent measures are necessary and appropriate to minimize the amount of incidental take. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impacts of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. The DOE must then immediately provide an explanation of the causes of the taking and review with the appropriate Ecological Service's Field Office the need for possible modification of the reasonable and prudent measures.

American Burying Beetle

The Service recommends the following Reasonable and Prudent Measures (RPM) to DOE to minimize potential take of the ABB.

1. The DOE will fully implement actions as described in this BO, including all proposed conservation measures and mitigation.

2. The DOE will ensure Clean Line shall perform ABB presence/absence surveys or assume presence in suitable habitat prior to construction. Additionally DOE and Clean Line shall delineate actual extent of impacted area that will occur during project construction based on these surveys or within the areas where occupancy is presumed to occur.

3. The DOE shall ensure the Clean Line monitors the level of take associated with the construction of the Project to ensure the level of take provided in this BO has not been exceeded.

4. The DOE shall ensure the Clean Line shall take every precaution to minimize the potential for direct killing of American burying beetles occurring in soil in the impact area, before, during, and after project implementation.

5. The DOE shall ensure the Clean Line shall perform presence/absence surveys to determine which locations are known to harbor ABB, and provide the Service with the actual amount of disturbance associated with operation and maintenance of the proposed action.

6. The DOE shall ensure that Clean Line track the amount of O&M activity and soil disturbance conducted over the life of the project to ensure that take have not been exceeded over the life of the project.

7. Fill dirt, if necessary for any phase of project activity, shall come from areas of nonnative vegetation where the beetle is not expected to be present. Soil should not have been recently treated with insecticides prior to use.

In order to be exempt from the prohibitions of section 9 of the Act, the DOE must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above, and outline any required reporting/monitoring requirements. These terms and conditions are non-discretionary.

RPM 1

1. The DOE shall work with the Oklahoma Ecological Services Field office prior to initiation of the 2016 active season to develop and prepare a monitoring report to be submitted to the Oklahoma Ecological Service's Field Office by January 1 of each year. This report shall briefly document the effectiveness of the terms and conditions and locations of listed species observed, and, if any are found dead, suspected cause of mortality. The report shall also summarize tasks accomplished under the proposed minimization measures and terms and conditions. The report shall make recommendations for modifying or refining these terms and conditions to enhance listed species protection or reduce needless hardship on the DOE and its permittees.

RPM 2

1. The DOE shall ensure Plains & Eastern Clean Line LLC perform ABB presence/absence surveys (or assume presence) in areas of favorable habitat to elucidate the actual occupied acreage within the Action Area. This information will be used by Clean Line and the Service to refine the estimates of take associated with the proposed project.

2. Before any ground disturbance occurs DOE shall ensure Clean Line
   a) Determines the permanent, permanent cover change and temporary impacts and provide this information in a report to the Service for review and approval;
   b) Ensure that mitigation is secured prior to project construction;

3. The DOE shall ensure Plains & Eastern Clean Line LLC submit actual impact acreage for each impact type (temporary, permanent cover change, permanent) to ensure compliance

RMP 3

1. Plains & Eastern Clean Line LLC shall monitor the project area and other areas that could be affected by the proposed action to ascertain take of individuals of the species and/or loss of its habitat that causes harm or harassment to the species.

RPM 4

1. If a dead or impaired ABB is found, care should be taken in its handling to preserve biological materials in the best possible state for later analysis of cause of death in accordance with measures described in the section on Disposition of Dead or Injured Listed Species.

2. All dead or moribund adults should be salvaged by placing them on cotton in a small cardboard box as soon as possible after collection. The date and location of collection should be included with the container. Specimens should then be furnished to the Sam Noble Museum of Natural History at the University of Oklahoma in Norman for deposition in their collection of invertebrates, or to another suitable site approved by the Service.

RPM 5

1. DOE will calculate and purchase Credits from U.S Fish and Wildlife Service approved ABB Conservation Banks to offset acres of ABB impact prior to the start of the project (or impact occurrence) or develop a similar amount of Permittee-Responsible Mitigation lands.

RPM 6

1. Clean Line can chose to survey for ABBs prior to the O&M activity following the Service's guidelines that are currently accepted at the time the surveys occur (likely to change over the life of the project). If no surveys are conducted, ABBs will be assumed to be present.

RMP 7

1. During the first growing season following construction or immediately following soil ripping if construction concludes during the growing season, a mixture of native warm season grasses shall be planted within the ROW. This shall include species found within the ecoregion where the activity is implemented, such as little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*).

Bats

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of the gray bat, Indiana bat, northern long-eared bat, and Ozark big-eared bat.

1. Clean Line will ensure surveys are conducted for potential roost trees and locations of caves or cave-like features throughout the entire final selected route within the known range of these species.

2. Clean Line will monitor take to verify that the authorized level of take has not been exceeded.

3. Clean Line will apply time of year restrictions and limit tree removal and burning to the period between October 15 and March 31.

4. Clean Line will implement all environmental measures identified in the BA and supporting documents in an effort to minimize harassment during construction within either the active or inactive season.

5. Clean Line will provide appropriate mitigation for the loss of any habitat known to be occupied by gray bat, Indiana bat, northern long-eared bat or Ozark big-eared bat, as stated in the BA.

In order to be exempt from the prohibitions of section 9 of the Act, the DOE must comply with the following terms and conditions, which implement the identified reasonable and prudent measures, described above, and outline any required reporting/monitoring requirements. These terms and conditions are non-discretionary.

RPM 1.

1. All surveys are must be conducted by a biologist with a current section 10 permit for gray bat, Indiana bat, northern long-eared bat and Ozark big-eared bat. Results of these surveys are to be provided to the Service as quickly as possible.

2. If a survey finds evidence of current or likely use of cave or cave-like formations or roost trees by federally-listed bats (e.g., presence of federally-listed bats, moth wings and/or guano), DOE will reinitiate consultation. An appended BA should be prepared outlining the new information and allow the Service to refine take estimates.

3. Considering very few caves meet gray bat or Ozark big-eared bat biological requirements for both maternity sites and hibernacula, all caves and cave-like features within the selected ROW must be surveyed for use during the same maternity or hibernating season of the same year that construction is planned.

4. Ozark big-eared bat maternity surveys should be conducted between May 15 and July 15, and winter hibernation surveys should be conducted between November 15 and February 15. If the duration of the project is anticipated to occupy both the maternity and hibernation seasons of the same year, then surveys will be conducted during both seasons to check for use before construction starts.

5. If, during surveys, a cave or cave-like feature is found to be occupied by the gray bat, Indiana bat, northern long-eared bat or Ozark big-eared bat, Clean Line will monitor the site for three years post-construction to determine the impact of construction on occupancy of the identified site. Clean Line shall contact the appropriate Service office to determine appropriate methods for monitoring the site.

RPM 2.

1. Take by harm and harassment when active maternity trees are removed during the inactive season will be monitored through documentation of the number of active roost trees removed. The number potential roost trees removed will be provided to the Service along with the number of individuals known to occupy the tree(s) during the active season. These data will be reported to the Service as described below.

2. Clean Line will provide the Service an annual report detailing the area (acres) of forested habitat removed, number of active maternity roost trees and/or the 300 ft. buffer removed, number of caves identified and surveyed, and species observed during cave surveys. This report must include a copy of all Indiana and northern long-eared bat survey results and reasonable and prudent measures implemented. Clean Line will verify that the report covers their permit areas prior to submitting it to the USFWS. Clean Line will submit the full report by December 31 every year.

RPM 3.

1. Tree removal will be conducted during the inactive season of October 15th through March 31st.

2. Active season will be extended to November 15th if a new hibernaculum/fall swarming site is identified through survey efforts. This will represent new information and DOE must reinitiate consultation.

RPM 4.

1. Direct temporary lighting away from suitable habitat.

2. Insure that all phases/aspects of the project (e.g., temporary work areas, alignments, fill disposal area, etc.) avoid tree removal in excess of what is required and has been assessed to implement the project safely.

3. Ensure tree removal is limited to that specified in project plans. Install bright orange flagging/fencing prior to any tree clearing to ensure contractors stay within clearing limits. Ensure that contractors understand clearing limits and how they are marked in the field.

4. To minimize potential effects on air quality, construction contractors will use water trucks and other proactive measures to prevent discharges of dust into the atmosphere that may unreasonably interfere with the public and adjacent properties or may be harmful to plants and animals.

5. To minimize potential indirect effects on bats or aquatic insects which may provide forage, adverse effects to aquatic resources will be minimized through strict adherence to the Stormwater Pollution Prevention Plan (SWPPP).

RPM 5.

1. Clean Line shall ensure that appropriate mitigation is secured for any impacts prior to initiation of construction. Use or development of a conservation bank or development of a similar amount of Permittee-Responsible mitigation lands is appropriate and should be in accordance with Service conservation banking guidance.

2. If post-construction monitoring indicate abandonment of a previously occupied cave or cave-like feature, Clean Line will work with the Service and appropriate State agencies to protect, by fee or easement, or enhance a suitable surrogate feature currently under protection for use by these bats.

Interior Least Tern

The Service recommends the following RPMs for the proposed transmission line be implemented to minimize potential take of interior least terns:

1. Develop and implement a project specific appropriate Avian Protection Plan to minimize collisions with transmission lines.

2. Monitor take of interior least terns.

3. Conduct, evaluate, and adjust construction, maintenance, and operations as needed to minimize take of ILT.

In order to be exempt from the prohibitions of section 9 of the Act, the DOE must comply with the following terms and conditions, which implement the identified reasonable and prudent measures, described above, and outline any required reporting/monitoring requirements. These terms and conditions are non-discretionary.

RPM 1.

1. The Avian Protection Plan (APP) will be consistent with the Avian Power Line Interaction Committee (APLIC) guidance and should include such measures as bird diverters, perch deterrents, and timing of construction and planned maintenance operations to avoid the breeding season for the interior least tern.

2. As part of the APP, Clean Line will mark those sections of transmission line that cross major rivers and may therefore be preferentially used as movement corridors by bald eagles, least terns, and other avian species with traditional marker balls, spiral vibration dampeners, or air flow spoilers. These markers will be installed on the shield wires with spacing dependent on the type of marker used. Markers placed at river crossings would extend from the river centerline out to a distance of 300 feet beyond each river bank. Markers will be inspected and replaced as necessary as part of routine maintenance activities.

RPM 2.

1. Monitor habitat with a survey for the presence and condition of sand bars/gravel bars and a subsequent presence/absence survey for terns prior to initiating construction or maintenance in areas within 1 mile of the river sections between April 15 and September 15. Clean Line should conduct routine monitoring surveys during the breeding season for bird strikes near the river crossings and coordinate with ongoing survey efforts near the crossings. If Clean Line determines, as part of the APP and monitoring plan that automated monitoring devices will be used on the transmission line, then two different types of monitors should be used: a Bird Strike Indicator and a Bird Activity Monitor. Clean Line will work with the Service to develop an appropriate post-construction monitoring plan. This monitoring is needed to ensure take limit is not exceeded.

2. Clean Line shall enroll in and utilize the Service's Office of Law Enforcement Bird Fatality/Injury Reporting Program to report bird collisions, injuries, and fatalities with the Plans and Eastern transmission line at: https://birdreport.fws.gov/BirdReportHomePage.cfm

RPM 3.

1. Adaptive management strategies shall be used to minimize take of interior least terns including alteration and improvement to monitoring strategies and line markings based on observed interior least tern take. Activities, such as initial construction and structure placement or routine maintenance, having the potential to disturb interior least terns or their habitat should take place outside of the nesting season (April 1 to September 1). Clearing of woody vegetation within the transmission line ROW and access roads will be performed to the extent possible during the fall and winter months to minimize the potential for clearing activities to disturb nesting birds.

2. Human activities near nesting sandbars can disrupt nesting. Clean line should map or obtain the most recent breeding season's information on interior least tern nesting sites within three miles of the project site and maintain a 1,500 feet buffer between work sites

and nesting sandbars during construction activities in the nesting season if those activities cannot be completed outside of the nesting season.

Piping Plover

The Service recommends the following RPMs for the proposed transmission line be implemented to minimize the potential for take of piping plovers.

1. Develop and implement a project specific appropriate Avian Protection Plan to minimize collisions with transmission lines.

2. Monitor take of piping plover.

In order to be exempt from the prohibitions of section 9 of the Act, the DOE must comply with the following terms and conditions, which implement the identified reasonable and prudent measures, described above, and outline any required reporting/monitoring requirements. These terms and conditions are non-discretionary.

RPM 1.

1. The Avian Protection Plan will be consistent with the Avian Power Line Interaction Committee (APLIC) guidance and should include such measures as bird diverters, perch deterrents, and timing of construction and planned maintenance operations to avoid the breeding season for the interior least tern.

2. As part of the APP, Clean Line will mark those sections of transmission line that cross major rivers and may therefore be preferentially used as movement corridors by bald eagles, least terns, and other avian species with traditional marker balls, spiral vibration dampeners, or air flow spoilers. These markers will be installed on the shield wires with spacing dependent on the type of marker used. Markers placed at river crossings would extend from the river centerline out to a distance of 300 feet beyond each river bank. Markers will be inspected and replaced as necessary as part of routine maintenance activities.

RPM 2.

1. If Clean Line determines, as part of the APP and monitoring plan that automated monitoring devices will be used on the transmission line, then two different types of monitors should be used: a Bird Strike Indicator and a Bird Activity Monitor.

2. Clean Line shall enroll in and utilize the Service's Office of Law Enforcement Bird Fatality/Injury Reporting Program to report bird collisions, injuries, and fatalities with the Plans and Eastern transmission line at:
https://birdreport.fws.gov/BirdReportHomePage.cfm

PROCEDURES FOR HANDLING AND DISPOSING OF DEAD OR INJURED LISTED SPECIES

Upon locating a dead, injured, or sick listed species initial notification must be made to the nearest Service Law Enforcement Office [Oklahoma (405) 715-0617 or Tennessee (615) 736-5532]. Secondarily, the appropriate Ecological Services Field Office should be contacted within three working days of its finding [Oklahoma (918) 581-7458, Arkansas (501) 513-4470 or Tennessee (931) 528-6481]. Written notification must be made within seven calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care and in handling dead specimens to preserve the biological material in the best possible condition.

All dead or moribund individuals will be frozen and the date and location of collection recorded. These specimens should then be furnished to the university, museum, or agency specified by the Service.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency actions that aid in minimizing or avoiding adverse effects of a proposed action on listed species or to designated critical habitat, help implement recovery plans, or assist in development of needed information. The Service offers the following conservation recommendations:

1. We recommend DOE provide limited funding annually for a captive research colony at Oklahoma State University that will be used for testing hypotheses for improving management of ABB.

2. Consider participation in research of effects from Climate Change on the ABB. Changing weather patterns have been observed to impact ABB life history and distribution. Future changes in precipitation and soil moisture as well as higher temperatures have the potential to displace ABB from portions of its last remaining suitable habitats.

3. Investigate options with the Ozark Plateau National Wildlife Refuge (Refuge) to secure sites for permanent conservation by the Refuge.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

COORDINATION OF INCIDENTAL TAKE STATEMENT WITH OTHER LAWS, REGULATIONS, AND POLICIES

Migratory Bird Treaty Act (MBTA)

The MBTA implements various treaties and conventions between the U.S., Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the provisions of the MBTA it is unlawful "by any means or manner to pursue, hunt, take, capture or kill any migratory bird except as permitted by regulations issued by the Service. The term "take" is not defined in the MBTA, but the Service has defined it by regulation to mean to pursue, hunt, shoot, wound, kill, trap, capture or collect any migratory bird, or any part, nest or egg or any migratory bird covered by the conventions or to attempt those activities.

In order to comply with the MBTA and potential for this project to impact nesting shorebirds, the DOE and Clean Line should coordinate with the Service to protect against impacts to migratory birds during implementation of this project. Development, in coordination with the Service, of an appropriate Avian Protection Plan is particularly important in efforts to avoid or minimize collisions with transmission lines.

The Service will not refer the incidental take of interior least terns or piping plovers anticipated with this project for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703-712), provided such take complies with the take statement, reasonable and prudent measures, and terms and conditions specified in this BO.

REINITIATION NOTICE

This concludes the Biological Opinion for the potential effects of the proposed action. As provided in 50 CPR§ 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Jonna E. Polk

11/20/15

Jonna E. Polk, Project Leader
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U.S. Fish and Wildlife Service, Southwest Region

Date

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APPENDIX

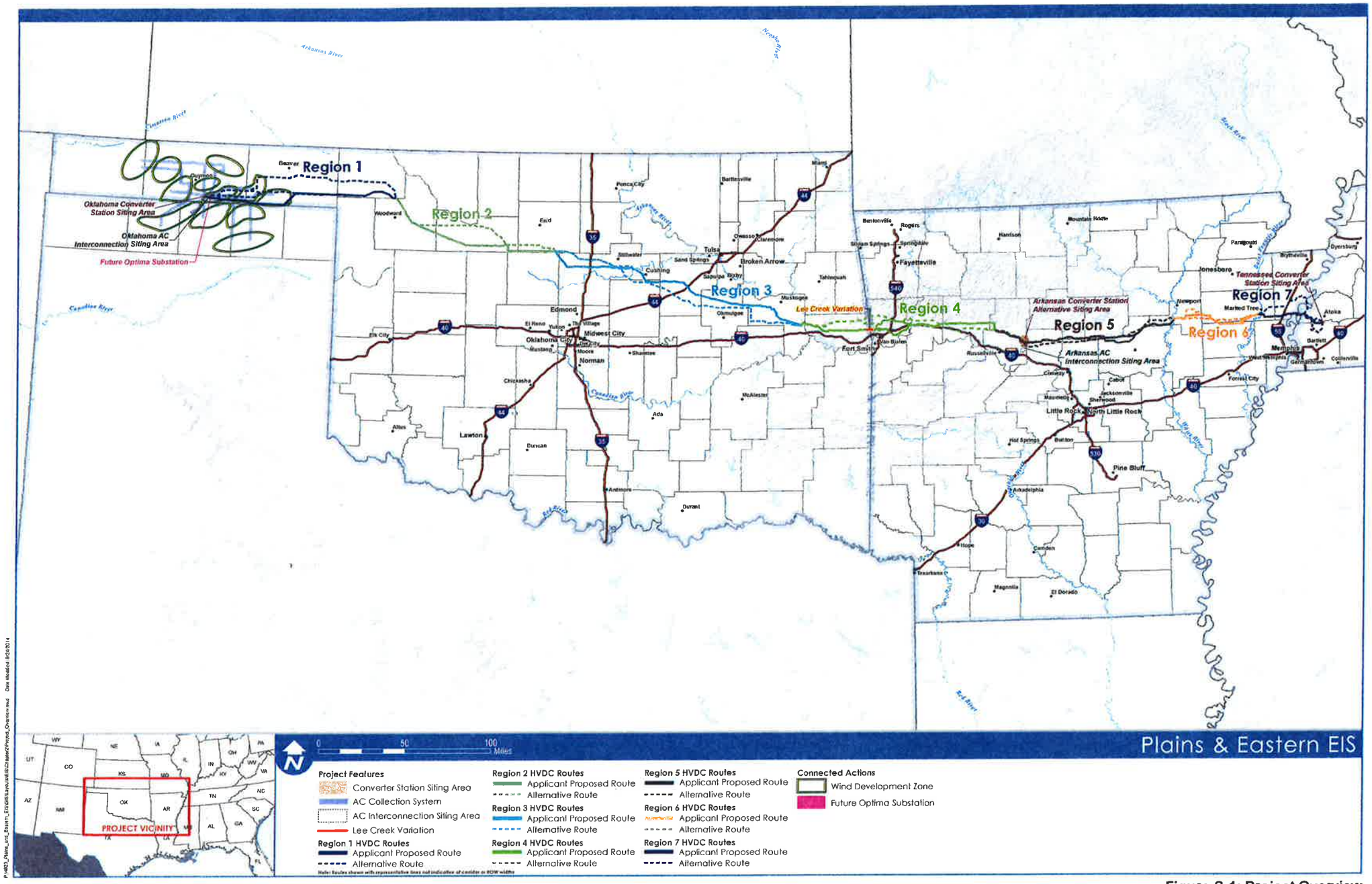

Figure S-1: Project Overview