United States Department of the Interior

FISH AND WILDLIFE SERVICE
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September 3, 2015

Ms. Jennifer Brown
U.S. Army Corps of Engineers
St. Louis District
Regulatory Branch
1222 Spruce Street
St. Louis, Missouri 63103-2833

Subject: Biological Opinion on the Menard's Industrial Campus, Sullivan, Missouri

Dear Ms. Brown,

This document transmits our final biological opinion based on our review of the U.S. Army Corps of Engineers (USACE) issuance of a 404 Clean Water Act permit for the Menard's Industrial Campus, Sullivan, Missouri, under section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Your request for formal consultation was received electronically on April 3, 2015. The biological opinion is based on information regarding federally listed species that could occur in the project area provided in the April 2015 Biological Assessment, other available literature, and personal communications with experts.

The enclosed Biological Opinion addresses effects of the project on the federally endangered Indiana bat (*Myotis sodalis*), federally endangered gray bat (*Myotis grisescens*), and federally threatened northern long-eared bat (*Myotis septentrionalis*). The opinion also provides a statement of anticipated incidental take as a result of the project.

We appreciate your cooperation in working to protect federally listed species. If you have any questions or concerns regarding this consultation and biological opinion, please contact me or Shauna Marquardt of this office at 573-234-2132.

Sincerely,

Amy Salveter
Field Supervisor

Enclosure

BIOLOGICAL OPINION

for

U.S. Army Corps of Engineers' Issuance of Section 404 Clean Water Act Permits to Menard Corporation

for

Menard's Industrial Campus, Sullivan, Missouri

September 3, 2015

1. INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) for the U. S. Army Corps of Engineers' (USACE) issuance of Section 404 Clean Water Act permits for the Menard's Industrial Campus. This BO evaluates the potential and actual effects of project construction on the Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), and gray bat (*Myotis grisescens*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

The federally endangered Indiana bat and federally threatened northern long-eared bat throughout Missouri 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. Federally endangered gray bats roost in caves or mines year-round and use forest riparian areas for foraging. Actions that will be implemented for construction of the Menard's Industrial Campus will permanently remove suitable roosting and foraging habitat for all three federally listed bat species.

This BO describes the effects of these actions on Indiana bat, northern long-eared bat, and gray bat 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 April 3, 2015. Formal consultation was initiated on April 3, 2015 via an email from the USACE to the Service's Missouri Ecological Services Field Office. The purpose of the formal consultation process is for the Service to write a biological opinion that addresses the adverse effects identified in the Biological Assessment (BA) submitted by the USACE.

Section 7(a)(2) of the Act 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.

Consultation History

January 7, 2015	Pre-construction notification (PCN) issued to regulatory agencies
January 23, 2015	Comments to PCN submitted by Service via email
March 6, 2015	SCI confers responses to agency comments via email to Service
March 27, 2015	Conference call between USACE, Congressional offices, and Service

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

April 3, 2015	USACE requests formal consultation via email to Missouri Ecological Services Field Office (MOESFO)
April 3, 2015	Initiation package received by MOESFO; formal consultation initiated via letter to USACE
July 24, 2015	Service requests 30-day extension to formal consultation timeline via email to USACE
August 28, 2015	Draft Biological Opinion (BO) sent to USACE for review
September 3, 2015	Final BO sent to USACE

2. DESCRIPTION OF THE PROPOSED ACTION

Section 7(a)(2) of the 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 USACE. The USACE is issuing Section 404 Clean Water Act permits for activities involved with the construction of the Menard's Industrial Campus, Sullivan, Missouri. The issuance of permits is the nexus for this consultation, which is being conducted 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, northern long-eared bat, and gray bat in Franklin County, Missouri. The project area is approximately 123 acres and is located in the City of Sullivan, Missouri; the entire 123 acres is considered the Action Area for the purposes of this consultation. Approximately 90 acres of the site consists of early successional to second growth forest. The remaining 33 acres are located along the eastern and northern portion of the tract and exists as a previously disturbed area that contains a mixture of scrub-shrub, grasses and soil borrow areas. There are three ephemeral or intermittent tributaries and one perennial tributary within the site. The tract contains a total of 3,840 linear feet of jurisdictional tributaries.

2.2 Project Action

Project plans include the construction of a new distribution and manufacturing campus for the Menard Corporation. The campus will serve Menard's retail store locations throughout Missouri, Southern Illinois, and Western Kentucky. The campus includes home improvement/construction material storage areas, personal/commercial parking lots and associated infrastructure such as roadways and stormwater management systems.

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

- Permanent loss of 78 acres of forested habitat

2.2.1 Project impacts

Three unnamed tributaries to Winsel Creek will be impacted per the project plans. Tributary impacts total 2,432 linear feet. The impacts will consist of a mixture of filling and rerouting through a series of vegetated grass swales and culvert pipes.

The site includes approximately 90 acres of forested habitat. Impacts to the forested portion of the site include the removal of 78 acres of trees.

2.3 Conservation Measures

Conservation measures represent actions pledged in the project description that the action agency and applicant will implement to further the recovery of the species under review. Conservation measures implemented to minimize harm to listed species which are proposed by the action agency are considered part of the project and their implementation is required under the terms of this consultation.

- Menards has attempted to minimize impacts on-site and have provided their preferred alternative which includes the clearing of 78 acres of forested habitat. The preferred alternative also includes avoiding impacts to approximately 12 acres of forested habitat within the project area. The 12-acres of forested area that will not be cleared exist within the southern portion of the site and include a perennial stream source.

- In addition to on-site measures, Menard will provide mitigation for the unavoidable loss of suitable roosting and foraging habitat. Off-site mitigation will occur at a minimum amount of 183 acres (approximately 2.3: 1). The mitigation area will be protected in perpetuity through a conservation easement, managed by a third-party land conservation organization, or gifted to a public land management agency.

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 (*Myotis lucifugus*) 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 (S. Marquardt, pers. obs.).

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 (*Populus deltoids*) 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 2015 is estimated to number about 523,636 bats (Figure 5).

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. In the face of white-nose syndrome, nearly all states show population declines that range from minor to severe (USFWS 2015).

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.

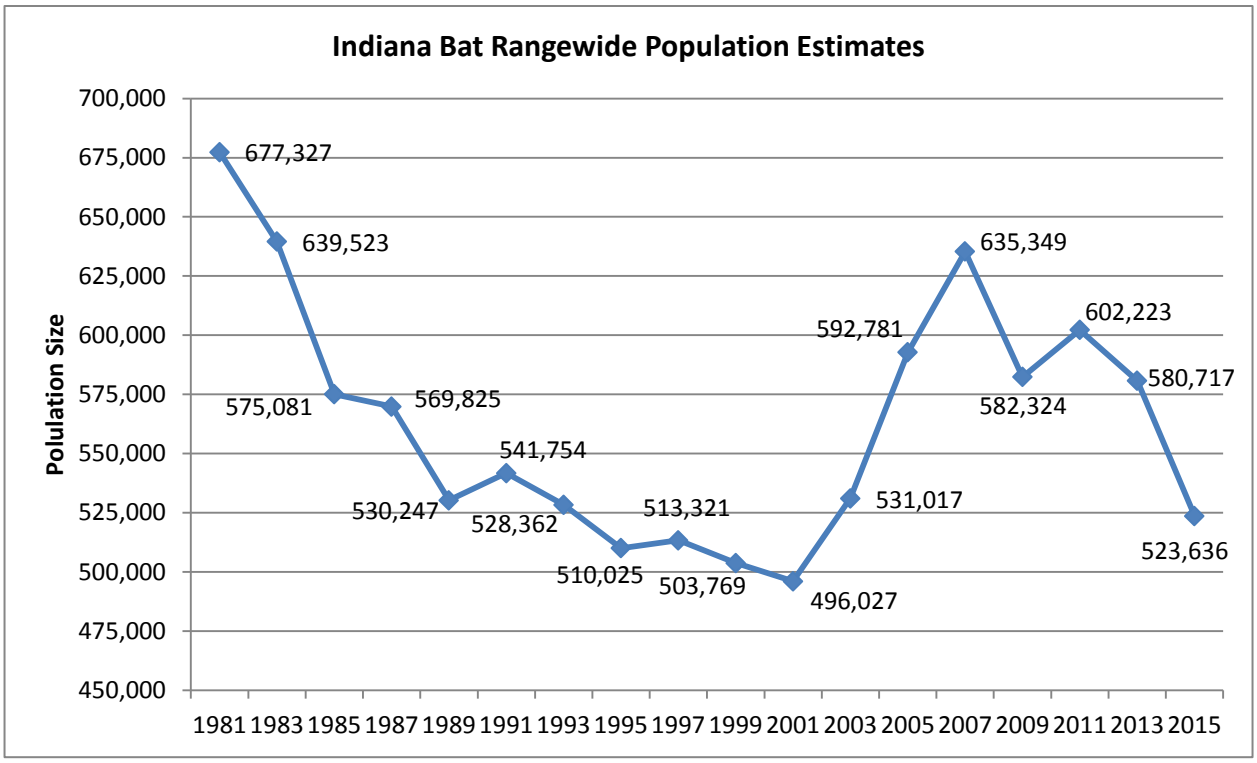

Figure 5. Indiana bat rangewide population estimates from 1981 – 2015 (http://www.fws.gov/midwest/Endangered/mammals/inba/pdf/2015IBatPopEstimate25Aug2015v2.pdf; (USFWS 2015)).

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 (S. Marquardt, pers. comm).

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, Arkansas, Illinois, Iowa, Michigan, Wisconsin, and suspected in Minnesota and Oklahoma. 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 recently have remained relatively stable based on the last two biannual surveys (USFWS 2013, USFWS 2015). 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 167,000 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 2015 population estimate for the Ozark-Central RU is approximately 243,142.

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.

Northern long-eared bats tend to roost singly or in small groups (USFWS 2014), with hibernating population sizes ranging from just a 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. Females 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). Furthermore, surveyors have detected indications of decline (changes in bat behavior) as well as actual declines in numbers of northern long-eared bats in hibernacula in the State (T. Elliott 2015, pers. comm.). 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 (S. Amelon 2014, pers. comm.; M. 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).

3.3 Gray bat

3.3.1 Life History, Biology, and Threats

The gray bat was listed as an endangered species on April 28, 1976 (41 FR 17736). No critical habitat was designated for the species.

The gray bat is the largest member of the genus Myotis in the eastern United States (USFWS 1982). Forearm lengths range from 40 to 46 millimeters and individuals weigh from 7 to 16 grams. This species is easily distinguished from all other bats in the eastern United States by the color of its fur. All other species have bi-colored or tri-colored fur. In late summer, the gray bat's fur is uniformly dark gray, but the color may bleach to chestnut brown or russet between molts (USFWS 1982). Also, the wing membrane of gray bats connects to the foot at the ankle rather than at the base of the first toe as in other Myotis species (USFWS 1982).

Gray bats use caves, storm sewers, bridges, and mines for maternity colonies, transient sites, bachelor colonies, and hibernation sites. They exhibit strong fidelity to their habitats and return to the same maternity and hibernation sites each year, making protection of these sites from vandalism and disturbance vital. The majority of the males form small bachelor colonies in separate caves, however, in some large caves, maternity colonies and bachelor colonies may be found in separate sections. Gray bats are easily disturbed by human entry into occupied sites. Such disturbance can cause mothers to abandon their young during the maternity season. Gray bats are known to be active on warm days in winter (mainly to drink), but are not known to forage. Preferred hibernation sites are typically deep vertical pit caves, while maternity caves are characterized by large entrances and large rooms with domes where females form maternity colonies.

Gray bats can migrate fairly long distances between their summer and wintering sites. Banding studies have noted bats banded at hibernacula in Missouri being found in Oklahoma, Arkansas, Kansas, and other surrounding states. During current banding studies, some gray bats have been recovered 60 to 100 miles from their original banding site. Gray bats forage along streams, rivers and other bodies of water to consume flying aquatic and terrestrial insects.

Additional information on the life history of, and threats to, the gray bat is contained in the species' recovery plan (USFWS 1982), completed 5-year review (USFWS 2009), and published and unpublished literature for the species. This information is adequately described in those documents and is hereby incorporated by reference.

3.3.2 Status and Distribution

Rangewide

The gray bat occurs in limestone karst areas in the Southeastern United States and the Ozarks of Arkansas, Kansas, Missouri, and Oklahoma. Populations are known from Alabama, northern Arkansas, Kentucky, Missouri, and Tennessee. The species has also been reported to exist in northwestern Florida, western Georgia, southeastern Kansas, southern Indiana, southern and southwestern Illinois, northeastern Oklahoma, northeastern Mississippi, and western Virginia (USFWS 1982). At the time of its listing, the species' total population size was estimated at 1.6 million individuals. Recent estimates indicate that the range-wide estimate has increased to approximately 3.4 million individuals (USFWS 2009).

Since the completion of the 1982 Gray Bat Recovery Plan and the 2009 5-year review, ongoing surveys have been undertaken throughout the species' range. Counts have been conducted at hibernacula and maternity sites, and there have been surveys conducted for the species associated

with various development projects. Depending on the situation and season, different techniques have been used to monitor various gray bat populations including direct counts, emergence counts and measuring the extent of guano piles or ceiling stains at established roosts. More recently, species' numbers have been monitored using technologically advanced equipment such as near-infrared (NIR) or thermal infrared (TIR) videography with computer and statistical software packages. In addition to problems inherent with using various census techniques, other complications associated with differences in observers' counting abilities, movements of gray bats between transient and permanent hibernacula or maternity sites, seasonality (e.g., counts at maternity sites before or after birth of young), inability to census sites the same year, and the potential of disturbing hibernating bats at critical hibernacula, all further hamper the ability to obtain accurate population trends for the species. The difficulty in obtaining meaningful trend data for various species of bats including gray bats has been exhaustively examined (Tuttle 1979; Sabol and Hudson 1995; Ellison et al. 2003, Kunz 2003, O'Shea and Bogan 2003, Tuttle 2003, Martin 2007, Sasse et al. 2007, Elliott 2008). Despite these limitations, various analyses have been conducted to assess changes in the population levels of gray bats since the recovery plan for the species was completed in 1982.

Ellison et al. (2003) of the U.S. Geological Survey (USGS) developed an extensive bat population database for 45 species of bats known from the United States, including the gray bat. From this database, the authors statistically analyzed 1,879 observations of gray bats obtained from 334 roost locations (103 summer colonies and 12 hibernacula) in 14 south-central and southeastern states. These authors reported upward, downward, or no trends for all sites analyzed. The Service interpreted an upward trend to be defined as an increasing population, a downward trend to be defined as a decreasing population, and no trend to be defined as a stable population. This follows terminology used in analysis of the status of gray bat populations in the western portion of the species' range by Sasse et al. (2007). Ellison et al. (2003) determined that 94.4% (85.4% no trend; 9% upward trend) of the populations showed stable or increasing populations while 6% revealed a decreasing population. Stable or increasing populations were reported for 83% (58% no trend; 25% upward trend) of the 12 hibernating colonies examined. For populations where there was a downward population trend, decreases in population numbers were mostly attributed to on-going problems with human disturbance.

Sasse et al. (2007) analyzed data from 48 gray bat maternity sites involving three subpopulations in Missouri, Arkansas, and Oklahoma between 1978 and 2002, and calculated that 79% of the colonies were stable or increasing. Elliott (2008) examined population trends of gray bats at nine, Priority 1 caves and concluded that although the species had increased by approximately 21% between 1980 and 2005, it had only reached roughly 37% of its maximum historic populations at these sites. Martin (2007) compiled a rangewide exhaustive review of gray bat hibernacula and maternity sites and summarized conservation actions that had been undertaken and suggested steps that were necessary to achieve full recovery. Based on general population trends across the range of the species, Dr. Michael Harvey of Tennessee Technological University has attempted to estimate changes in the species status. He reported that the species increased from approximately 1,575,000 to roughly 2,678,000 in 2002 and to approximately 3,400,000 in 2004 (see Ellison et al. 2003 and Martin 2007). Martin (2007) noted that gray bat population levels have increased approximately 104% since 1982.

Wide population fluctuations of gray bat numbers have been documented at many maternity sites across the species' range, but there have been significant population increases in some of the major hibernacula. Martin (2007) noted that gray bat populations exhibited increases at Coach Cave,

Kentucky from 0 in 1995 to 337,750 in 2007; at Blanchard Springs Caverns, Arkansas from 33 in 1985 to 128,005 in 2006; at Cave Mountain Cave, Arkansas from 205 in 1988 to 139,740 in 2006; and at Bellamy Cave, Tennessee from 347 in 1965 to 139,364 in 2006. Similarly, Martin (2007) and Elliott (2008) reported that populations of gray bats at Coffin Cave, Missouri increased from an estimate of 250,000 in 1977-79 to 561,000 bats in 2005. Although increases at some hibernacula may be due to movements from other caves, gray bat populations have increased in many areas throughout the species' range (Tuttle 1987; Harvey and Britzke 2002; Ellison et al. 2003; Tuttle and Kennedy 2005b; Martin 2007; Sasse et al. 2007).

Missouri

Gray bats are highly associated with karst topography. In Missouri, they can be found from the far southwestern part of the state and throughout the Ozarks to the northeastern part of the state along the Mississippi River. Gray bats use caves year round with separate maternity caves, bachelor caves, transient caves and hibernation caves (hibernacula). The majority of gray bats hibernate in nine major caves throughout their range; three of those being in Missouri. The three primary hibernacula in Missouri contain approximately 600,000 gray bats. There are also numerous small hibernacula in Missouri and throughout their range. Gray bats typically enter hibernation in mid- to late-October and exit hibernation early to mid-March.

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 potential absence from this site. 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 the year by certain populations of Indiana bats.

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. Overall, the conservation status of the species in the Action Area is assumed to mirror the status of the Ozark-Central RU and, in fact, the last two biannual surveys in Missouri have shown stable statewide populations.

Indiana bats have been documented in the vicinity of the proposed project during the active season, most often in hibernacula or swarming areas around hibernacula in the fall. Two Priority 2 hibernacula (contain 100-1000 individuals) occur within 1.5 miles of the project area and seven additional known caves occur within three miles. No surveys were conducted in the Action Area, but based on the presence of suitable habitat and proximity to known locations, species presence is assumed throughout the Action Area.

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).

Northern long-eared bats have been documented in the vicinity of the proposed project during the active season, most often in hibernacula or swarming areas around hibernacula in the fall. Nine known caves occur within three miles of the Action Area. No surveys were conducted in the Action Area, but based on the presence of suitable habitat and proximity to known locations, species presence is assumed throughout the Action Area.

4.1.3 Gray bat

Gray bats are present in the vicinity of the proposed project year-round in maternity, bachelor, transient, and hibernation caves. Eleven known gray bat caves (Priority 2, 3, and 4) occur adjacent to or near the Action Area. Because of the proximity to known locations for gray bat and the connectivity of forested habitat with the project area, gray bats can be present any time during the active season, and are likely to use the stream and associated riparian area as foraging habitat and a travel corridor. No surveys were conducted in the Action Area, but based on the presence of suitable habitat and proximity to known locations, the species presence is assumed throughout the Action Area.

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
Wappapello Lake Timber Stand Improvement (2015)	Direct impacts	627 acres of suitable habitat for Indiana bats and northern long-eared bats
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 2011-present, the Service consulted on approximately 1400 proposed actions in Missouri potentially affecting the Indiana bat, 830 potentially affected the gray bat, and 970 potentially affected the 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.

Of these, three BOs exempting take are in effect in Missouri and Iowa:

- Corps of Engineers – St. Louis District, Wappapello Lake Phase I;
- Corps of Engineers – St. Louis District, Wappapello Lake Phase II;
- U.S. Forest Service (USFS) Mark Twain National Forest programmatic biological opinion;
- Enbridge Flanagan South Pipeline

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 69 entities or individuals in the Ozark RU (Missouri, Illinois, and Iowa) possess valid Section 10(a)(1)(A) scientific research permits to enhance the survival of the species. Although these permits are enhancement of survival permits, some take of Indiana bats, gray bats, or northern long-eared bats can occur. The research conducted must further conservation efforts for the species. The loss of some individual bats over the short-term from research is acceptable as long as the survival of the species is not jeopardized. The Service requires that every available precaution be implemented to reduce and/or eliminate anticipated 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.

Currently the Service is developing a Multi-species HCP to address impacts to federally listed species by wind energy projects that will occur in Region 3. The Indiana bat and northern long-eared bats are two of the species covered in the Multi-species HCP that will include wind energy projects in Missouri, Illinois, and Iowa. The HCP is not finalized and no incidental take has been exempted at the time of this BO; thus, the impacts from the future Section 10 permit are not considered in this BO.

4.3 Factors Affecting the Environment of Federally Listed Bats 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 Missouri 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 private, municipal, and State ownership. Land is used for agriculture, commercial development, residential development, recreational areas, transportation infrastructure, and natural areas. The cumulative impacts of projects occurring in areas proximal to the Action Area, such as those described in this section, could negatively impact the Indiana bats, northern long-eared bats, and gray bats 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. 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, northern long-eared bats, and gray bats.

Distribution: The Action Area includes the project area and adjacent connected habitat used by individuals or colonies of Indiana bats, northern long-eared bats, and gray bats.

Timing: Spring migration and staging occurs from early April through mid-May at which point maternity colonies begin to form. The federally-permitted activities addressed in this BO will directly affect Indiana bats, northern long-eared bats, and gray bats during the first two weeks of spring staging and migration (April 1-15). Indirect impacts will occur during the summer and maternity periods of their life cycle due to permanent loss of suitable roosting and foraging habitat.

Nature of the effect: Direct and indirect effects are described below.

Duration: The duration of the effects will be both short-term (felling trees in April 2015) and long-term (permanent loss of suitable roosting and foraging habitat), but should be primarily localized to the Action Area.

Disturbance frequency: Tree removal and project construction will result in a one-time disturbance to habitat and impact to individuals within the Action Area.

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

5.2.1. Indiana bat

Forest ecosystems support Indiana bats during all life stages of the active season. As a result of project construction, maternity roosting habitat, non-maternity[2] roosting habitat, and staging and swarming habitat will be modified or removed. Project activities covered in this BO are those that involve tree felling during the early active season for Indiana bats (April 1-15) and clearcutting of 78 acres of trees of all size and age classes. The Action Area is assumed to be occupied by Indiana bats during all times of the active season therefore impacts will occur to one maternity colony as well as small non-maternity colonies and migratory individuals.

5.2.2 Northern long-eared bat

Forest ecosystems support northern long-eared bats during all life stages of the active season. As a result of project construction, maternity roosting habitat, non-maternity[3] roosting habitat, and staging and swarming habitat will be modified or removed. Project activities covered in this BO

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

are those that involve tree felling during the early active season for northern long-eared bats (April 1-15) and clearcutting of 78 acres of trees of all size and age classes. The Action Area is assumed to be occupied by northern long-eared bats during all times of the active season therefore impacts will occur to one maternity colony as well as small non-maternity colonies and migratory individuals.

5.2.3 Gray bat

Gray bats roost year-round in caves and mines. They depend on forest ecosystems for foraging and travel during nightly migrations to distant foraging areas. Forested corridors that connect caves and mines to other forest patches or riparian areas are essential to daily and seasonal migrations. As a result of project construction, foraging and travel corridors and staging and swarming habitat will be modified or removed. Project activities covered in this BO involve clearcutting 78 acres of trees of all size and age classes that are in or adjacent to stream corridors. The Action Area is assumed to be occupied by gray bats during all times of the active season; therefore, impacts will occur to individuals foraging or migrating through the area.

5.2.4 Direct Effects to Individuals from Active Season Tree Removal

Impacts to Indiana bats and northern long-eared bats from the action are direct impacts to small colonies or individuals if an occupied roost tree is felled from April 1-15. Impacted individuals could include reproductive females that are migrating to summer maternity areas and non-reproductive individuals that are migrating or that will remain in the vicinity of hibernacula for the summer season.

Removal of roost trees while bats are present may result in direct effects by killing, injuring, or otherwise harming individuals or a colony. Three accounts of felling occupied maternity roost trees have been documented in the literature, each event having slightly different long-term impacts on the affected bats, but all resulting in mortality of adults and juveniles due to trauma from the fallen tree. The first account led to the discovery of the first maternity colony in Indiana in 1971 when a dead elm (*Ulmus* sp.) tree containing a maternity colony was bulldozed on August 3 during a hedgerow clearing (Cope *et al*. 1973). Approximately 50 bats flew from the tree; eight (16%) of these were either killed or injured allowing them to be captured (J. Whitaker, Indiana State University, pers. comm., 2005 from USFWS 2007). The eight individuals were comprised of two adult females (4% of observed individuals), 6 immature individuals (two males, four females; 12% of observed individuals); they were positively identified and accessioned into the Joseph Moore Museum. Subsequent surveys in the vicinity of the lost roost indicated that the reproductive females were still foraging in the area, but a roost tree could not be located.

The second case occurred around September 8, 1984 in Knox County, Indiana (J. Whitaker, pers. comm., 2005). Eleven dead adult female Indiana bats were retrieved by a landowner when their roost, a shagbark hickory (*Carya ovata*), was felled in a pastured woodlot containing multiple dead trees. The eleven individuals were submitted for rabies testing to the state health department and subsequently sent to Indiana State University for positive identification by J. Whitaker. This represented the first record of a probable maternity colony in southern Indiana.

The third case occurred in Ohio. The first maternity colony of Indiana bats in Ohio was accidentally discovered on July 8, 1996 when a tree was felled to keep it from falling on a residence in a subdivision (Belwood 2002). Homeowners retrieved 34 individuals, one dead adult female, three dead non-volant juveniles, and 30 live non-volant juveniles. J. Belwood assisted the homeowners and placed live juveniles on the downed tree and in a nearby bat house. Overnight,

adults retrieved the live juveniles; two additional non-volant juveniles died overnight. One adult female died out of a presumed 33 adult females based on 33 non-volant pups (3% of adult females observed), and five of the 33 observed non-volant pups died (15% of pups observed). A portion of the maternity colony (approximately 15 individuals) used a nearby tree later that same maternity season. However, the colony abandoned their maternity area for three years following the loss of their roost tree. Surveys during the fourth year after loss of the roost documented a low number of females (i.e. two) present in the neighborhood.

For the project covered in this BO, the intensity and severity of disturbance are based primarily on the type of habitat that will be impacted, and secondarily on the likelihood of impact, best indicated here by size of the project footprint or nature of the activity. Projects that cause disturbances with high severity are those that impact maternity colonies, whereas disturbances that impact non-maternity or migratory bats are of moderate severity. Disturbances with high intensity are those that are most likely to impact occupied roost trees, either because they cover large acreages or are the kind of activity that is focused on the removal of these specific kinds of trees. Development of the Menard's Industrial Campus is characterized as high severity because all three federally listed bat species were assumed present on the project site and to use the forested habitat during the entire active season. The project is characterized as high intensity because no surveys were conducted to determine specific use of the area so at least a portion of the potential roost trees identified in the habitat assessment are assumed to be active and occupied during the period of removal.

Summary of effects

Indiana bats, northern long-eared bats, and gray bats present in the Action Area were likely to be negatively impacted if present during project construction. Such actions are likely to adversely affect Indiana bats, northern long-eared bats, and gray bats through removal of occupied roost tree resulting in direct take (i.e., death or injury of individuals), as well as by permanent loss of suitable forested habitat. These impacts have not been fully avoided and are expected to occur.

5.3 Species' Response to the Action

Despite the implementation of conservation measures, we anticipate that some female and male Indiana bats and northern long-eared bats may be killed or injured during tree removal that occurs during initial project construction during the active season. This is likely to occur if a tree in which they are roosting is felled during spring staging or migration. Additionally, Indiana bats, northern long-eared bats, and gray bats will be adversely affected by loss of roosting and foraging habitat.

Direct effects

Direct mortality or injury to maternity colonies of Indiana bat and northern long-eared bat will be avoided by clearing outside of the maternity season (i.e. clear prior to April 15). However, the Service anticipates low-level impacts to non-maternity colonies (i.e. bachelor males and non-reproductive females) and migratory individuals based on felling of trees between April 1 and April 15.

Indirect effects

Because no presence/absence surveys were conducted and three federally listed bat species were assumed present, the Service assumes that active maternity roost trees and non-maternity roost trees for Indiana bats and northern long-eared bats are present in the project area. Any active roost

trees in the project area will be removed for project development. Additionally, Indiana bats, northern long-eared bats, and gray bats likely forage along stream corridors and through forested habitat in the project area. Permanent changes to the roosting habits of all three species are likely to occur because of the loss of active roost trees in the project area. Short-term impacts to the foraging behavior of all three species are also likely to occur.

Without surveys to determine the number of bats that could be impacted, the Service is using acres of habitat as a surrogate for individuals. Impacts to maternity colonies, non-maternity colonies, and individuals will occur from the loss of 78 acres of suitable roosting and foraging habitat in the project area.

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 development of the Menard's Industrial Campus 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.

We also considered the effects of tree clearing on private and State land. This activity is reasonably certain to occur in the Action Area due to private landowner activities or continued urban and suburban development in or near the City of Sullivan. State-owned land occurs east of the City of Sullivan (Meramec State Park and Meramec Conservation Area) where tree removal for forest management or development could potentially occur.

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 rise to the level of Jeopardy for Indiana bats in the Ozark-Central RU, or to the level of Jeopardy for northern long-eared bats and gray bats range-wide.

7. CONCLUSION

Impacts to individuals are likely to occur during spring tree felling that occurs between April 1 and April 15 to any cohort of individuals present when activities are conducted. The proposed action will permanently remove 78 acres of Indiana bat, northern long-eared bat, and gray bat roosting and foraging habitat in Sullivan, Missouri. Adverse effects are likely to occur from the permanent loss of forested habitat that is occupied by all three federally listed bat species, including maternity colonies of Indiana bat and northern long-eared bat assumed present in the project area.

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 development of Menard's Industrial Campus will not have impacts at the recovery unit level for Indiana bats and will not jeopardize the continued existence of the Indiana bat. Likewise, the same activities will not jeopardize the continued existence of the northern long-eared bat or gray bat because the proposed action is not expected to reduce the reproduction, numbers, or distribution of the northern long-eared bat or gray bat range-wide. Therefore, we do not anticipate a reduction in the likelihood of both survival and recovery of these 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).

The measures described below are non-discretionary, and must be undertaken by the USACE and the applicant so they become binding conditions of any permit for the exemption in section 7(a)(2) to apply. The USACE has a continuing duty to regulate the actions covered by this Incidental Take Statement as it relates to their issuance of a permit to the applicant. If the USACE: (1) fails to assume and implement the terms and conditions or, (2) fails 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, the USACE 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 conservation measures outlined in section 2.3, we anticipate that some male, female, and juvenile Indiana bats, northern long-eared bats, and gray bats may be killed, injured, harmed, or harassed during project construction and from permanent habitat loss. This is likely to occur if an occupied roost tree is felled during migration or staging. We anticipate that clearing during the spring season will result in take, in the form of death, injury, harm, or harassment of individuals over 78 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 forest habitat that are removed during implementation of the project covered in this BO. Direct Take also will be detected by observing disturbance, injury, or mortality of individuals or colonies.

The USACE must reinitiate consultation with the Service if more than 78 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 removal of 78 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 and gray 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, northern long-eared bat, or gray 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, northern long-eared bats, and gray bats:

1. Avoid direct mortality of females and non-volant juveniles in maternity roosts
2. Maintain habitat connectivity to surrounding forests to facilitate movement of migratory bats across the landscape
3. Implement Conservation Measures as described in section 2.3 (page 5)

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 measures described above applies. These terms and conditions are non-discretionary:

1. Avoid direct mortality of females and non-volant juveniles in maternity roosts
    a. Remove potential roost trees outside of the maternity season for tree-roosting bats (May 15-August 15)
    b. If any Indiana or northern long-eared bats are found dead or injured following removal of trees during the active 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 USFWS law enforcement in St. Peters Missouri: 636-441-1909
        iv. Provide a report on the circumstances surrounding the discovery and incidental taking
2. Maintain habitat connectivity to surrounding forests to facilitate movement of migratory bats across the landscape
    a. Retain forested habitat on-site to the extent practical and do so in a way to connect areas of adjacent forest to riparian corridors to facilitate natural nightly and seasonal migrations (e.g. retain forested riparian corridors)
3. Implement Conservation Measures as described in section 2.3 (page 5)

a. Compensate for lost forested habitat through permanent habitat protection at a rate of 2.3:1 or approximately 183 acres of mature forested habitat. Habitat protection can occur through providing appropriate funds to a third-party land conservation organization, application of a conservation easement to existing high-quality forested bat habitat, or gifting of forested bat habitat to a willing public land management agency.

12. REINITIATION NOTICE

This concludes formal consultation on the issuance of Section 404 Clean Water Act permits for the Menard's Industrial Campus project. 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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