United States Department of the Interior

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May 1, 2017

MEMORANDUM

To: Chief, Division of Wildlife and Sport Fish Restoration Programs, Region 3

From: Field Supervisor, Missouri Ecological Services Field Office, Columbia, MO

Subject: Wildlife and Sport Fish Restoration Program, Missouri Wildlife Restoration Program Grant (MO-W93-D-23) – Biological Opinion

This memorandum transmits the U.S. Fish and Wildlife Service's (Service) final biological opinion on the Federal Aid Division's (FA) Wildlife Restoration and State Wildlife grants to the Missouri Department of Conservation (MDC). The section 7 Phase 1 evaluation reviewed the effects of implementing the grant on the federally listed Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C., 1531 et seq.).

Some activities that were proposed and covered under the 2016 Intra-Service Biological Opinion were not completed during the FY17 fiscal year. Although they were included in the 2017 Biological Assessment, no changes to the projects are proposed. Therefore, effects of these activities already have been analyzed and take exempted. These projects, take acreage listed below, were not reanalyzed for FY18, but the take exemption is extended through FY18.

Fountain Grove CA – 232 acres
Columbia Bottom – 68 acres
Prescribed burns (46) – 4,853 acres
Small tree removal – 169 acres

After reviewing the status and environmental baseline of Indiana bats and northern long-eared bats and analysis of the potential effects of the Proposed Action to the species, the Service

concludes that Proposed Action is not likely to jeopardize the continued existence of Indiana bats, will not adversely modify designated critical habitat of Indiana bats, and is not likely to jeopardize the continued existence of northern long-eared bats.

If you have any questions or comments on this biological opinion, please contact Karen Herrington, Field Supervisor, at (573) 234-2132.

Cc: MDC, Jefferson City, MO (Attn: Sara Parker Pauley, Tom Draper, Jennifer Battson Warren, and Doyle Brown)

Attachment

INTRA-SERVICE BIOLOGICAL OPINION

for

U.S. Fish & Wildlife Service's Wildlife and Sport Fish Restoration Programs' Allocation of Federal Aid to the Missouri Department of Conservation

for

Habitat Management and Operations and Maintenance

May 2017

1. INTRODUCTION

This document is the U.S. Fish and Wildlife Service's (Service) biological opinion (BO) for the allocation of Federal Aid through the Wildlife and Sport Fish Restoration program (WSFR) to the Missouri Department of Conservation (MDC) (Wildlife Restoration Program Grant, MO-W93-D-22) for the entire fiscal year 2017 (July 1, 2016 to June 30, 2017). The specific program areas under the larger umbrella grants addressed in this BO are Habitat Management and Operation and Maintenance. The purpose of the allocations to these program areas is to facilitate the creation, restoration, and enhancement of wildlife habitats and to enhance public use and access to public lands.

The federally endangered Indiana bat (*Myotis sodalis*) and federally threatened northern long-eared bat (*Myotis septentrionalis*) occur throughout Missouri and use forested habitat in the spring, summer, and fall for roosting and foraging. These species use both dead and live trees for roosting and rearing young and require one or more primary trees plus multiple alternate trees to meet their roosting needs during an annual cycle. Individuals, small colonies, or large maternity colonies can be present in forested habitats from April through October (active season[1]) and exhibit high site fidelity for summer habitats. Populations of forest-dwelling bats benefit from restoration and management of degraded forest communities that facilitates an immediate and long term supply of roost trees in their summer ranges. Actions that will be implemented based on the allocation of Federal Aid to the MDC include management of savannas, woodlands, and forests throughout Missouri. These actions can provide a net benefit to the species but could be conducted during the active season when Indiana bats and northern long-eared bats are present in forested habitats.

This BO describes the effects of these actions on Indiana bats and northern long-eared bats pursuant to section 7(a)(2) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Project details were received on 15 March 2016. Formal consultation began on 16 March 2016.

Section 7(a)(2) of the ESA states that Federal agencies must ensure that their activities are not likely to:

- Jeopardize the continued existence of any listed species, or
- Result in the destruction or adverse modification of designated critical habitat.

Final 4(d) for the northern long-eared bat

On January 14, 2016, the Service published a species-specific rule pursuant to section 4(d) of the ESA for northern long-eared bat. Section 4(d) of the ESA states that:

> *Whenever any species is listed as a threatened species ... the Secretary shall issue such regulations as he deems necessary and advisable to provide for the conservation of such species* (16 U.S.C. 1533(d)).

[1] The active season in Missouri is defined as April 1 through October 31.

The Service's 4(d) rule for northern long-eared bat establishes prohibitions from take for activities involving tree removal and activities that do not involve tree removal. Purposeful take of northern long-eared bats throughout the species' range is prohibited, except in instances of:

(1) Removal of northern long-eared bats from human structures, defense of human life (including public health monitoring), or
(2) removal of hazardous trees for the protection of human life and property.

Incidental take resulting from otherwise lawful activities is not prohibited in areas not yet affected by white-nose syndrome (WNS). Take of northern long-eared bats in their hibernacula is prohibited in areas affected by WNS, unless permitted under section 10(a)(1)(A) of the Act. Take of northern long-eared bats inside of hibernacula may include disturbing or disrupting hibernating individuals when they are present as well as the physical or other alternation of the hibernaculum's entrance or environment when bats are not present if the result of the activity will impair essential behavioral patterns, including sheltering northern long-eared bats. Incidental take of northern long-eared bats outside of hibernacula resulting from activities other than tree removal is not prohibited.

Incidental take resulting from tree removal is prohibited if it:

(3) Occurs within a 0.25-mile (0.4-km) radius of known northern long-eared bat hibernacula; or
(4) cuts or destroys known, occupied maternity roost trees, or any other trees within a 150-foot (45-m) radius from the known maternity tree during the pup season (June 1 through July 31).

However, 4(d) rules do not afford exemption from the ESA's section 7 procedural requirements. Therefore, consultation remains appropriate when actions (even those within the scope of a 4(d) rule) are funded, authorized or carried out by a federal agency. This is because the purpose of section 7 consultation is broader than the mere evaluation of take and issuance of an Incidental Take Statement; such consultations fulfill the requirements of section 7(a)(2) of the ESA, which directs that all Federal actions insure that their actions are not likely to jeopardize the continued existence of any listed species, or result in the destruction or adverse modification of designated critical habitat.

Conservation Measures Under Northern Long-eared Bat 4(d)

Conservation measures are those actions taken to benefit or promote the recovery of the species. These actions taken by the federal agency or the applicant that serve to minimize or compensate for project effects on the species under review and are included as an integral portion of the proposed action.

To be in compliance with the final 4(d) rule for northern long-eared bat, the following conservation measures will be implemented as part of the project description where applicable:

1) All proposed tree removal activities will occur more than 0.25 mile (0.4 km) from a known, occupied hibernacula.

2) MDC will avoid cutting or destroying known, occupied maternity roost trees, or any other trees within a 150-foot (45-m) radius from the known maternity tree during the pup season (June 1 through July 31).

2. DESCRIPTION OF THE PROPOSED ACTION

Section 7(a)(2) of Act requires that Federal agencies shall insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any threatened or endangered species, or result in the destruction or adverse modification of critical habitat. When the actions of a Federal agency may adversely affect a protected species, that agency (i.e., the action agency) is required to consult with either the National Marine Fisheries Service (NMFS) or the Service, depending upon the protected species that may be affected.

For the actions described in this document, the action agency is the Region 3 Wildlife and Sport Fish Restoration Program (WSFR) of the U.S. Fish and Wildlife Service. WSFR is allocating Federal Aid to the MDC for Habitat Management and Operations and Maintenance on MDC-managed lands (Conservation Areas). The Federal funding is the nexus for this consultation, which is being conducted as an intra-service consultation with the Missouri Ecological Services Field Office.

2.1 Action Area

The action area is that area in which the direct and indirect effects of the proposed actions may occur. The proposed activities will take place within the range of the Indiana bat and northern long-eared bat on Conservation Areas throughout Missouri.

2.2 Project Action

This BO describes and evaluates two groups of actions that will occur as a result of the proposed project:

- Habitat management in the active season (defined here as spring migration, summer (maternity and non-maternity), and fall migration) that involves:
    - Tree felling in known habitat or in areas of suitable habitat where the species are likely to occur
    - Prescribed burning in suitable habitat for the Indiana bat
- Operation and maintenance in the active season that involves removal of hazard trees or small numbers of trees that are suitable roost trees

<u>Habitat Management</u>
Management activities will occur year-round on Conservation Areas (CAs) throughout Missouri. Conservation areas that have suitable roosting habitat for the Indiana bat are those that include savannas, woodlands, upland forests, and bottomland forests. Prairies and grasslands with mature woody draws and newly-created or woody-encroached wetlands might also possess suitable roosting habitat. Funding will be provided to MDC in state fiscal year 2017 to conduct habitat restoration and enhancement activities across Missouri and to conduct operation and maintenance activities at CAs.

Tree felling – In order to achieve habitat management objectives, tree felling for enhancement or restoration can occur in any of the previously listed habitat types. Specific management actions or prescriptions will include forest understory thinning, overstory canopy reduction, timber stand improvement, intermediate cuts, regeneration cuts, and selective harvest. Bulldozers might also be used to remove large woody vegetation to prepare sites for native grass establishment, construct fire lines, or conduct major habitat restoration in wetlands.

Prescribed burning – Prescribed fire is used as a tool to eradicate invasive species and to achieve the desired plant species composition and structure. Prescribed fire can be used as a stand-alone method or used in conjunction with mechanical treatments.

Operation and Maintenance

Operation and maintenance will occur year-round on approximately 1,200 CAs statewide. Infrastructure on these CAs includes buildings, boundary fences, and storage structures. Additionally, in order to meet management and public access objectives approximately 1,000 miles of roads, more than 3,300 parking lots, trails, camping areas, firebreaks, erosion control structures, levees, and water control structures will be constructed, operated or will undergo maintenance. During operation and maintenance of CAs removal of hazard trees will be necessary for human safety along roads, trails, camping areas, and prescribed fire units. Removal of single or a small group of potential roost trees could be necessary for infrastructure construction and maintenance.

2.2 Conservation Measures and Avoidance and Minimization Measures

The Department has produced "Guidelines for Avoiding and Minimizing Impacts to Federally Listed Bats on Missouri Department of Conservation Lands" (Guidelines, MDC 2016). These Guidelines provide detailed descriptions of the Department's Conservation Measures and Avoidance and Minimization Measures (AMM). The Department will follow these Guidelines for all projects conducted during FY18, including those specified in this document.

In addition to the Guidelines and work included in the WSFR grant, the Department has for many years, worked on its own and with other federal and state agency partners on efforts to provide and maintain healthy bat populations, including the following activities: protecting important hibernacula from disturbance; implementing the Missouri White-nose Syndrome Action Plan with our conservation partners; implementing the 2006 Bat Management Plan for the Department of Conservation; requiring a Wildlife Collector's Permit for directed capture and possession of all bat species; following forest management guidelines that avoid impacts to bats while producing healthy forest communities and sharing these with non-MDC foresters who work on private lands; conducting annual surveys of hibernacula; participating in research and monitoring efforts related to WNS and the presence of the causative agent; and increasing research and survey efforts to better document bat distribution, maternity colony demographics and dynamics, and migratory movements.

3. STATUS OF THE SPECIES

This section presents the biological or ecological information relevant to formulating this BO. Appropriate information on the species' life history, its habitat and distribution, and other data on factors necessary to its survival are included to provide background for analysis in later sections. This analysis documents the effects of past human and natural activities or events that have led to the

current range-wide status of the species. Portions of this information are also presented in listing documents, the recovery plan (USFWS 1983), and the draft recovery plan, first revision (USFWS 2007), and are referenced accordingly.

3.1 Indiana bat

3.1.1 Species Description

The Indiana bat was originally listed as an endangered species by the Service in 1967. Thirteen winter hibernacula (11 caves and two mines) in six states were designated as critical habitat for the Indiana bat in 1976 (USFWS 1976). Six of these hibernacula are in Missouri.

The Indiana bat is an insectivorous, temperate, medium-sized bat that migrates annually from winter hibernacula to summer habitat in forested areas. The bat has a head and body length that ranges from 41 to 49 mm, with a forearm length of 35 to 41 mm. The fur is described as dull pinkish-brown on the back but somewhat lighter on the chest and belly, and the ears and wing membranes do not contrast with the fur (Barbour and Davis 1969). Although the bat resembles the little brown bat and the northern long-eared bat, it is distinguished by its distinctly keeled calcar and a long, pointed, symmetrical tragus.

3.1.2 Life History and Biology

The key stages in the annual cycle of Indiana bats are: hibernation, spring staging, pregnancy, lactation, volancy/weaning, migration and swarming. While there is variation based on weather and latitude, generally bats begin winter torpor in mid-September through late-October and begin emerging in April. Females depart shortly after emerging and are pregnant when they reach their summer area. Birth of young occurs between mid-June and early July and then nursing continues until weaning, which is shortly after young become volant (able to fly) in mid- to late-July. Migration back to the hibernaculum may begin in August, peak in September, and continue into October.

Winter Hibernation

After the summer maternity period, Indiana bats migrate back to traditional winter hibernacula. Some male bats may begin to arrive at hibernacula as early as July. Females typically arrive later and by September the number of males and females are present in comparable numbers. Autumn "swarming" occurs prior to hibernation. During swarming, bats fly in and out of cave entrances from dusk to dawn and use trees and snags as day roosts (Cope and Humphrey 1977). Swarming continues for several weeks and mating occurs during the latter part of the period. Fat supplies are replenished as the bats forage prior to hibernation. By late September many females have entered hibernation, but males may continue swarming well into October in what is believed to be an attempt to breed with late arriving females.

All cohorts of Indiana bats are hibernating by November and remain in hibernacula through April (Hall 1962, LaVal and LaVal 1980), depending upon local weather conditions. Indiana bats hibernate in caves and mines with cold, stable microclimates. They form large, dense clusters, ranging from 300 bats per square foot to 484 bats per square foot (Clawson et al. 1980, Clawson, pers. observ. October 1996 in USFWS 2000). Clusters form in the same area in a cave each

year, with more than one cluster possible in a particular cave (NatureServe 2007). Indiana bats, especially females, are philopatric to hibernacula (i.e., they return annually to the same hibernaculum). Bands returns from a mine in Missouri during winter surveys have documented one female Indiana bat present in a cluster in the same location for three years (USFWS unpublished data).

Summer Roosting and Foraging

After hibernation ends in late March or early April, most Indiana bats migrate to summer roosts. Females emerge from hibernation ahead of males. Reproductively active females store sperm from autumn copulations through winter, and ovulation takes place after the bats emerge from hibernation. The period after hibernation and just before spring migration is typically referred to as "staging," a time when bats forage and a limited amount of mating occurs (USFWS 2007).

In spring when fat reserves and food supplies are low and females are pregnant, migration is probably hazardous (Tuttle and Stevenson 1977). Consequently, mortality may be higher in the early spring, immediately following emergence. Once en route to their summer destination, females move quickly across the landscape. Radio-telemetry studies in New York documented females flying between 10 and 30 miles in one night after release from their hibernaculum, arriving at their maternity sites within one night. Indiana bats can migrate hundreds of miles from their hibernacula. Observed migration distances range from just 34.1 mi to 356.5 mi (USFWS 2007).

Females seek suitable habitat for maternity colonies, which is a requisite behavior for reproductive success. They exhibit strong site fidelity to summer roosting and foraging areas, generally returning to the same summer range annually to bear their young (Garner and Gardner 1992). For example, surveys conducted in summer 2014 in a maternity colony homerange first documented in 1985, indicated continued presence of a maternity colony in the area. Females arrive in their summer habitats as early as April 15 in Illinois (Garner and Gardner 1992), and usually start grouping into larger maternity colonies by mid-May. Garner and Gardner (1992) reported that Indiana bats first arrived at their maternity roost in early May in Indiana, with many individuals arriving in mid-May. During this early spring period, a number of roosts may be used temporarily until a roost with larger numbers of bats is established.

In general, Indiana bats roost in large, often dead or partially dead trees with exfoliating bark and/or cavities and crevices (Callahan et al. 1997; Farmer et al. 2002; Kurta et al. 2002). Trees in excess of 16 inch diameter at breast height (dbh) with exfoliating bark are considered optimal for maternity colony roost sites, but trees in excess of 9 inches dbh appear to provide suitable maternity roosting habitat (Romme et al. 1995). Rittenhouse et al. (2007) considered roost trees as suitable at approximately 7 inches dbh, but the suitability index (SI, SI = 0.00 to 1.00) of roost trees increased with greater dbh with trees reaching a SI of 0.50 at approximately 12 inches dbh and a SI of 1.00 at approximately 20 inches dbh or greater.

Indiana bat maternity roosts can be described as primary or alternate based upon the proportion of bats in a colony consistently occupying the roost site. 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 (Gardner and Gardner 1992; Miller et al. 2002). Alternate roosts are used by individuals, or a small number of bats, and may be used intermittently throughout the

summer or used only once or for a few days. Females frequently switch roosts to find optimal roosting conditions, switching roosts every few days on average, although the reproductive condition of the female, roost type, and time of year affect switching. When switching between day roosts, Indiana bats may travel as little as 23 feet or as far as 3.6 miles (Kurta et al. 1996; Kurta et al 2001; Kurta et al. 2002). In general, moves are relatively short and typically less than 0.6 mile (USFWS 1997).

Maternity colonies typically contain 100 or fewer adult females (Harvey 2002), but as many as 384 have been observed from a single maternity roost tree in Indiana (Whitaker and Brack 2002). The average sized maternity colony in Indiana was 80 females (Whitaker and Brack 2002). Birth of young occurs in late June and early July (Easterla and Watkins 1969, Humphrey et al. 1977). The young are able to fly between mid-July and early August (Mumford and Cope 1958, Cope et al. 1974, Humphrey et al. 1977, Clark et al. 1987, Gardner et al. 1991, Kurta et al. 1996). An exit count conducted on July 17, 2014 on U.S. Army Corps of Engineers property (Wappapello Lake) in Missouri yielded a count of 195 individuals exiting a 26-inch dbh cottonwood snag (York-Harris, pers. comm). Volant pups likely were included in the count, but at least 96 adults were present in the primary tree.

The home range of a maternity colony is the area within a 2.5-mile radius (i.e., 12,560 acres) around documented roosts or within a 5-mile radius (i.e., 50,265 acres) around capture location of a reproductive female or juvenile Indiana bat or a positive identification of Indiana bat from properly deployed acoustic devices and acceptable analysis of data. Based on data provided in the Indiana bat draft revised recovery plan (USFWS 2007), a maternity colony needs at least 10% suitable habitat (i.e., forested habitat that provides adequate roost sites and foraging areas) to exist at a given point on the landscape. Garner and Gardner (1992) found that females in Illinois utilized larger foraging ranges than males, whereas Menzel et al. (2005) found no difference in homerange sizes of males and females in west-central Illinois.

Male Indiana bats may be found throughout the entire range of the species. Some males spend the summer near hibernacula, as has been observed in Missouri (LaVal and LaVal 1980) and West Virginia (Stihler, pers. observ. October 1996, in USFWS 2000). Males appear to roost singly or in small groups, except during brief summer visits to hibernacula. Males have been observed roosting in trees as small as 3 inches dbh, but the average roost diameter for male Indiana bats is 13 inches (USFWS 2007).

Indiana bats forage over a variety of habitat types but prefer to forage in and around the tree canopy of both upland and bottomland forest, along roads, or along the corridors of small streams. Menzel et al. (2005) found that females foraged significantly closer to forests, roads, and riparian habitats than agricultural land and grasslands. Womack et al. (2012) documented selection by reproductive females of forests with higher canopy cover but more open mid-stories caused by management via prescribed fire. Females in Illinois were found to forage most frequently in areas with canopy cover of greater than 80% (Garner and Gardner 1992). Bats forage between dusk and dawn at a height of approximately 6-90 feet above ground level and feed exclusively on flying insects, primarily moths, beetles, and aquatic insects (Humphrey et al. 1977).

3.1.3 Population Dynamics

The population of the Indiana bat has decreased significantly from an estimated 808,000 in the 1950s (USFWS 2007). Based on censuses taken at all hibernacula, the current total known Indiana bat population in 2013 is estimated to number about 536,362 bats (Figure 5). Population trend data showed a steady increase from 2001 to 2007, a drop in 2009, an increase in 2011, and finally a drop in 2013 to a population estimate that approximates the 2011 estimate.

Missouri, Indiana, and Kentucky have historically had the highest estimated numbers of hibernating bats; all had estimates of greater than 10,000 bats in 1965. Over the period 1965 to 2005, estimated numbers of hibernating bats in Missouri and Kentucky clearly declined (USFWS 2007). Among the group of states in which aggregate hibernaculum surveys have never reached 100,000 bats, hibernaculum surveys in Arkansas, Tennessee, and Virginia consistently declined from 1965 to 2000. Hibernacula surveys in Illinois, New York, Ohio, and West Virginia were greater in 2000 than in 1965, but trends are not entirely consistent through the period. Thus, the southern tier of states in the species' range shows declines in counts at hibernacula, whereas some states in the upper Midwest show increasing counts (USFWS 2007).

3.1.4 Status and Distribution

The current species range includes much of the eastern half of the United States, from Oklahoma, Iowa, and Wisconsin east to Vermont, and south to northwestern Florida. The species has disappeared from, or greatly declined, in most of its former range in the northeastern United States. The current revised recovery plan (USFWS 2007) delineates recovery units based on population discreteness, differences in population trends, and broad level differences in land-use and macro-habitats. There are currently four recovery units for the Indiana bat: Ozark-Central, Midwest, Appalachian Mountains, and Northeast.

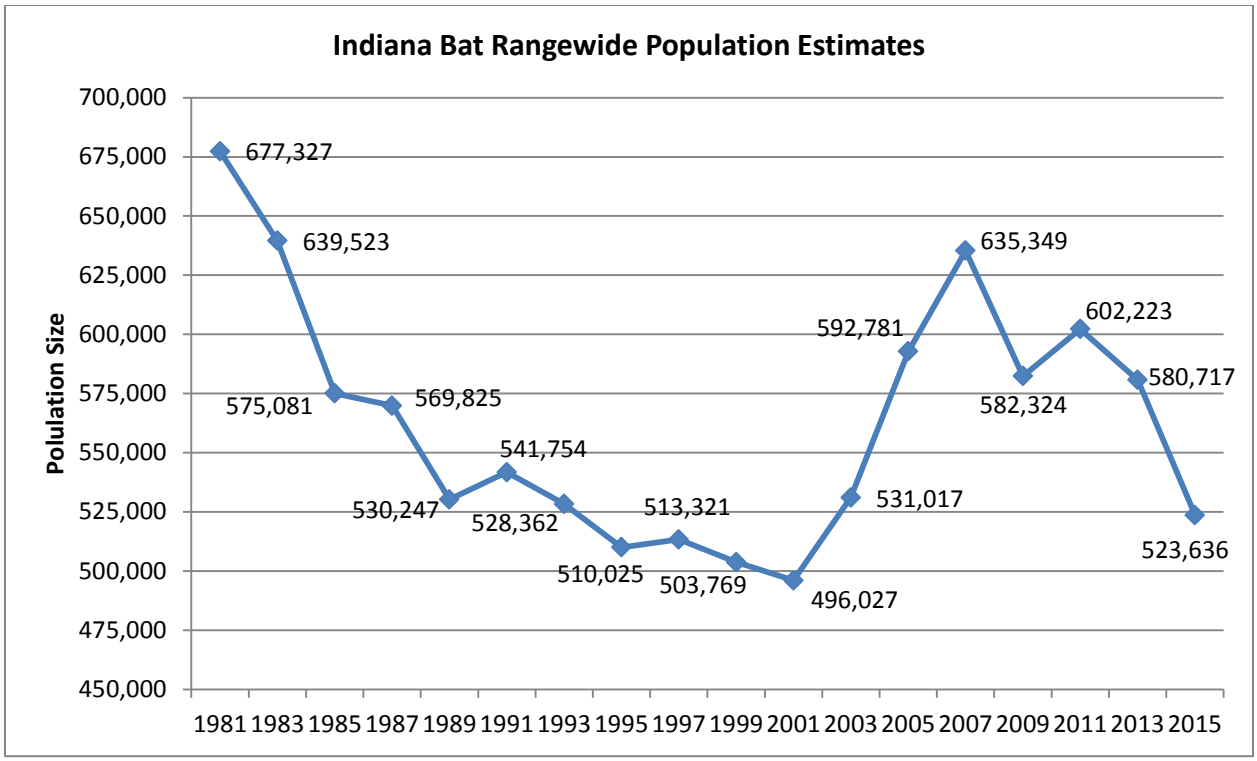

Figure 5. Indiana bat rangewide population estimates from 1981 – 2015 (http://www.fws.gov/midwest/Endangered/mammals/inba/pdf/2015IBatPopEstimate25Aug2015v2.pdf; (USFWS 2015)).

Historically, the Indiana bat had a winter range restricted to areas of cavernous limestone in the karst regions of the east-central United States. Hibernacula are divided into priority groups that have been redefined in the Service's Draft Recovery Plan (USFWS 2007): Priority 1 (P1) hibernacula typically have a current and/or historically observed winter population of greater than or equal to 10,000 Indiana bats; P2 have a current or observed historic population of 1,000 or greater, but fewer than 10,000; P3 have current or observed historic populations of 50 to 1,000 bats; and P4 have current or observed historic populations of fewer than 50 bats. Based on 2009 winter surveys, there were a total of 24 P1 hibernacula in seven states: Illinois (one); Indiana (seven); Kentucky (five); Missouri (six); New York (three); Tennessee (one); and West Virginia (one). One additional P1 hibernaculum was discovered in Missouri in 2012. A total of 55 P2, 151 P3, and 229 P4 hibernacula are also known from the aforementioned states, as well as 15 additional states.

The historical summer range of the Indiana bat is thought to be similar to its modern range. However, the bat has been locally extirpated due to loss of summer habitat. The majority of known maternity sites have been located in forested tracts and riparian areas in agriculturally dominated landscapes such as Missouri, Iowa, Indiana, Illinois, southern Michigan, western Ohio, and western Kentucky. They have been documented to use roost trees in highly fragmented areas as well as more contiguous forested patches. Recent surveys for a proposed utility corridor documented a primary maternity roost tree in a narrow forested corridor in northwest Missouri (KCPL unpublished data).

The reasons for listing the Indiana bat were summarized in the original Recovery Plan (USFWS 1983) including: declines in populations at major hibernacula despite efforts to implement cave protection measures, the threat of mine collapse and the potential loss of largest known hibernating population at Pilot Knob Mine, Missouri, and other hibernacula throughout the species range were not adequately protected. Although several known human-related factors have caused declines in the past, they may not solely be responsible for recent declines. Documented causes of Indiana bat population decline include: 1) human disturbance of hibernating bats; 2) improper cave gates and structures rending them unavailable or unsuitable as hibernacula; and 3) natural hazards like cave flooding and freezing. Suspected causes of Indiana bat declines include: 1) changes in the microclimate of caves and mines; 2) dramatic changes in land use and forest composition; and 3) chemical contamination from pesticides and agricultural chemicals. Current threats from changes in land use and forest composition include forest clearing on private and public land within the summer range, woodlot management and wetland drainage by landowners, and other private and municipal land management activities that affect the structure and abundance of forest resources.

Climate change is also an emerging threat to the Indiana bat, primarily because temperature is an essential feature of both hibernacula and maternity roosts. Potential impacts of climate change on temperatures within Indiana bat hibernacula were reviewed by V. Meretsky (pers. comm., 2006 in USFWS 2007). Climate change may be implicated in the disparity of population trends in southern versus northern hibernating populations of Indiana bats (Clawson 2002), but Meretsky noted that confounding factors are clearly involved. Potential impacts of climate change on hibernacula can be compounded by mismatched phenology in food chains (e.g., changes in insect availability relative to peak energy demands of bats) (V. Meretsky, pers. comm., 2006 in USFWS 2007). Changes in maternity roost temperatures may also result from climate change, and such changes may have negative or positive effects on development of Indiana bats, depending on the location of the maternity colony. The effect of climate change on Indiana bat populations is a topic deserving additional consideration.

The greatest current threat to Indiana bats is white nose syndrome (WNS). WNS was first documented in New York in February of 2006 and has since been confirmed in 20 states and 4 Canadian Provinces (www.whitenosesyndrome.org/resources/map). It is currently unknown if WNS is the primary cause or a secondary indicator of another pathogen, but it has been correlated with erratic behavior such as early or mid-hibernation arousal that leads to emaciation and mortality in several species of bats, including the Indiana bat (http://whitenosesyndrome.org/; www.fws.gov).

Overall mortality rates, primarily of little brown bats, have ranged from 90 to 100 percent in hibernacula in the northeastern United States. It is currently estimated that 5.7 to 6.7 million bats have died from WNS in infected regions (www.whitenosesyndrome.org/about-white-nose-syndrome). Apparent losses of 685 Indiana bats in Hailes Cave and 12,890 (previous population was 13,014) Indiana bats in the Williams Preserve Mine in New York were documented during the first winter WNS was observed at each site. Additionally, Indiana bat surveys conducted at hibernacula in New York during early 2008 estimated the population declined 15,662 bats, which represents 3.3% of the 2007 revised rangewide population estimate. The number of confirmed cases of WNS has increased significantly in the Ozark-Central Recovery Unit since 2011 (www.whitenosesyndrome.org/resources/map) and if trends continue, it is likely that additional

reductions in the Indiana bat population will occur in this region.

WNS is thought to be transmitted by direct bat contact with an infected bat and by transmission of the causative agent from cave to cave. The distribution of WNS appears to be expanding in all directions from its epicenter in New York. Between 2007 and 2008, it was documented to have spread from a 9 km radius to a 200 km radius, and at the end of the 2008-2009 winter, it was documented in all major hibernacula in New York. Most recently it has been found throughout Missouri, northern Alabama, Illinois, and suspected in eastern Iowa. The Service and partners are conducting research to develop management strategies to reduce the spread and impacts of WNS. However, it remains a significant and immediate threat to the Indiana bat.

At the time the revised recovery plan was drafted in 2007, the causative agent for WNS had not yet been discovered and the additive impacts to the already declining Indiana bat were not yet considered. Given the documented deaths of Indiana bat due to WNS in the Northeast since 2006, the species is further threatened with extinction. Numerous research projects have been completed and are ongoing at a rapid rate since the first discovery of WNS, a national response plan has been completed (available at www.whitenosesyndrome.org), multiple states and agencies have approved or are in the process of developing response action plans, and various management actions have been undertaken with the hope of slowing the spread of the disease (e.g., cave closures, the development of decontamination protocols, etc.). Despite these efforts, there is no known cure for the disease and all bats in North America that hibernate in caves could be threatened with extinction.

Status within the Ozark-Central Recovery Unit

The Indiana bat populations in the Ozark-Central Recovery Unit (RU) have declined significantly since 1990 but have shown modest increases based on the last two biannual surveys (USFWS 2007, USFWS 2013). Historically, the Ozark-Central Recovery Unit had the largest numbers of Indiana bats in hibernacula; however, populations have declined such that the Midwest RU unit hosts the largest populations of Indiana bats. Prior to 2012, the majority of hibernating bats in the Ozark-Central RU were assumed to overwinter in Pilot Knob Mine in Missouri. Dramatic declines in the hibernating population at this site occurred since the early 1980s from an original estimation of approximately 100,000 in the 1970s to an estimation of 1,678 in the 2000s. The discovery of a previously unknown P1 hibernation site has increased the baseline size of the population in the Ozark-Central RU, but not the overall trend across the range of the species. The newly discovered site houses approximately 122,936 hibernating Indiana bats. Based on observations by private cavers, the site has been occupied by a similar number of Indiana bats since the 1970s and would have concurrently occupied both sites; these bats are not considered to be bats that moved from Pilot Knob Mine. After incorporating bats from the newly discovered site, the current 2013 population estimate for the Ozark-Central RU is approximately 197,707. Based on biannual hibernacula counts, the Indiana bat population in the Ozark-Central RU declined from 2005 to 2009 and has since shown a slight increase (1.1%). The next population census will take place during winter 2016-2017.

3.2 Northern long-eared bat

3.2.1 Life History and Biology

The northern long-eared bat is a temperate, insectivorous, migratory bat that hibernates in mines

and caves in the winter and spends summers in wooded areas. The key stages in its annual cycle are: hibernation, spring staging and migration, pregnancy, lactation, volancy/weaning, fall migration and swarming. Northern long-eared bats generally hibernate between mid-fall through mid-spring each year. Spring migration period likely runs from mid-March to mid-May each year. Females depart shortly after emerging from hibernation and are pregnant when they reach their summer area. Young are born between mid-June and early July, with nursing continuing until weaning, which is shortly after young become volant in mid- to late-July. Fall migration likely occurs between mid-August and mid-October.

Summer habitat and ecology

Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts, as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure.

Many species of bats, including the northern long-eared bat, 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 both 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.

Upon emergence from the hibernacula in the spring, females seek suitable habitat for maternity colonies. Coloniality is a requisite behavior for reproductive success. Northern long-eared bat maternity colonies range widely in size, although 30-60 may be most common (USFWS 2014). Northern long-eared bats show some degree of interannual fidelity to single roost trees and/or maternity areas. Unlike Indiana bats, male northern long-eared bat are routinely found with females in maternity colonies. Northern long-eared bats use networks of roost trees often centered around one or more central-node roost trees. Northern long-eared bat roost networks also include multiple alternate roost trees and male and non-reproductive female northern long-eared bat may also roost in cooler places, like caves and mines (Barbour and Davis 1969, Amelon and Burhans 2006).

Northern long-eared bats roost in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically ≥3 inches dbh). Northern long-eared bats are known to use a wider variety of roost types, using tree species based on presence of cavities or crevices or presence of peeling bark. Northern long-eared bats have also been occasionally found roosting in structures like barns and sheds (particularly when suitable tree roosts are unavailable).
Young northern long-eared bats 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.

Migration

Males and non-reproductive females may summer near hibernacula, or migrate to summer habitat some distance from their hibernaculum. northern long-eared bat is not considered to be a long distance migrant (typically 40-50 miles). Migration is an energetically demanding behavior for the northern long-eared bat, particularly in the spring when their fat reserves and food supplies are low and females are pregnant.

Winter habitat and ecology

Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (e.g. abandoned or active mines, railroad tunnels). There may be other landscape features being used by northern long-eared bats during the winter that have yet to be documented. Generally, northern long-eared bats hibernate from October to April depending on local weather conditions (November-December to March in southern areas and as late as mid-May in some northern areas).

Hibernacula for northern long-eared bats typically have significant cracks and crevices for roosting; relatively constant, cool temperatures (0-9 degrees Celsius) and with high humidity and minimal air currents. Specific areas where they hibernate have very high humidity, so much so that droplets of water are often seen on their fur. Within hibernacula, surveyors find them in small crevices or cracks, often with only the nose and ears visible. Caves that meet temperature requirements for Indiana bats are rare. Most Indiana bats hibernate in caves or mines where the ambient temperature remains below 10ºC (50.0ºF) but infrequently drops below freezing (Hall 1962, Myers 1964, Henshaw 1965, Humphrey 1978). Caves that historically sheltered the largest populations of hibernating Indiana bats were those that provided the largest volumes and structural diversity, thus ensuring stable internal temperatures over wide ranges of external temperatures, with a low likelihood of freezing (Tuttle and Kennedy 2002).

Northern long-eared bat tend to roost singly or in small groups (USFWS 2014), with hibernating population sizes ranging from a just few individuals to around 1,000 (USFWS unpublished data). Northern long-eared bat display more winter activity than other cave species, with individuals often moving between hibernacula throughout the winter (Griffin 1940, Whitaker and Rissler 1992, Caceres and Barclay 2000). Northern long-eared bats have shown a high degree of philopatry to the hibernacula used, returning to the same hibernacula annually.

Spring Staging and Fall Swarming habitat and ecology

Upon arrival at hibernacula in mid-August to mid-November, northern long-eared bats “swarm,” a behavior in which large numbers of bats fly in and out of cave entrances from dusk to dawn, while relatively few roost in caves during the day. Swarming continues for several weeks and mating occurs during the latter part of the period. After mating, females enter directly into hibernation but not necessarily at the same hibernaculum as they had been mating at. A majority of bats of both sexes hibernate by the end of November (by mid-October in northern areas).

After hibernation ends in late March or early April (as late as May in some northern areas), most northern long-eared bats migrate to summer roosts. Female emerge from hibernation prior to

males. Reproductively active females store sperm from autumn copulations through winter. Ovulation takes place after the bats emerge from hibernation in spring. The period after hibernation and just before spring migration is typically referred to as "staging," a time when bats forage and a limited amount of mating occurs. This period can be as short as a day for an individual, but not all bats emerge on the same day.

In general, northern long-eared bats use roosts in the spring and fall similar to those selected during the summer. Suitable spring staging/fall swarming habitat consists of the variety of forested/wooded habitats where they roost, forage, and travel, which is most typically within 5 miles of a hibernaculum. This includes forested patches as well as linear features such as fencerows, riparian forests and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Isolated trees are considered suitable habitat when they exhibit the characteristics of a suitable roost tree and are less than 1,000 feet from the next nearest suitable roost tree, woodlot, or wooded fencerow.

3.2.2 Threats

No other threat is as severe and immediate for the northern long-eared bat and the Indiana bat as the disease white-nose syndrome (WNS). Although Indiana bat populations have been imperiled for decades, it is unlikely that northern long-eared bat populations would be declining so dramatically without the impact of WNS. Since the disease was first observed in New York in 2006, WNS has spread rapidly in bat populations from the Northeast to the Midwest and the Southeast. Population numbers of northern long-eared bat have declined by 99 percent in the Northeast, which along with Canada, has been considered the core of the species' range. WNS-related declines in Indiana bat populations are estimated at up to 75 percent, with the disease recently moving into the Midwest core of the species range. Although there is uncertainty about how quickly WNS will spread through the remaining portions of these species' ranges, it is expected to spread throughout their entire ranges. In general, the Service believes that WNS has significantly reduced the redundancy and resiliency of both the northern long-eared bat and Indiana bat.

Although significant northern long-eared bat population declines have only been documented due to the spread of WNS, other sources of mortality could further diminish the species' ability to persist as it experiences ongoing dramatic declines. Specifically, declines due to WNS have significantly reduced the number and size of northern long-eared bat populations in some areas of its range. This has reduced these populations to the extent that they may be increasingly vulnerable to other stressors that they may have previously had the ability to withstand. These impacts could potentially be seen on two levels. First, individual northern long-eared bats sickened or struggling with infection by WNS may be less able to survive other stressors. Second, northern long-eared bat populations impacted by WNS, with smaller numbers and reduced fitness among individuals, may be less able to recover making them more prone to extirpation. The status and potential for these impacts will vary across the range of the species.

Bats affected but not killed by WNS during hibernation may be weakened by the effects of the disease and may have extremely reduced fat reserves and damaged wing membranes. These effects may reduce their capability to fly or to survive long-distance migrations to summer

roosting or maternity areas. Affected bats may also be more likely to stay closer to their hibernation site for a longer time period following spring emergence.

In areas where WNS is present, there are additional energetic demands for northern long-eared bats. For example, WNS-affected bats have less fat reserves than non-WNS-affected bats when they emerge from hibernation (Reeder et al. 2012; Warnecke et al. 2012) and have wing damage (Meteyer et al. 2009; Reichard and Kunz 2009) that makes migration and foraging more challenging. Females that survive the migration to their summer habitat must partition energy resources between foraging, keeping warm, successful pregnancy and pup-rearing, and healing and may experience reduced reproductive success. In addition, with wing damage, there may be an increased chance of WNS-affected bats being killed or harmed as a result of proposed action, particularly if timber harvest or burns are conducted early in the spring (April – May).

Over the long-term, sustainable forestry benefits northern long-eared bat by maintaining suitable habitat across a mosaic of forest treatments. However, forest practices can have a variety of impacts on the northern long-eared bat depending on the quality, amount, and location of the lost habitat, and the time of year of clearing. Depending on their characteristics and location, forested areas can function as summer maternity habitat, staging and swarming habitat, migration or foraging habitat, or sometimes, combinations of more than one habitat type. Impacts from tree removal to individuals or colonies would be expected to range from indirect impact (e.g., minor amounts of forest removal in areas outside northern long-eared bat summer home ranges or away from hibernacula) to minor (e.g., largely forested areas, areas with robust northern long-eared bat populations) to significant (e.g., removal of a large percentage of summer home range, highly fragmented landscapes, areas with WNS impacts).

Lastly, there is growing concern that bats, including the northern long-eared bat (and other bat species) may be threatened by the recent surge in construction and operation of wind turbines across the species' range. Mortality of northern long-eared bat has been documented at multiple operating wind turbines/farms. The Service is now working with wind farm operators to avoid and minimize incidental take of bats and assess the magnitude of the threat.

3.2.3 Status and Distribution

Rangewide

The northern long-eared bat 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). 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).

Although they are typically found in low numbers in inconspicuous roosts, most records of northern long-eared bat 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 bat are documented in 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, lack of survey effort, or existence of unknown retreats).

The current range and distribution of northern long-eared bat must be described and understood within the context of the impacts of WNS. Prior to the onset of WNS, the best available information on northern long-eared bat came primarily from surveys (primarily focused on Indiana bat or other bat species) and some targeted research projects. In these efforts, northern long-eared bat was very frequently encountered and was considered the most common myotid bat in many areas. Overall, the species was considered to be widespread and abundant throughout its historic range (Caceres and Barclay 2000).

WNS has been particularly devastating for northern long-eared bat in the northeast, where the species was believed to be the most abundant. There are data supporting substantial declines in northern long-eared bat populations in portions of the Midwest due to WNS. In addition, WNS has been documented at more than 100 northern long-eared bat hibernacula in the southeast, with apparent population declines at most sites. WNS has not been found in any of the western states to date and the species is considered rarer in the western extremes of its range. We expect further declines as the disease continues to spread across the species' range.

Missouri

The northern long-eared bat has been documented in 76 of 114 counties in Missouri; its abundance in the summer is variable across the state and is likely related to the presence of suitable forest habitat and fidelity to historical summer areas. There are approximately 269 known northern long-eared bat hibernacula that are concentrated in the karst landscapes (characterized by underground drainage systems with sinkholes and caves) of central, eastern, and southern Missouri (Missouri Department of Conservation 2014, in litt.). Similar to other more predominantly karst areas, the northern long-eared bat is difficult to find in Missouri caves,

and thus is rarely found in large numbers. *Pseudogymnoascus destructans* (Pd) was first detected in Missouri in the winter of 2009–2010; however, the majority of sites in the state that have been confirmed with WNS were confirmed more recently, during the winter of 2013–2014. Due to low numbers historically found in hibernacula in the state, it is difficult to determine if changes in count numbers are due to natural fluctuations or to WNS. However, there was one northern long-eared bat mortality observed during the winter of 2013–2014 (WNS Workshop 2014, pers. comm.). Furthermore, Elliott (2015, pers. comm.) noted that surveyors are detecting indicators of decline (changes in bat behavior) as well as actual declines in numbers of northern long-eared bats in hibernacula in the state. As for summer survey data, mist-net and acoustic surveys conducted across Missouri in the summer of 2014 indicate continued distribution throughout the state. However, there were fewer encounters with northern long-eared bats in some parts of the state in 2014, as compared to previous years. Specifically, surveys conducted on the Mark Twain National Forest in 2014 indicate a decline in the overall number of captures of all bat species, including fewer northern long-eared bats than expected (Amelon 2014, pers. comm.; Harris 2014, pers. comm.). Further, in southwest Missouri, northern long-eared bats have been encountered during mist-net surveys conducted on the Camp Crowder Training Site in 2006, 2013, and 2014. Overall, the number of northern long-eared bat captures has decreased since 2006, relative to the level of survey effort (number of net nights) (Missouri Army National Guard 2014, pp. 2–3; Robbins and Parris 2013, pp. 2–4, Robbins et al. 2014, p. 5). Additionally, during a 2-year survey (2013–2014) at a state park in north-central Missouri, 108 northern long-eared bats were captured during the first year, whereas only 32 were captured during the second year, with a similar level of effort between years (Zimmerman 2014, unpublished data).

4. ENVIRONMENTAL BASELINE

The environmental baseline is the current status of listed species and their habitats, and critical habitat, as a result of past and ongoing human and natural factors in the area of the proposed action. Also included in the environmental baseline are the anticipated impacts of other proposed Federal projects in the action area that have already undergone formal section 7 consultation.

4.1 Status of the Species within the Action Area

4.1.1 Indiana bat

The Action Area is within the Ozark-Central recovery unit of the Indiana bat and is assumed to mirror the population status and dynamics of the recovery unit. The entire state of Missouri is considered to be within the range of the Indiana bat and the species could occur wherever suitable habitat is present. The species is known to be less common in west-central and southwest portions of the state. There has not been a sufficient survey effort to conclude certain absence from most of west-central and southwest Missouri; however, repeated negative survey results in Newton County on the Missouri Army National Guard's Camp Crowder Training Area could indicate of potential absence from this site (MOARNG unpublished data). Throughout the remaining areas of Missouri, Indiana bats can be present during the active season in summer or swarming/staging habitats, and during the inactive season in hibernacula. Some areas of Missouri provide habitat that is occupied during all parts of year by certain populations of Indiana bats.

Known maternity habitat for Indiana bats exists throughout northern Missouri and in portions of southeast Missouri. The greatest number of maternity colonies exists in north central and northeast portions of the state and this area is considered to be the core of maternity habitat in Missouri. It was once thought that maternity habitat was only present north of the Missouri River and hibernacula were only present south of the Missouri River. However, recent summer surveys and discovery of a previously unknown Priority 1 hibernaculum provide data invalidating this idea and further evidence that the Missouri River is not a reliable boundary for defining active and inactive season presence of Indiana bats. Forty hibernacula in Missouri have extant winter populations (USFWS 2007). Of those hibernacula, six are Priority 1 and are designated as critical habitat. The newly discovered Priority 1 hibernaculum has not been designated as critical habitat but is the largest known winter population of the species.

4.1.2 Northern long-eared bat

Missouri records indicate that the northern long-eared bat hibernates mostly in the eastern and central Ozarks. However, they are widespread and have been recorded in approximately 270 hibernacula throughout the state. Hibernating individuals have been found in Missouri as far southwest as McDonald County and as far northeast as Marion County (MDC unpublished data).

It is presumed that the northern long-eared bat occurs throughout most of Missouri during the summer. Mist net captures of the species have been reported from counties at or near all four corners of the state (Newton, Nodaway, Clark, and Cape Girardeau counties). Trapping effort has been minimal in the extreme southeast and west-central to northwest portions of the state, so there is still uncertainty about the occurrence or abundance of the northern long-eared bats in these areas (MDC unpublished data).

4. 2 Federal Actions

Recent activities across Missouri that required formal section 7 consultations, and the estimated incidental take of Indiana bats and northern long-eared bats, is presented in Table 1. These actions were considered in the final jeopardy analysis of this biological opinion.

Table 1. Activities in Missouri that required formal section 7 consultation and the amount of incidental take exempted (.

Project Name	Impact Type	Estimated Incidental Take
Mark Twain NF – Cane Ridge Small Tree (2017)	Direct impacts	50 acres Salvage harvest 5.8 acres Hazard tree removal – temporary roads and skid trail
USFWS Wildlife and Sport Fish Restoration Missouri Department of Conservation (2016)	Direct impacts	16,179 acres of maternity and non-maternity roosting habitat, swarming, staging, and migratory habitat
Mark Twain NF – Floyd Restoration (2016)	Habitat loss, direct impacts	2,977 acres Salvage harvest 23.4 miles Hazard tree removal – firelines 200 acres Hazard tree removal – temporary roads and skid trail 49 acres Road construction/reconstruction
Mark Twain NF – Blackwell Ridge (2016)	Habitat loss, direct impacts	6,000 acres Salvage harvest 147.1 acres Hazard tree removal – temporary roads and skid trail
USFWS Wildlife and Sport Fish Restoration Missouri Department of Conservation (2015)	Direct impacts	6,829 acres, and 31,080 linear feet, of maternity and non-maternity roosting habitat, swarming, staging, and migratory habitat
Menard's – Sullivan (2015)	Direct impacts	78 acres of suitable habitat for Indiana bats, northern long-eared bats, and gray bats
Wappapello Lake Timber Stand Improvement (2015)	Direct impacts	627 acres of suitable habitat for Indiana bats and northern long-eared bats
USFWS Wildlife and Sport Fish Restoration Missouri Department of Conservation (2014)	Direct impacts	75 acres of maternity roosting habitat
Mark Twain NF – Boiling Spring (2014)	Habitat loss, direct impacts	16.3 miles Hazard tree removal – firelines 142 acres Hazard tree removal – temporary roads and skid trails
Wappapello Lake Timber Stand Improvement (2013)	Direct impacts	Harm, harassment, or death of 12 male or non-reproductive females Harm, harassment, or death of 3 reproductive females
Enbridge Flanagan South Pipeline (2013)	Habitat loss, direct impacts	Harm, harassment, or death of 19 males, females, or juveniles Harm or harassment of up to 120 reproductive females based on loss of two active maternity roost trees
Mark Twain NF – Bunker Area Derecho Fuels (2013)	Habitat loss, direct impacts	4,856 acres Salvage harvest 20.94 miles Hazard tree removal – firelines 208 acres Hazard tree removal – temporary roads and skid trails
Mark Twain NF – Trace Creek and Council Bluff Trails Reroute (2013)	Habitat loss, direct impacts	1.61 acres Hazard tree removal
Mark Twain NF – Northeast Lake Project (2012)	Habitat loss, direct impacts	4,166 acres Salvage harvest 41.5 acres Hazard tree removal – temporary roads and skid trails

Other Consultations

During fiscal years 2012-present, the Service consulted on approximately 4,260 proposed actions in Missouri potentially affecting the Indiana bat and northern long-eared bat. Project types evaluated included wind energy projects, highway construction, transmission lines, commercial development, communication towers, residential housing development, bridges, pipelines, levee repair, forest management activities, and recreational construction.

We are unaware of any consultations involving Federal agencies where formal consultation was initiated due to the possible destruction or adverse modification of critical habitat designated for the Indiana bat.

Section 10 Permits

Currently approximately 80 entities or individuals possess valid Section 10(a)(1)(A) scientific research permits for the Ozark RU (Missouri, Illinois, and Iowa) to enhance the survival of federally listed bat species. Although these permits are enhancement of survival permits, some authorized take of Indiana bats can occur. The research conducted must further conservation efforts for the species. The loss of some individual Indiana bats over the short-term from research is allowed as long as the survival of the Indiana bat is not jeopardized. The Service requires that every available precaution be implemented to reduce and/or eliminate authorized take associated with research activities.

No 10(a)(1)(B) incidental take permits have been issued in Missouri and no associated Habitat Conservation Plans (HCPs) have been approved.

4.3 Factors Affecting the Indiana Bat Environment within and adjacent to the Action Area

This section describes factors affecting the environment of the species or critical habitat in the Action Area. The environmental baseline includes state, tribal, local, and private actions already affecting the species or that will occur contemporaneously with the consultation in progress. Related and unrelated Federal actions affecting the same species and critical habitat that have completed formal or informal consultation are also part of the environmental baseline, as are Federal and other actions within the Action Area that may benefit listed species or critical habitat.

Landownership in the Action Area is approximately 89% private and 11% public, with the public portion being owned and managed by a combination of state and federal agencies. Current land-use in the action area varies greatly and includes agriculture, commercial development, residential development, recreational areas, transportation infrastructure, and natural areas. The cumulative impacts of projects occurring in proximal areas of the Ozark-Central Recovery Unit, such as those described in this section, could negatively impact the Indiana bat within the action area.

5. EFFECTS OF THE ACTION

This section of the biological opinion provides an analysis of the effects of the Action on listed species, and on critical habitat. Both direct effects (those immediately attributable to the Action), and indirect effects (those caused by the Action, but which will occur later in time, and are reasonably certain to occur) are considered. Finally, the effects from interrelated and interdependent activities are also considered. These effects will then be added to the environmental baseline in determining the proposed Action's effects to the species or its critical habitat (50 CFR Part 402.02).

5.1 Factors Considered

This section includes an analysis of the direct and indirect effects of the proposed action on the species and critical habitat and its interrelated and interdependent activities. Our analysis considers the following factors:

Proximity of the action: The proposed action will affect occupied habitat of Indiana bats.

Distribution: The Action Area includes the entire State of Missouri, which accounts for nearly half of the Ozark-Central RU.

Timing: The federally-funded activities will affect Indiana bats in the spring staging, maternity, and swarming stages of their life cycle from July 1, 2016 to June 30, 2017.

Nature of the effect: Direct effects are described below.

Duration: The duration of the effects will primarily be short-term. Habitat management covered in this BO will occur in the short term and are anticipated to ultimately result in beneficial effects. Hazard tree removal that involves removal of active roost trees could have short term and long term effects, but likely will be only localized impacts (impacts to individuals, not a maternity colony population).

Disturbance frequency: Habitat management activities covered in this BO will result in a one-time disturbance to habitat and impact to individuals within the Action Area. Hazard tree removal will result in a one-time permanent impact to individuals.

Disturbance intensity and severity: The intensity and severity of the disturbance are described below. In general, intensity increases as projects impact more acres of suitable habitat or greater number of individuals. Severity is related to the type of individuals or populations impacted; severity is highest for impacts to maternity colonies, moderate for non-maternity, swarming, and staging populations, and is lowest for migratory individuals.

5.2 Impact of the Proposed Action

As a result of habitat management and operations and maintenance, maternity roosting habitat, non-maternity[2] roosting habitat, and staging and swarming habitat will be modified or removed. Management actions and operations and maintenance activities covered in this BO are those that

[2] Non-maternity habitat is defined as summer roosting habitat used by males and non-reproductive females.

involve tree felling and prescribed burning during the active season for Indiana bats (April 1 through October 31). Habitat management can involve few acres up to several hundred acres, whereas operation and maintenance activities typically only impact individual or small groups of roost trees. The Biological Assessment (BA) considered 103 habitat management and operations and maintenance projects. Projects were presented in Tables 1-7 in the BA. Projects considered in the BA are only those that are tied to Federal Aid allocated by WSFR or those that are being conducted on lands purchases with Federal funds.

5.2.1. Active Season Tree Removal – Indiana bats and NLEB

Impacts to bats from loss of forest would be expected to vary depending on the timing of removal, location (e.g. within or outside a home range), and extent of removal. While bats can flee during tree removal, removal of occupied roosts (during spring through fall) is likely to result in direct injury or mortality to some percentage of bats. This percentage would be expected to be greater if flightless pups or inexperienced flying juveniles were also present. Felling roost trees during the active season may result in adverse effects to Indiana bats or NLEBs. If a bat is in the tree and a tree is cut down, the bat may either stay in the tree and potentially be crushed or fly out (adults or volant pups) during the day and be more susceptible to predation (e.g., by raptors). Belwood (2002) reported on the felling of a dead maple in a residential lawn in Ohio. One dead adult Indiana bat female and 33 nonvolant young were retrieved by the researcher. Three of the young bats were already dead when they were picked up, and two more died subsequently. The rest were apparently retrieved by adult bats that had survived. Risk of injury or death from being crushed when a tree is felled is most likely, but not limited, to impact nonvolant pups. The risk is also greater to adults during cooler weather when bats periodically enter torpor and would be unable to arouse quickly enough to respond. The likelihood of potential roost trees containing larger number of NLEBs is greatest during pregnancy and lactation (April-July) with exit counts falling dramatically after this time. For example, two studies found NLEBs use of certain trees appears to be highest in spring, when females were pregnant, and the colony apparently splintered into smaller groups before parturition (Foster and Kurta 1999, Sasse and Pekins 1996). Indiana bat colonies also break up over time with smaller exit counts later in the summer (Barclay and Kurta 2007).

5.2.2 Loss of Documented Maternity Roosts – Indiana bat

Effects to Indiana bats may occur even if maternity roost trees are cleared during the hibernation period (inactive season). No removal of documented Indiana bat roosts is proposed as part of this consultation.

5.2.3 Loss of Unknown Maternity Roosts – Indiana bat

Indiana bats form colonies in the summer and exhibit fission-fusion behavior where members frequently coalesce 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, Indiana bats switch roosts often, typically every 2–3 days with adult female reproductive condition, roost type, and time of year affecting switching (Kurta et al. 2002, Kurta 2005). The bats' fission-fusion behavior is influenced by a number of factors, including temperature, precipitation,

predation, parasitism, and the ephemeral nature of the habitability of roost sites (Carter and Feldhamer 2005). Bats need to proactively investigate new potential roost trees prior to their current roost tree becoming uninhabitable (e.g., tree falls over)(Kurta et al. 2002, Carter and Feldhamer 2005, Timpone et al. 2010).

The exact number of roost trees a colony uses at any given time (or across the season) is not known, because: 1) not every bat in a colony can be tracked; 2) not all bats can be tracked simultaneously; 3) bats are generally tracked for a short period; and 4) number of trees used by a bat is correlated with number of days it is radio-tracked (Gumbert et al. 2002, Kurta et al. 2002). On any day, a colony is dispersed among numerous trees, with many bats occupying one or more primary roosts, while individuals and small groups reside in different alternate roosts (Kurta et al. 2004). The number of alternates used on any day probably varies, but bats from one colony occupied at least eight trees on a single day (Carter 2003). Maternity colonies use a minimum of 8–25 different trees in one season (Callahan et al. 1997, Carter 2003, Kurta et al. 2002, Sparks 2003). Therefore, Indiana bats associated with a maternity colony are spread out across these multiple trees in any given day/night. However, one to three of these are primary roosts used by the majority of bats for some or all of the summer (Callahan et al. 1997).

Fidelity of Indiana bat maternity colonies to their summer range is well documented. In addition to fidelity to the general summer maternity area, roost trees, although ephemeral in nature, may be occupied by a colony for a number of years until they are no longer available (i.e., the roost has naturally fallen to the ground) or suitable (i.e., the bark has completely fallen off of a snag). Some trees have shorter life expectancy as a roost than others (e.g., living shagbark hickories can provide suitable roosts for Indiana bat for decades while elm snags may lose their bark within a few years). Although loss of a roost (e.g., blow down, bark loss) is a natural phenomenon that Indiana bats must deal with regularly, the loss of multiple roosts, which could comprise most or all of a home range, likely stresses individual bats, affects reproductive success, and impacts the social structure of a colony (USFWS 2007). This section does not analyze the impact (harm) of loss of habitat within a home range (see Loss/fragmentation of summer roosting/foraging habitat/travel corridors for that discussion) but addresses loss of individual known roosts.

Kurta (2005) suggested that loss of a single alternate roost at any time of year probably has little impact on Indiana bats because the colony has a minimum of 8–25 other trees from which to select, but loss of a primary roost could be detrimental. Silvis et al. (2014b) modeled impacts of removing documented roosts from an Indiana bat colony located in central Ohio where woodlands comprised 9 percent of the land cover. Bat and roost data was used to generate networks upon which roost removal simulations were conducted, and they found the likelihood of the colony splitting into multiple roosting networks depended on the connectivity of the colony. The greater the number of bats sharing secondary roosts (the greater the number of connections between roosts) increased the robustness of the colony when exposed to simulated roost loss. In 2009, only 5 percent of modeled roost loss resulted in >50 percent likelihood of colony fragmentation, whereas in 2010, 30 percent of modeled roost loss resulted in >50 percent likelihood of colony fragmentation. In both years, simulated removal of the most central roost resulted in fragmentation. They postulated the differences in the network metrics between years for Indiana bats may have been related to ecological factors such as roost quality, temperature,

suitability, behavioral flexibility, or simply the result of tracking different individuals. However, they also suggested that the roosting behavior and social structure of bat maternity colonies may be inherently flexible and perhaps the differences between years such as were observed are common for the Indiana bat in each year. Silvis et al. (2014b) stated that "As the ephemerality of roost trees likely cause Indiana bat maternity colonies to experience frequent roost loss, including that of primary roosts, fission-fusion dynamics may provide a mechanism for the formation of new maternity colonies by presenting opportunities for the colony to split." Similarly, in a long-term study of an Indiana bat maternity colony in Indiana, Sparks et al. (2003) found that the natural loss of a single primary maternity roost led to the fragmentation of the colony (bats used more roosts and congregated less) the year following the roost loss.

Removal of an Indiana bat primary roost tree (that is still suitable for roosting) in the winter is expected to result in temporary or permanent colony fragmentation. Smaller colonies may be expected to provide less thermoregulatory benefits for adults and for nonvolant pups in cool spring temperatures. Also, removal of a primary roost is expected to result in increased energy expenditures for affected bats. Female bats have tight energy budgets, and in the spring need to have sufficient energy to keep warm, forage, and sustain pregnancies. Increased flight distances or smaller colonies are expected to result in some percentage of bats having reduced pregnancy success, and/or reduced pup survival. Removal of multiple alternate roost trees in the winter is also expected to result in similar adverse effects.

Figure 1 depicts geographic rankings (high, moderate, and low) based on the likelihood of occurrence of Indiana bat maternity colonies. Ranks were assigned based on locations of known maternity colonies, ecological section boundaries, and the collective knowledge of bat biologists of the ecology of Indiana bats in the state. The resulting ranked areas were used in determining the potential risk of impacts to maternity colonies in areas where no surveys have been conducted but suitable roosting habitat is present.

5.2.4 Loss of Documented Maternity Roosts – NLEB

Effects to NLEBs may occur even if maternity roost trees are cleared during the hibernation period (inactive season). No removal of documented NLEB roosts is proposed as part of this consultation.

5.2.5 Loss of Unknown Maternity Roosts – NLEB

NLEBs form colonies in the summer (Foster and Kurta 1999) and exhibit fission-fusion behavior (Garroway and Broders 2007) where members frequently coalesce 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, NLEBs switch roosts often (Sasse and Pekins 1996), typically every 2–3 days (Foster and Kurta 1999; Owen et al. 2002; Carter and Feldhamer 2005; Timpone et al. 2010). Bats switch roosts due to a variety of factors, including temperature, precipitation, to avoid predation and parasitism, and because some roost sites are ephemeral (Carter and Feldhamer 2005). Bats proactively investigate new potential roost trees prior to their current roost tree becoming uninhabitable (e.g., tree falls over) (Kurta et al. 2002, Carter and Feldhamer 2005, Timpone et al. 2010).

Johnson et al. (2012) found that NLEBs form social groups among networks of roost trees that are often centered around a central-node roost. Central-node roost trees may be similar to Indiana bat primary roost trees (locations for information exchange, thermal buffering) but they were identified by the degree of connectivity with other roost trees rather than by the number of individuals using the tree (Johnson et al. 2012). NLEBs form smaller social groups within a maternity colony and exhibit nonrandom roosting behaviors, with some female NLEBs roosting more frequently together than with others (Garroway and Broders 2007; Patriquin et al. 2010; Johnson et al. 2012).

Similar to Indiana bats, NLEBs exhibit fidelity to the general summer maternity area (Foster and Kurta 1999, Jackson 2004, Johnson et al. 2009, Patriquin et al. 2010, Perry 2011, Broders et al. 2013). Roost trees, although ephemeral in nature, may be used by a colony for a number of years until they are no longer available (i.e., the roost has naturally fallen to the ground) or suitable (i.e., the bark has completely fallen off of a snag). Some trees have shorter life expectancy as a roost than others (e.g., living shagbark hickories can provide suitable roosts for Indiana bat for decades while elm snags may lose their bark within a few years). Although loss of a roost (e.g., blow down, bark loss) is a natural phenomenon that NLEBs must deal with regularly, the loss of multiple roosts, which could comprise most or all of a home range, likely stresses individual bats, affects reproductive success, and impacts the social structure of a colony. This section does not analyze the impact of loss of most of a home range (see Loss/fragmentation of summer roosting/foraging habitat/travel corridors for that discussion) but addresses loss of individual roosts.

NLEBs are flexible in their tree species roost selection and roost trees are an ephemeral resource; therefore, the species would be expected to tolerate some loss of roosts provided suitable alternative roosts are available. Silvis et al. (2014a) modeled the effects of roost-loss on NLEBs and then Silvis et al. (2015) actually removed known NLEB roosts during the winter to investigate the effects. Once removals exceeded 20–30 percent of documented roosts (ample similar roosts remained), a single maternity colony network started showing patterns of break-up. Sociality is believed to increase reproductive success (Silvis et al. 2014a) and smaller colonies would be expected to have reduced reproductive success. Similar to the Indiana bat discussion, smaller colonies would be expected to provide less thermoregulatory benefits for adults in cool spring temperatures and for nonvolant pups.

Summary of effects

Indiana bats and northern long-eared bats present in suitable forest habitat could be adversely impacted during habitat management during the active season. Such actions are likely to adversely affect Indiana bats and northern long-eared bats through removal of unknown occupied roost trees resulting in direct take (i.e., death or injury of individuals). While these impacts have been minimized through survey and implementation of AMMs, they have not been fully avoided and are expected to occur.

Indiana Bat Maternity Colony Presumed Likelihood of Occurrence

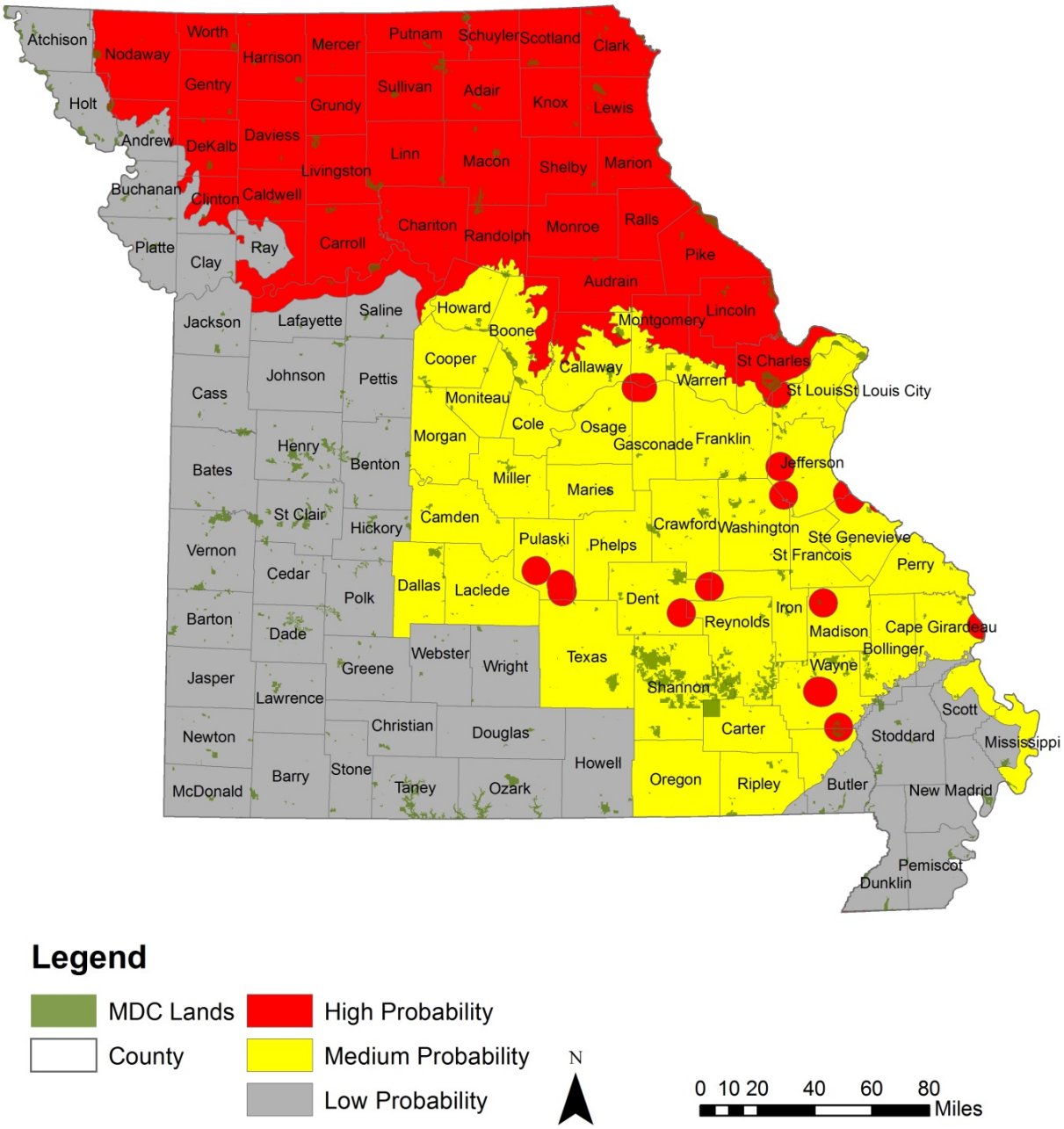

Figure 1. Areas of Missouri ranked according to likelihood of Indiana bat maternity colony presence. Areas were ranked according to presence of documented maternity colonies (either by capture of reproductive females or juveniles, by identification of maternity trees), juxtaposition with counties of known occurrence (i.e. the county is adjacent to or surrounded by counties with known occurrence), and location in an ecological section known to encompass documented Indiana bat colonies.

5.3 Species' Response to the Action

Despite the minimization measures, we anticipate that some female, juvenile, and male and Indiana bats and northern long-eared bats may be killed or injured during tree removal that occurs during planned management, operation, and maintenance activities in the active season. This is likely to occur if a tree in which they are roosting is felled during summer roosting, migration, or swarming. Potential impacts will be distributed across the state mirroring the distribution of project locations and will include impacts to maternity colonies, non-maternity colonies, and migratory and swarming individuals.

The effects of tree removal may include:

- Direct death/injury by removing occupied roost trees, especially when nonvolant pups are present;
- Harm from:
    - Loss of roosts and/or alteration of habitat around remaining roosts;
    - Loss/fragmentation of summer roosting/foraging habitat;

5.3.1 Known Indiana Bat and Northern Long-eared Bat Locations

Known Maternity Colonies and Roosts

Large Tree Removal – On three CAs, Weldon Spring, LaBarque Creek, and August A. Busch Memorial, the removal of trees greater than 9 inches DBH is planned to occur on management units that intersect with the 2.5-mile buffer of a known Indiana bat maternity roost tree. According to MDC's final bat Guidelines, MDC will avoid direct impacts to known Indiana bat and northern long-eared bat maternity roost trees by protecting known roost trees and applying a buffer around trees to protect the roosting area. These projects are fully outside of the 300-acre buffers established in accordance with the Bat Guidelines and tree removal will occur between September 1 and March 31 to fully avoid the maternity season. **We anticipate adverse effects to Indiana bats and NLEBs to result from large tree removal within 2.5 miles of a maternity roost on up to 196 acres of habitat during the migratory season.**

Small Tree Removal - On three CAs, Deer Ridge, August A. Busch, and Weldon Spring, the removal of trees less than 9 inches DBH is planned to occur on management units that intersect with the 2.5-mile buffer of a known Indiana bat maternity roost tree. According to MDC's final bat guidelines, MDC will avoid direct impacts to known Indiana bat and northern long-eared bat maternity roost trees by protecting known roost trees and applying a buffer around trees to protect the roosting area. These projects are fully outside of the 300-acre buffers established in accordance with the Bat Guidelines and no trees greater than 9 inches DBH will be removed. With the possible exception of 2 acres of work at Deer Ridge, work will not be conducted during the maternity season. **We anticipate adverse effects to Indiana bats and NLEBs to result from small tree removal within 2.5 miles of a maternity roost on up to 148 acres of habitat during the migratory season and up to 2 acres of habitat during the maternity season.**

Prescribed Burning – One prescribed burn (Deer Ridge CA) is planned to occur within a 300 acre buffer a known Indiana bat maternity roost tree. This burn will preferentially be conducted during September or October, at which time the maternity colony should have dispersed, and any

remaining bats will be volant and able to escape. If the appropriate weather conditions required to conduct the prescribed burn, according to the approved burn plan, do not occur during September or October, then the burn may be conducted the following April. As such, this burn may occur early in the maternity colony establishment period, well before pups are born.

Six prescribed burns are planned to occur in burn units that intersect with the 2.5-mile buffer of a known Indiana bat maternity roost tree. Each of these burns will take place fully outside of the 300-acre buffers established in accordance with the Bat Guidelines and managers have committed to avoid conducting these burns during May 1 – July 31.

Two prescribed burns (Dunn Ford Access) are targeted for fall (August – October) at which time the maternity colony should have dispersed, and any remaining bats will be volant and able to escape. If the appropriate weather conditions required to conduct the prescribed burn, according to the approved burn plan, do not occur during September or October, then MDC will attempt to conduct the burn during the winter safe dates (November 1 – March 14). As a last resort, the burn(s) may be conducted in late March, but MDC has committed to avoiding April. As such, there is a small chance these burns may occur very early in the maternity colony establishment period, well before pups are born.

Two of the prescribed burns (August A. Busch and Weldon Spring) are targeted for winter (November 1 – March 14). If the appropriate weather conditions required to conduct the prescribed burn, according to the approved burn plan, do not occur during that timeframe, then the burn may be conducted during March 15-April 30. As such, this burn may occur early in the maternity colony establishment period, well before pups are born.

Two of the prescribed burns (Rebel's Cove) are targeted for spring (March 15 – April 30) in order to achieve management goals. Therefore, if the appropriate weather conditions occur during that time frame, these burns may occur early in the maternity colony establishment period, but well before pups are born.

We anticipate adverse effects to Indiana bats and NLEBs to result from prescribed burning within a 300 acre maternity colony buffer on up to 209 acres during the migratory season or potentially early maternity season. We also anticipate adverse effects from prescribed fire within 2.5 miles of a maternity roost early in the maternity season on up to 1,006 acres during the migratory season and up to 947 acres early in the maternity season.

Known Hibernacula

No tree removal, large or small, or prescribed fire is planned to occur within a northern long-eared bat hibernacula buffer.

Large Tree Removal – Four planned timber sales intersect with Indiana bat Priority 1-2 hibernacula buffers. The prescription for each sale is primarily uneven-aged management. In accordance with the Bat Guidelines, no trees will be removed from stands within a hibernacula buffer during the hibernacula avoidance dates (Sep 15 – Oct 31, Mar 15-Apr 30). This is expected to fully avoid adverse effects during the fall swarm and spring emergence periods.

Small Tree Removal - No small tree removal projects are planned to occur within the 5-mile hibernacula buffers established in the Bat Guidelines for Priority 1-2 hibernacula. Two small

tree removal projects are planned outside the 5-mile buffers established in the Bat Guidelines for Priority 1-2 hibernacula, but intersecting with the 10-mile buffers applied by the Service. This work will not be conducted during May-July but may occur during the fall swarm or spring emergence periods, because the avoidance dates for Priority 1-2 hibernacula buffers only apply within the 5-mile buffers established in the Bat Guidelines and only to the removal of trees greater than 9 inches DBH. **We anticipate adverse effects to Indiana bats from small tree removal within 10 miles of an Indiana bat hibernacula during the migratory season**. With the exception of 17 acres of old field habitat, all of this work will be done in woodland systems.

Prescribed Burning - Two prescribed fires are planned for units that intersect with a 5-mile Indiana bat Priority 1-2 hibernacula buffer. These burn units are comprised primarily of open habitat (1,723 acres) with a smaller component of treed natural communities (652 acres). Implementation of the avoidance and minimization measures described in the Bat Guidelines will fully avoid adverse effects.

5.3.2 Potential Indiana Bat Maternity Colony Habitat

Zone of High Likelihood of Occurrence

Large tree removal will be conducted on up to 5,026 acres outside of buffers established in the bat guidelines within the High-Likelihood (High) zone during FY18. Two projects intersect with a five-mile buffer established for summer captures of reproductively active female or juvenile Indiana bats. The majority of this work will occur in open systems including 540 acres of grassland, 791 acres of old field, 3,025 acres of wetland, and 1 acres of glade. Forest (518 acres) and woodland (151 acres) management will be applied across 670 acres; no large tree removal will occur on savanna communities within the high-likelihood zone.

In accordance with the bat guidelines, all large tree removal activities within the High zone will occur outside the maternity season (May-Aug) with the exception of three projects at Fountain Grove CA. Two projects affecting 232 acres have already been addressed in the 2016 Intra-Service BO; only the third affecting 546 total acres are addressed in this BO. At Fountain Grove CA, some work may occur during the active season, but no trees >9” DBH will be removed during June – July. In accordance with the bat guidelines for high-likelihood areas, Tier 3, an evaluation and management plan will be developed by the wildlife management biologist and bat biologist for these projects. A 13-acre segment of the 139-acre tree removal project occurs within five miles of a 1978 summer Indiana bat capture without reproductive status details. For removal of trees >9” dbh that occurs in May, pregnant females could be present in maternity trees, but pups are unlikely to be born by this date; therefore, tree felling could harm, harass, injure, or kill pregnant females. The same tree felling activities conducted in August could harm, harass, injure, or kill females and volant pups. In areas where no surveys have been or will be conducted to locate maternity colonies and active maternity roost trees, and where the species is known or likely to be present, direct effects are likely to occur to females and non-volant pups. Without surveys to determine presence or probable absence, it is not possible to determine the number of bats that could be impacted, so we are using acres of habitat as a surrogate for individuals. **Impacts to maternity colonies, non-maternity colonies, or migratory individuals are anticipated over 234 acres of suitable maternity habitat on Fountain Grove CA.**

We anticipate impacts to migratory individuals over an additional 4,000 acres in the High Likelihood of Occurrence Zone (High). Areas of suitable habitat in the High zone are likely to be used by bats for spring and fall migration between summer and winter habitats. Adverse effects resulting from felling trees occupied by individuals or small colonies could occur during activities planned in the active season, but this activity is anticipated to be infrequent and of low intensity. In the absence of survey information, we are using acres as a surrogate for individuals because it is not possible to determine the number of individuals that could be affected. **Migratory impacts could occur over an additional 4,000 acres beyond the acres addressed above for Fountain Grove CA.**

Zone of Medium Likelihood of Occurrence

Twenty timber sales on Federal Aid lands are planned for FY18, and all occur within the Medium-Likelihood (Medium) zone of Indiana bat maternity colony occurrence. No timber sales intersect with known maternity colony buffers or capture buffers for reproductively active female or juvenile Indiana bats or northern long-eared bats. The three sales that intersect with Indiana bat hibernacula buffers are addressed above and not included in this section.

Outside of established hibernacula and maternity colony buffers, timber sale activities may occur year round. However, in accordance with the avoidance and minimization measures described in the bat guidelines for the Medium zone, tree removal will be minimized during June-July. Therefore, 11 sales will begin in August and three will begin in October to maximize the amount of work that can be completed before the following June, thereby minimizing activity during June-July. Depending upon conditions, work may be completed on many of these areas prior to the maternity season. Five of these sales will have a delayed start (2 in January, 3 in March, and 1 in April) because inventory and marking are not yet complete. For the delayed sales, work during June-July will likely be necessary. Regardless of start date, no regeneration harvest will be conducted during June or July for any of these timber sales.

Despite efforts to avoid and minimize tree removal during June and July, it is possible that tree removal will be conducted during any season on any of these areas. **Therefore, we anticipate that timber sales could harm, harass, injure, or kill Indiana bats and NLEBs during the maternity, non-maternity or migratory season on over 9,065 acres in the Medium zone.**

In addition to potential adverse effects from timber sales as discussed above, we anticipate impacts to migratory individuals over 1,672 acres in the Medium zone from non-timber sale activities (forest, woodland, glade, grassland, old field, and wetland management). Columbia Bottom (68 acres) was included in the 2016 Intra-Service BO and will be excluded from further exemptions in this BO. Areas of suitable habitat in the Medium zone are potentially used by bats for spring and fall migration between summer and winter habitats. Adverse effects resulting from felling trees occupied by individuals or small colonies could occur during activities planned in the active season, but this activity is anticipated to be infrequent and of low intensity. In the absence of survey information, we are using acres as a surrogate for individuals because it is not possible to determine the number of individuals that could be affected. Adverse effects resulting from timber sale activities during the **migratory season could occur over an additional 1,606 acres beyond the acres addressed above for timber sales.**

Zone of Low Likelihood of Occurrence

Large tree removal will be conducted on up to 3,141 acres outside of established bat buffers within the Low-Likelihood (Low) zone during FY18. Natural communities to be treated include forest (893 acres), woodland (30 acres), savanna (50 acres), grassland (886 acres), old field (744 acres), and wetland (539 acres). In accordance with the Bat Guidelines, tree removal activities in the low likelihood zone will be minimized during April – August, and further minimized during June-July. At Truman Reservoir, 14 acres of tree removal may be conducted during June – October because this is a wetland area that is only accessible during dry periods in the summer or fall. Otherwise, no large tree removal is planned to occur in the low likelihood zone during May-July. Large tree removal may occur in April or August at five sites. With the exception of the 14 acres at Truman Reservoir, May-July will be avoided. **We anticipate that large tree removal could harm, harass, injure, or kill Indiana bats and NLEBs during the maternity or migratory season on over 261 acres, as well as 2,720 acres solely during the migratory season in the Low zone.**

Four-hundred-fifty-six prescribed burns totaling approximately 93,280 acres are planned across the state in units that do not intersect with any bat buffers established in the bat guidelines as of February 2017. This includes approximately 32,860 acres of treed natural communities (forest, woodland, glade and savanna) and 58,870 acres of open natural communities (wetland, grassland, old field and agricultural). There are no avoidance dates associated with these prescribed fires outside of established buffers, but prescribed fire is not conducted in forest or woodland habitats during May – July, so adverse effects to non-volant pups and females is very unlikely to occur if any unknown maternity sites exist in burn areas. Forty-six of these prescribed burns, totaling 4,853 acres, were included in the FY17 BO and will not be analyzed further in this BO. Included in this category are 28 potential projects intersecting with five-mile buffers established by the Service around captures of juvenile or female Indiana bats in the high-likelihood zone because there are no avoidance dates for prescribed fire associated with these buffers. Although there are no avoidance dates associated with these 453 prescribed fires outside of the buffers established in the Bat Guidelines, if any maternity sites are discovered prior to conducting a burn the appropriate avoidance and minimization measures will be followed. Prescribed fire is not conducted in forest or woodland habitats during May – July, so impacts to maternity colonies are very unlikely to occur during the maternity season. Adverse effects are unlikely to occur from prescribed fire in the Low zone.

5.3.3 Removal of Small Diameter Trees

The removal of trees less than 9 inches dbh (other than eastern red cedar and brushy invasive species) during the active season (March 15 – Nov 1) has the potential to negatively impact northern long-eared bats (including maternity colonies) and male or non-reproductive female Indiana bats. Although the final 4(d) rule exempts all management activities that are more than 0.25 miles from a known northern long-eared bat maternity roost or hibernaculum, the Service must still estimate potential adverse effects to northern long-eared bat resulting from habitat removal. Any of the tree removal projects discussed above that address large tree (>9 inches dbh) removal may also include some small tree removal. In addition to these activities, other activities that will involve the removal of trees less than 9 inches dbh include:

- 12,307 acres of small tree removal (includes totals from Table 2 and Table 6)
    - 123 acres during inactive season only (Nov 1 – Mar 15)

    - 12,021 acres may occur during April - August
- 6,818 acres of mechanical control of woody species
    - 90 acres during inactive season only (Nov 1 – Mar 15)
    - 1,813 acres may occur during April – August
    - 169 acres was also included in the FY17 BA; work may carry over into FY18

This totals 19,125 acres of small tree removal activities for FY18, of which 213 acres will take place entirely during the inactive season (Nov 1 – Mar 15). Up to 12,021 acres of small tree removal and 1,813 acres of mechanical control of woody species may occur during the maternity season (April – August). **Therefore, we anticipate adverse effects to NLEBs and male or non-reproductive female Indiana bats from small tree removal on up to 13,665 acres (excludes acres covered in FY17 BO) during the maternity season or migratory season clearing. Take of northern long-eared bats resulting from this activity is not prohibited under the final 4(d) rule.**

5.3.4 Removal of Hazard Trees

Hazard trees are defined as one to a few trees that pose a threat to human life or property. Hazard trees may develop over time as a tree ages, or suddenly as a result of an external event such as a storm or fire. These are isolated incidents; clearing a large area of snags for safety is not included within the definition of 'hazard tree removal'. To be considered a hazard, the tree must be near enough to a property boundary, or to a feature designed to accommodate specific public use (e.g., public road, trail, parking lot, boat ramp, shooting range, picnic or camping area) that the tree poses a threat to members of the public and/or their property while using the public use feature.

Hazard trees that develop over time often provide suitable roosting habitat for bats. Therefore, in non-emergency situations MDC will remove hazard trees during the inactive period (Nov 1 – Mar 31). However, if a suitable roost tree poses an immediate threat to human life or property, it may be removed immediately regardless of location or time of year and without conducting a bat survey. If a suitable roost tree > 9 inches DBH poses an immediate threat to human life or property and must be removed during April 1 – Aug 31, the Wildlife Diversity Coordinator will be notified before or as soon as possible after the tree is removed, and the Wildlife Diversity Coordinator will notify the Service as needed. Best management practices for hazard tree removal are provided in detail in the bat guidelines.

Any planned removal of hazard trees will take place during the inactive period and will therefore have no direct effect on either bat species. Any hazard tree removal during the active season will be in an emergency situation that cannot be predicted. Emergency consultation with the Service will be initiated as needed for Indiana bat before or shortly after the removal of hazard trees that may be suitable Indiana bat roost trees. Hazard tree removal is not prohibited under the final 4(d) rule for northern long-eared bats.

5.4 Interrelated and Interdependent Actions

We must consider along with the effects of the action the effects of other activities that are interrelated to, or interdependent with, the proposed action (50 CFR sect. 402.02). Interrelated

actions are part of a larger action and depend on the larger action for their justification. Interdependent actions have no independent utility apart from the proposed action. At this time, the Service is unaware of actions that are interrelated and interdependent with the habitat management or operation and maintenance that have not already been considered in this biological opinion.

6. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the Action Area considered in this BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Indiana bats and northern long-eared bats within the Action Area may be affected by wind energy developments and tree clearing activities on private and public land. The operation of wind turbines has been documented to cause mortality of Indiana bats (Good et al. 2011, Service 2011). Three wind energy developments are currently planned in Missouri. Therefore, we expect that cumulative effects from wind projects could impact Indiana bats and northern long-eared bats in the Action Area.

We also considered the effects of tree clearing on private and state land. This activity is reasonably certain to occur in the Action Area, and we used Forest Inventory and Analysis (FIA) data to estimate the extent of clearing on private and state forest lands that could impact populations of Indiana bat and northern long-eared bat. For the 5-year inventory period of 2008 to 2012, approximately 87.2% of Missouri's forest land [3]was under private or state ownership (82.4% private, 4.8% state). Similarly, of forest land that is also considered timberland[4], 88% was under private or state ownership (83.4% private, 12,587,932 acres; 4.6% state, 691,528 acres). Timberland data from the 2008-2012 inventory period are used in the cumulative effects analysis.

Sawtimber[5] removal can occur statewide, but is more prevalent in the Ozark Plateau of southern Missouri. From 2008 to 2012, 539 million board feet (MBF) of sawtimber trees were removed from private and state land in Missouri. During the same time period, growth of sawtimber trees was 1,413 MBF and tree mortality was 443 MBF. The net change in sawtimber trees was an overall increase of 874 MBF. Tree mortality is highest in Ozark Plateau with Iron, Maries, Reynolds, Shannon, Washington, and Wayne counties having the highest levels of mortality. Tree species composition on private and state lands in the Ozark Plateau was assumed to be similar to that of the Mark Twain National Forest (MTNF). On the MTNF, tree species groups that are documented to have the highest mortality are the white oak/red oak/hickory and white

[3] Forest land is defined as land that is at least 10% stocked by trees of any size. The minimum are for classification of forest land is one acre and 120 feet wide measured stem-to-stem from the outer-most edge.

[4] Timberland is defined as forest land that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization by statue or administrative regulation.

[5] A sawtimber tree is a live tree of commercial species at least 9.0 inches dbh for softwoods, or 11.0 inches for hardwoods, containing at least one 12-foot sawlog or two noncontiguous 8-foot sawlogs, and meeting regional specifications for freedom from defect.

oak groups. Based on the extent of tree removal, tree species composition, and level of tree mortality on private and state lands in the Action Area, it is likely that Indiana bats occur on these lands and that tree removal could impact the species.

We have considered the impacts of potential direct and cumulative effects throughout the Action Area. While impacts could occur to individuals or populations, we do not consider these impacts to effect the persistence or reproductive potential of Indiana bats in the Ozark-Central Recovery Unit, or to northern long-eared bats range-wide.

7. CONCLUSION

Impacts to individuals are likely to occur during any time during the active season and to any cohort of individuals present when activities are conducted. The proposed actions will likely **modify or remove 34,458 acres of maternity and non-maternity roosting habitat, and migratory habitat** across the State of Missouri during the active season (Table 2). Based on implementation of avoidance and minimization measures, our analysis indicates that these actions are not likely to cause population-level (i.e. maternity colony) impacts that would lead to a decrease in fitness and viability of a population unit for either species.

Surveys will not be conducted in the project areas to determine presence/probable absence or identify roost trees. MDC will follow the final bat guidelines to avoid and minimize impacts during the active season and non-volancy period (June and July), but impacts to undocumented maternity colonies could occur during the active season where felling of potential roost trees occurs. It is unlikely that all project areas that occur in suitable forest habitat are occupied by maternity colonies and, therefore, unlikely that individual projects will cause population-level declines in fitness and viability. However, based on the geographic scope of the covered activities and habitats in which these activities occur, it is likely that work in the active season will impact individuals in one or more colonies somewhere in Missouri during the period covered by this BO.

Table 2. Total acres where activities could result in adverse effects to Indiana bats. (Mat = maternity, SS = staging and swarming, Mig = migratory, NM = non-maternity)

			Take				
Activity	**Acres**	**Bat Presence**	**Mat**	**SS**	**Mig**	**NM**	**Location**
Lg Tree Removal	196	Known Maternity Buffer (2.5-mi)			X		Weldon Spring, LaBarque Creek, and August A. Busch Memorial
Sm Tree Removal	148	Known Maternity Buffer (2.5-mi)			X		Deer Ridge, August A. Busch Memorial, and Weldon Spring
Sm Tree Removal	2	Known Maternity Buffer (2.5-mi)	X				Deer Ridge
Small Tree Removal	660	Known Hibernaculum Buffer			X		Peck Ranch, Plowboy Bend
RXB	209	Known Maternity Buffer (300-ac)	X		X		Deer Ridge
RXB	1,953	Known Maternity Buffer (2.5-mi)	X		X		Rebel's Cove, August A. Busch, Weldon Spring, Dunn Ford
Lg Tree Removal	234	High Zone	X		X		Fountain Grove
Lg Tree Removal	4,000	High Zone			X		Fountain Grove
Lg Tree Removal	9,065	Medium Zone	X		X	X	Timber sales
Lg Tree Removal	1,606	Medium Zone			X		Timber sales
Lg Tree Removal	261	Low Zone	X		X		Other habitat management
Lg Tree Removal	2,459	Low Zone			X		Other habitat management
Sm tree removal	13,665	Statewide				X	Other habitat management
Total Tree Removal Acres:							34,458

Furthermore, our analysis indicates that impacts to males and non-reproductive females could occur if roosts are lost during the summer roosting period or during swarming and staging areas that are not within five miles of Priority 1 and Priority 2 Indiana bat hibernacula. Projects occurring in non-maternity roosting habitat and swarming and staging habitat are relatively large and are occurring in proximity to hibernacula where these individuals are likely to spend the summer. The roosting behavior of non-maternity bats is such that they occur in much smaller groups or as individuals compared to reproductive females. MDC will follow the final bat guidelines for areas within five miles of Priority 1 and 2 hibernacula (no tree felling from September 15 to November 1 and March 15 to April 30). Actions during the summer roosting period around all hibernacula could cause impacts at the individual level; however, population-level impacts are unlikely because of bats' dispersed nature across forested landscapes. Population-level impacts to bats in Priority 1 and 2 hibernacula through disturbance in staging and swarming habitats are unlikely to occur based on implementation of the bat guidelines (no tree felling September 15 to November 1 and March 15 to April 30). Impacts to individuals could occur around hibernacula with lower priority numbers during the swarming and staging periods.

After reviewing the current status of the listed 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 the proposed habitat management and operation and maintenance activities will not have impacts at the recovery unit level for Indiana bats and will not jeopardize the continued existence of the Indiana bat. The proposed action also will not adversely modify designated critical habitat for the Indiana bat. Likewise, the same activities will not jeopardize the continued existence of the northern long-eared bat because the proposed action is not expected to reduce the reproduction, numbers, or distribution of the northern long-eared bat range-wide. Therefore, we do not anticipate a reduction in the likelihood of both survival and recovery of the species as a whole.

8. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species 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 behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering [50 CFR §17.3]. 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(a)(2), taking that is incidental to and not intended as part of the agency action is not considered prohibited taking under the Act, provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement (ITS).

On January 14, 2016, the Service published a species-specific rule pursuant to section 4(d) of the ESA for northern long-eared bat. The incidental take that is carried out in compliance with the

final 4(d) rule is not prohibited and does not require exemption in this Incidental Take Statement. Accordingly, there are no reasonable and prudent measures or terms and conditions that are necessary and appropriate for these actions relative to northern long-eared bats because all incidental take has already been exempted.

The measures described below are non-discretionary, and must be undertaken by WSFR so they become binding conditions of any grant, permit, or action for the exemption in section 7(a)(2) to apply. WSFR have a continuing duty to regulate the actions covered by this Incidental Take Statement as it relates to their allocation of federal funding. If WSFR: (1) fails to assume and implement the terms and conditions or, (2) fail to require any contracted group to adhere to the terms and conditions of the Incidental Take Statement through enforceable conditions that are added to any grant, contract, or permit, the protective coverage of section 7(a)(2) may lapse. In order to monitor the impact of incidental take, WSFR must report the impact on the species to the Service as specified in the ITS [50 CFR 402.14(I)(3)].

8.1 Amount or Extent of Take Anticipated

Despite the implementation of MDCs bat guidelines, we anticipate that some male, female, and juvenile Indiana bats may be killed or injured during habitat management and operation and maintenance activities that occur in the active season during FY 18. This is likely to occur if an occupied roost tree is felled during summer roosting, migration, staging, or swarming. **We anticipate that clearing during the active season will result in take, in the form of death, injury, harm, or harassment of individuals over 34,458 acres of maternity and non-maternity roosting habitat, swarming and staging habitat, and migratory habitat.** Take will be measured by the number of acres of suitable roosting habitat that are modified or removed during implementation of the projects covered in this BO. Direct take also will be detected by observing disturbance, injury, or mortality of individuals or colonies.

WSFR must reinitiate consultation with the Service if more than 34,458 acres of habitat is modified or removed by actions covered in this BO.

8.2 Effect of the Take

Overall, the harm, harassment, injury, or death of individuals caused by modification or removal of 34,458 acres of forested habitat is not likely to affect the status of Indiana bats in the Ozark-Central Recovery Unit or the range-wide status of northern long-eared bats. In the accompanying opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Indiana bat or northern long-eared bat.

9. REASONABLE AND PRUDENT MEASURES

The Service believes that the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize the incidental take of Indiana bats:

1. Avoid direct mortality of females and non-volant juveniles in maternity roosts;
2. Locate, maintain, and monitor known occupied maternity trees and resident Indiana bat populations;

3. Ensure the presence of an adequate short-term supply of roost trees and maintain a continuous, long-term supply of high quality roost trees;
4. Implement conservation measures and best management practices to maximize bat habitat and conservation of Indiana bats; and
5. Avoid and minimize impacts to Indiana bats in the active season from tree clearing.

10. TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of the Act, the following terms and conditions, which implement the reasonable and prudent measure described above applies. These terms and conditions are non-discretionary:

1. Avoid direct mortality of females and non-volant juveniles in maternity roosts
    a. All known Indiana bat maternity roost trees will be retained until they naturally fall to the ground
2. Locate, maintain, and monitor known occupied maternity trees and resident Indiana bat populations
    a. To the extent practical, presence and use of the project area by Indiana bats and northern long-eared bats will be determined through surveys (capture and radio telemetry) and location of primary and alternate maternity roost trees in the project area will be determined, if applicable
    b. Survey and monitoring results shall be submitted following the summer survey season to the Missouri Ecological Services Field Office of the Service Reports must contain:
        i. Description of management or habitat manipulations occurring in the area
        ii. The results of the mist netting survey, including number, sex, age (mature or juvenile) and reproductive status of all bats captured, including Indiana and northern long-eared bats, if any are captured
        iii. Whether or not dead Indiana or northern long-eared bats were found in the project area. Should one or more Indiana or northern long-eared bats be encountered during the course of the project, the Missouri Ecological Services Field Office must be notified upon the discovery, and the number, age, sex, and reproductive status of the bat(s) is to be reported
    c. If any Indiana or northern long-eared bats are found dead or injured following the necessary removal of a tree during the maternity season, the following protocols are requested:
        i. Contact Shauna Marquardt of our office at shauna_marquardt@fws.gov (573-234-2132, ext. 174) for deposition of specimens. She will contact appropriate individuals regarding final deposition and use of any specimen pending condition of the recovered carcass
        ii. Specimens should be frozen in a plastic bag and include date and location with latitude and longitude coordinates
        iii. Contact Service law enforcement in St. Peters Missouri: 636-441-1909
        iv. Provide a report on the circumstances surrounding the discovery and incidental taking
3. Provide an adequate short-term supply of high quality roost trees and maintain a continuous, long-term supply of high quality roost trees

    a. Current baseline habitat conditions will be enhanced in order to provide adequate short-term roosting opportunities. This will be accomplished through the natural generation of snags as well as retention of snags and potential roost trees
4. Implement conservation measures and best management practices to maximize bat habitat and conservation of Indiana bats
    a. Implement conservation measures identified in the documents *Guidelines for Avoiding and Minimizing Impacts to Federally-listed Bats on Missouri Department of Conservation Lands*
5. Avoid and minimize impacts to Indiana bats in the active season from tree clearing
    a. Maximize clearing from November through March

11. 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 activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Service as identified the following actions that would further the conservation of federally listed bats:

1. Avoid tree felling activities in areas of Missouri considered to have a high likelihood of occupancy by maternity colonies during May 15 to August 15
2. Conduct surveys for bats in Missouri to better define areas of occupancy relative to MDC lands
3. Assist with WNS investigations. For example:
    a. Monitor the status/health of known colonies
    b. Collect samples for ongoing or future studies
    c. Allow MDC staff to participate in research projects
4. Monitor post-WNS distribution of WNS-affected species in Missouri
    a. Conduct targeted presence/probable absence surveys
    b. Conduct radio telemetry to monitor status of colonies
    c. Participate in NABat surveys (http://www.srs.fs.usda.gov/pubs/gtr/gtr_srs208.pdf)
5. Conduct research on the summer habitat requirements of federally listed bats on MDC lands
    a. Investigate habitat characteristics of the forest in areas where post-WNS population occurrences have been documented
    b. Investigate bat use (acoustics, radio telemetry) of recently managed areas of different prescriptions

12. REINITIATION NOTICE

This concludes formal consultation on the allocation of Federal Aid to the Missouri Department of Conservation for fiscal year 2017. As provided in 50 CFR 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 action agency 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 listed 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.

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