United States Department of the Interior

FISH AND WILDLIFE SERVICE
Rock Island Field Office
1511 47th Avenue
Moline, Illinois 61265
Phone: (309) 757-5800 Fax: (309) 757-5807

IN REPLY REFER TO:
FWS/RIFO

June 18, 2015

Hurston A. Nicholas
Forest Supervisor
U.S. Forest Service
Shawnee National Forest
50 Highway 145 South
Harrisburg, IL 62946

Dear Mr. Nicholas:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the Harris Branch Project, located Hardin County, Illinois, and its effects on the northern long-eared bat (*Myotis septentrionalis*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended. Your request for formal consultation was received on March 11, 2015.

This biological opinion is based on information provided in the March 11, 2015 biological assessment, other available literature and information provided in the U.S. Fish and Wildlife Service's final rule of April 2, 2015, listing the northern long-eared bat as a threatened species that was published in the *Federal Register* (**80FR 17974**). A complete administrative record of this consultation is on file at our office and has been assigned log number [2015-R3-MISO-1].

If you have any questions or concerns regarding this consultation and or the consultation process in general, please feel free to contact me at (618)997-3344, ext. 345.

Sincerely,

Kraig McPeek
Field Supervisor

BIOLOGICAL OPINION

Effects to the
Northern Long-eared Bat
from the Harris Branch Project on the
Shawnee National Forest
Illinois

Prepared by:
U.S. Fish and Wildlife Service
Marion, Illinois Sub-Office
8588 Route 148
Marion, Illinois 62959

June 2015

TABLE OF CONTENTS

INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) based on our review of the U.S. Forest Service's (USFS) Harris Branch Project on the Shawnee National Forest, and the effects on the northern long-eared bat (*Myotis septentrionalis;* NLEB) in accordance with Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The USFS' request for formal consultation was received on March 11, 2015, along with the Biological Evaluation (BE) for the Harris Branch Project. A complete consultation history can be found in Appendix A. The USFS has previously consulted on all other involved federally-listed species. Therefore, this BO addresses one species, the NLEB.

This BO is based on information provided in the BE. A complete administrative record of this consultation is on file at the Service's Marion Illinois Sub-Office.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

As defined in the ESA Section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas." The "action area" is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." The direct and indirect effects of the actions and activities must be considered in conjunction with the effects of other past and present federal, state, or private activities, as well as the cumulative effects of reasonably certain future State or private activities within the action area.

The following project background and area description is summarized from the BE. The action involves shelterwood timber harvest of non-native mature pine, dormant season prescribed burning, development of temporary skid trails and log landings, and conducting TSI on approximately 225 acres. This action is ongoing and 60% of the harvest activities associated with the project have been implemented. The USFS and the Service previously concluded that the Harris Branch Project was also likely to adversely affect the Indiana bat and completed a Tier-II formal consultation for the project under the programmatic BO.

Conservation Measures

Conservation measures are those actions taken to benefit or promote the recovery of the species. These actions taken by the federal agency or the applicant that serve to minimize or compensate for project effects on the species under review and are included as an integral portion of the proposed action. The Harris Branch Project is being implemented consistent with the Forest Plan and the associated programmatic BO. These documents incorporate a number of standards and guidelines designed to protect and enhance populations of listed bats species on the Shawnee National Forest, as described more fully in Appendix A of the 2005 programmatic BO. While designed primarily for the Gray bat and Indiana bat, many of these measures will also directly

benefit the NLEB. The Shawnee National Forest provides habitat for swarming, hibernating, and summering NLEB and the Forest Plan already includes conservation measures that will protect and manage habitats that support these three key life stages.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. For the purposes of this BO, the action area includes the 225 acres within the Harris Branch Project located on the Shawnee National Forest.

STATUS OF THE SPECIES

Refer to the final rule (50 CFR 17.11) for the best available information on NLEB life history and biology, threats, distribution and overall status. The following is summary from that rule.

Life History and Biology

The NLEB 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. NLEB generally hibernate between mid-fall through mid-spring each year. Spring migration period likely runs from mid-March to mid-May each year, as 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[1] for NLEB 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 NLEB, consistently avoid foraging in or crossing large open areas, choosing instead to use tree-lined pathways or small openings (Patriquin and Barclay 2003, Yates and Muzika 2006). Further, wing morphology of the species suggests that they are adapted to moving in cluttered habitats. Thus, isolated patches of forest may not be suitable for foraging or roosting unless the patches are connected by a wooded corridor.

1 See the Service's current summer survey guidance for our latest definitions of suitable habitat.

Upon emergence from the hibernacula in the spring, females seek suitable habitat for maternity colonies. NLEB actively form colonies in the summer (Foster and Kurta 1999) and exhibit fission-fusion behavior (Garroway and Broders 2007), where members frequently coalesce to form a group (fusion), but composition of the group is in flux, with individuals frequently departing to be solitary or to form smaller groups (fission) before returning to the main unit (Barclay and Kurta 2007). As part of this behavior, northern long-eared bats switch tree roosts often (Sasse and Pekins 1996), typically every 2 to 3 days (Foster and Kurta 1999; Owen et al. 2002; Carter and Feldhamer 2005; Timpone et al. 2010). NLEB maternity colonies range widely in size, although 30-60 may be most common (Service 2014). NLEB show some degree of interannual fidelity to single roost trees and/or maternity areas. Male NLEB are routinely found with females in maternity colonies. NLEB use networks of roost trees often centered around one or more central-node roost trees (Johnson et al. 2012). NLEB roost networks also include multiple alternate roost trees and male and non-reproductive female NLEB may also roost in cooler places, like caves and mines (Barbour and Davis 1969, Amelon and Burhans 2006).

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

Young NLEB are typically born in late-May or early June, with females giving birth to a single offspring. Lactation then lasts 3 to 5 weeks, with pups becoming volant (able to fly) between early July and early August.

Migration

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

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 NLEB during the winter that have yet to be documented. Generally, NLEB hibernate from October to April depending on local climate (November-December to March in southern areas and as late as mid-May in some northern areas).

Hibernacula for NLEB 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.

NLEB tend to roost singly or in small groups (Service 2014), with hibernating population sizes ranging from a just few individuals to around 1,000 (Service unpublished data). NLEB 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). NLEB 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, NLEB "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 NLEB 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, NLEB 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.

Threats

No other threat is as severe and immediate for the NLEB as the disease white-nose syndrome (WNS). It is unlikely that NLEB populations would be declining so dramatically without the impact of WNS. Since the disease was first observed in New York in 2007 (later biologists found evidence from 2006 photographs), WNS has spread rapidly in bat populations from the Northeast to the Midwest and the Southeast. Population numbers of NLEB have declined by 99 percent in the Northeast, which along with Canada, has been considered the 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 the NLEB.

Although significant NLEB 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 NLEB 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 NLEB sickened or struggling with infection by WNS may be less able to survive other stressors. Second, NLEB 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.

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. Again, this is particularly likely if timber harvest or burns are conducted early in the spring (April – May) when bats have just returned, have damaged wings, and are exposed to colder temperatures when torpor is used more frequently.

Over the long-term, sustainable forestry benefits NLEB by maintaining suitable habitat across a mosaic of forest treatments. However, forest practices can have a variety of impacts on the NLEB 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 NLEB summer home ranges or away from hibernacula) to minor (e.g., largely forested areas, areas with robust NLEB 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 NLEB (and other bat species) may be threatened by the recent surge in construction and operation of wind turbines across the species' range. Mortality of NLEB 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.

Rangewide Status

The NLEB ranges across much of the eastern and north central United States, and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia (Nagorsen and Brigham 1993; Caceres and Pybus 1997; Environment Yukon 2011) (Figure 1). In the United States, the species' range reaches from Maine west to Montana, south to eastern Kansas, eastern Oklahoma, Arkansas, and east through the Gulf States to the Atlantic Coast (Whitaker and Hamilton 1998; Caceres and Barclay 2000; Amelon and Burhans 2006). The species' range includes the following 37 States (plus the District of Columbia): Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming. Historically, the species has been most frequently observed in the northeastern United States and in Canadian Provinces, Quebec and Ontario, with sightings increasing during swarming and hibernation (Caceres and Barclay 2000). However, throughout the majority of the species' range it is patchily distributed, and historically was less common in the southern and western portions of the range than in the northern portion of the range (Amelon and Burhans 2006).

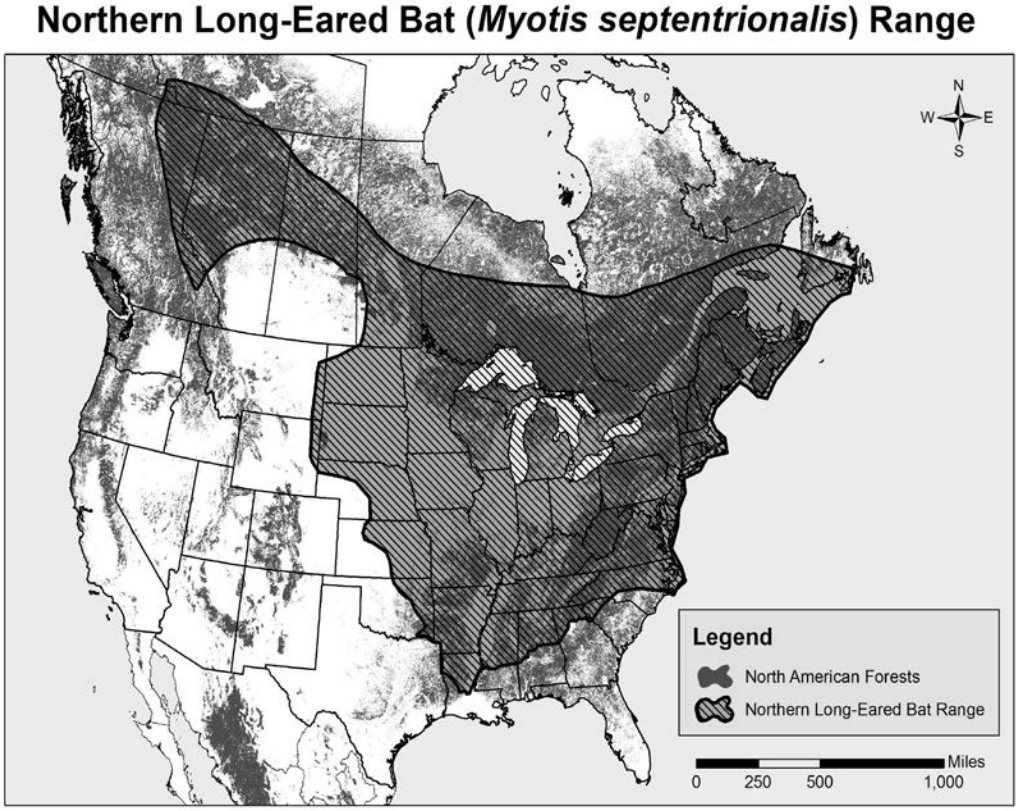

Figure 1.

Although they are typically found in low numbers in inconspicuous roosts, most records of NLEB are from winter hibernacula surveys (Caceres and Pybus 1997). More than 780 hibernacula have been identified throughout the species' range in the United States, although many hibernacula contain only a few (1 to 3) individuals (Whitaker and Hamilton 1998). Known hibernacula (sites with one or more winter records of northern long-eared bats) include: Alabama (2), Arkansas (41), Connecticut (8), Delaware (2), Georgia (3), Illinois (21), Indiana (25), Kentucky (119), Maine (3), Maryland (8), Massachusetts (7), Michigan (103), Minnesota (11), Missouri (more than 269), Nebraska (2), New Hampshire (11), New Jersey (7), New York (90), North Carolina (22), Oklahoma (9), Ohio (7), Pennsylvania (112), South Carolina (2), South Dakota (21), Tennessee (58), Vermont (16), Virginia (8), West Virginia (104), and Wisconsin (67). NLEB 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 NLEB must be described and understood within the context of the impacts of WNS. Prior to the onset of WNS, the best available information on NLEB came primarily from surveys (primarily focused on Indiana bat or other bat species) and some targeted research projects. In these efforts, NLEB 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 NLEB in the northeast, where the species was believed to be the most abundant. There are data supporting substantial declines in NLEB populations in portions of the Midwest due to WNS. In addition, WNS has been documented at more than 100 NLEB 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.

Status of the Northern Long-eared Bat in Illinois

In Illinois, northern long-eared bats have been found in both winter hibernacula counts and summer mist-net surveys. Northern long-eared bats have been documented in 21 hibernacula in Illinois, most of which are in the southern portion of the State (Davis 2014, p. 5). Counts of more than 100 bats have been documented in some hibernacula, and a high of 640 bats was observed in a southern Illinois hibernaculum in 2005; however, much lower numbers of northern long-eared bats have been observed in most Illinois hibernacula (Service 2015, unpublished data). WNS was first discovered in the State during the winter of 2012–2013. Mortality of northern long-eared bats was observed 1 year later, during the winter of 2013–2014, at two of the State's major hibernacula, which are in the central part of the State. At one hibernaculum, there was a drop-off in numbers of northern long eared bats observed over the winter, with 371 individuals occupying the hibernaculum in November of 2013, and by March of 2014, there were 10 individuals, which amounts to a 97 percent decline (Davis 2014, pp. 6–18). At the other hibernaculum, in March of 2013, there were 716 northern long-eared bats counted; in November of 2013, there were 171 individuals; and in March of 2014, there were 3 individuals, with a decline of over 99 percent (Davis 2014, pp. 6–18).

During the summer, northern long-eared bats have been observed in landscapes with a variety of forest cover throughout Illinois. Surveys conducted across the State, related to highway projects and research activities, resulted in the capture of northern long-eared bats in moderately forested counties in western and eastern Illinois (*e.g.,* Adams, Brown, and Edgar Counties), as well as in northern counties where forests are highly limited (*e.g.*, Will and Kankakee Counties) (Mengelkoch 2014, unpublished data; Powers 2014, unpublished data). Pre-WNS, northern long-eared bats were regularly caught in mist-net surveys in the Shawnee National Forest in southern Illinois (Kath 2013, pers. comm.). The average number of northern long-eared bats caught during surveys between 1999 and 2011 at Oakwood Bottoms in the Shawnee National Forest was fairly consistent (Carter 2012, pers. comm.). Summer bat surveys in 2007 and 2009 at Scott Air Force Base in St. Clair County resulted in a low numbers of captures (a few individuals) of northern long-eared bats, and, in 2014, no northern long-eared bats were encountered (Department of the Air Force 2007, pp. 10–14; Department of the Air Force 2010, pp. 11–12). Overall, summer surveys from Illinois have not documented a decline due to WNS to date.

Critical Habitat

Critical habitat has not been proposed for the NLEB.

Conservation Needs of the Species

The species' conservation needs define what is needed in terms of reproduction, numbers, and distribution to ensure the species is no longer in danger of extinction. The conservation needs should be defined in the species' recovery outline or plan. Since there is no recovery plan or recovery outline available at this time, we will outline the conservation needs based on our current understanding of the species.

We find that the primary conservation need of the NLEB is to reduce the threat of WNS. This includes minimizing mortality in WNS-affected areas, and slowing the rate of spread into currently unaffected areas. In addition, NLEB that continue to exist within WNS-affected areas need to be able to continue to survive and reproduce in order to stabilize and/or increase the populations. This can be done by reducing the other threats to the species, as listed above. Therefore, efforts to protect hibernacula from disturbances need to continue. This should include restricting human access to hibernacula particularly during the hibernation period, constructing and maintaining appropriately designed gates, and restoring microhabitat conditions in hibernacula that have been altered. Efforts should also be made to protect and restore (in some cases) adequate fall swarming habitat around hibernacula. Known maternity habitat should be maintained, and the removal of known roost trees, particularly when pregnant females and/or young are present should be reduced. Research to identify important hibernacula and summer areas and to delineate the migratory relationship between summering and wintering populations should also be pursued.

ENVIRONMENTAL BASELINE

The Environmental Baseline analyzes the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and the ecosystem within the action area.

Status of the Species in the Action Area

USFS biologists conducted surveys on an adjacent project area in July 2014, and captured seven NLEB's in 12 nights of netting. Radio-tracking documented several maternity roosts from 0.5 to 1.0 miles from the Harris Branch Project Area; however, no individuals were tracked to the Harris Branch Project Area. In addition, surveys in 2004 conducted on the Harris Branch Project Area resulted in the capture of only two adult male NLEB's. Even though the maternity colony was not documented using the project area, the potential exists for individuals to be utilizing the project area.

Habitat Conditions in the Action Area

Habitat conditions on the action area remain approximately the same as described in the 2007 BE

and 2013 Supplemental Information Report (SIR). The forest stand on the project area is dominated by mature pine, there is a lack of larger live or dead roost trees, and a lack of snag trees in general. The habitat conditions have been determined to be of low quality for the NLEB in general and even less likely for any maternity use. In addition, the areas surrounding the project area are of higher quality and more likely to be utilized as documented during the survey in July of 2014.

Conservation Needs of the Species in the Action Area

The conservation needs of the species in the action area are similar to the needs rangewide. The Shawnee National Forest provides habitat for swarming, hibernating, migrating, and summering NLEB, and NLEB on the Shawnee National Forest have already been affected by WNS. Therefore, within the action area the conservation needs include: 1) reducing WNS-related mortality and injury; 2) maintaining suitable conditions within hibernacula and protecting them from disturbance; 3) providing suitable habitat conditions for NLEB swarming, foraging, and roosting; 4) maintaining suitable habitat conditions in identified maternity areas and reducing the removal of roost trees; 5) searching for previously unidentified areas of maternity and hibernation activity; and 6) conducting research to understand the migration patterns of NLEB that use the area during the summer or winter.

EFFECTS OF THE ACTION

Potential effects to the NLEB include direct and indirect effects. Direct effects occur when bats are present while the activities are being conducted; indirect effects occur later in time. Effects will vary based on the type of the proposed activity.

Our analysis of effects for NLEB entails: (1) evaluating individual NLEB exposure to action-related stressors and response to that exposure; (2) integrating those individual effects (exposure risk and subsequent response) to discern the consequences to the populations to which those individuals belong; and (3) determining the consequences of any population-level effects to the species rangewide. If, at any point, we demonstrate that the effects are unlikely, we conclude that the agency has insured that their action is not likely to jeopardize the continued existence of the species and our analysis is completed.

Direct and Indirect Effects

Effects to Hibernating Bats and/or Hibernacula

Neither direct or indirect effects are anticipated to wintering NLEB or their hibernacula from the proposed action.

Effects to Bats during Fall Swarming and/or to Fall Swarming Habitat

Neither direct or indirect effects are anticipated to fall swarming NLEB or their fall swarming habitat from the proposed action.

Effects to Bats during Spring/Summer and/or to Spring/Summer Habitat

Tree Removal Associated with Timber Harvest and Other Activities

The USFS has proposed conducting shelterwood timber harvest on non-native mature pine during the summer maternity season.

Death/Injury

Risk of death or injury of individual NLEB from timber harvest or other tree removal varies depending on the timing of activities, the location, type of harvest, and extent of removal.

The timing of forest management activities greatly influences the likelihood of exposure and the extent of impacts on individual bats and their populations. Female NLEB typically roost colonially, with their largest population counts occurring in the spring, presumably as one way to reduce thermal costs for individual bats (Foster and Kurta 1999). While bats do have the ability to flee their roosts during tree removal, removal of occupied roosts during the active season while that bats are present (spring through fall) will also likely cause injury or mortality to those roosting bats. During the entire active season, bats are likely to be injured or killed during the spring months when bats often use torpor (temporary unresponsive state) to survive cool weather and low prey availability. Bats are further likely to be killed or injured during early to mid-summer (approximately June-July) when flightless pups or inexperienced flying juveniles are present. Removal of trees outside these periods is less likely to result in direct injury or mortality when the majority of bats can fly and are more dispersed.

The location of timber harvest activities also influences the likelihood and extent of impacts. Timber harvest activities outside of NLEB summer home ranges or away from hibernacula will not result in death or injury to individuals. The greatest risk of take is associated with projects within known NLEB home ranges (calculated from radio telemetry or estimated based on capture or detection of NLEB [see Service 2014]) where no or few roost trees have been located. This is because occupancy probability has already been established at 100% but it is unclear where the core roosting area is located and these areas are not protected from in-season removal. The risk of death or injury of bats from timber harvest or other tree removal within known home ranges with documented roost trees is less as some of the trees occupied by roosting bats should be left undisturbed during the pup season. Areas outside of known home ranges have some probability of occupancy from 0-100%. As discussed in the Environmental Baseline, the potential exists for individual NLEBs to be present within the Harris Branch Project area.

Lastly, the likelihood and extent of impacts are influenced by the type/scope of the timber harvest/tree removal relative to the amount of remaining suitable roosting and foraging habitat. Within a given home range NLEB use multiple roosts throughout the season. Therefore, only a certain number of roosts are anticipated to be occupied in any given day and within any given year. Therefore, the risk of encountering roosting NLEB during a given forest treatment is associated with the percentage of home range impacted and the type of forest treatment. Larger

acreages of treatment have greater risk than smaller acreages. Similarly, clearcuts have greater risk than selective harvest treatments (individual or group) because more trees in a given treatment area will be removed.

Response to Removal or Alteration of Roosting/Foraging Habitat

The best available data indicate that the NLEB shows a varied degree of sensitivity to timber harvesting practices so long as there are sufficient roosts available for their use (Menzel et al. 2002, Owen et al. 2002). In central Arkansas, the three classes of mixed pine-hardwood forest that supported the majority of the roosts were partially harvested or thinned, unharvested (50–99 years old), and group selection harvest (Perry and Thill 2007). Forest size and continuity are also factors that define the quality of habitat for roost sites for NLEB. Lacki and Schwierjohann (2001) stated that silvicultural practices could meet both male and female roosting requirements by maintaining large-diameter snags, while allowing for regeneration of forests.

In addition to impacts on roost sites, timber harvest practices can also affect foraging and traveling habitat, and thus, NLEB fitness. In southeastern Missouri, the NLEB showed a preference for contiguous tracts of forest cover (rather than fragmented or wide open landscapes) for foraging or traveling and, different forest types interspersed on the landscape increased likelihood of occupancy (Yates and Muzika 2006). Similarly, in West Virginia, female NLEB spent most of their time foraging or travelling in intact forest, diameter-limit harvests (70–90 year-old stands with 30–40 percent of basal area removed in the past 10 years), and road corridors, with no use of deferment harvests (similar to clearcutting) (Owen et al. 2003). In Alberta, Canada NLEB avoided the center of clearcuts and foraged more in intact forest than expected (Patriquin and Barclay 2003). On Prince Edward Island, Canada, female NLEBs preferred open areas less than forested areas, with foraging areas centered along forest-covered creeks (Henderson and Broders 2008). In general, NLEBs prefer intact mixed-type forests with small gaps (i.e., forest trails, small roads or forest covered creeks) in forest with sparse or medium vegetation for foraging and traveling rather than fragmented habitat or areas that have been clearcut.

Timber harvest activities do not typically lead to permanent losses of suitable roosting, foraging, or traveling habitat for NLEB. On the contrary, timber harvest activities are expected to maintain a forest over the long term for the species. Many timber harvest regimes will result in minimal change in terms of providing suitable roosting or foraging habitat for NLEB. For example, selective harvest regimes are not anticipated to result in alterations of forest to the point where NLEB would be expected to significantly alter their normal behaviors. This is because the treatment areas will still be forested with small openings. Similarly, small patch cuts, wildlife openings, and forest roads would be expected to serve as foraging areas or travel corridors. Therefore, the only impacts of concern from these forest treatments are the potential for death or injury during active season tree removal.

However, localized long-term reductions in suitable roosting and/or foraging habitat can occur from various forest practices. For example, large clearcuts (that remove a large portion of a known or assumed home range) would result in a temporary “loss” of forest for NLEB. In these

cases, “temporary” would be for many years (amount of time to reproduce suitable roosting/foraging habitat). Foraging would be possible prior to roosting depending on the juxtaposition of cuts to other forest regimes.

As stated above, NLEB have been found in forests that have been managed to varying degrees and as long as there is sufficient suitable roosting and foraging habitat within their home range and travel corridors between those areas, we would expect NLEB colonies to persist in managed landscapes.

In addition to the type of timber harvest, the extent of impact from timber harvest related habitat modifications is influenced by the amount of suitable habitat available within and nearby NLEB home ranges. Some portions of the NLEB’s range are more forested than others. In areas with little forest or highly fragmented forests (e.g., western U.S. edge of the range, central Midwestern states; see Figure 1), impact of forest loss would be disproportionately greater than similar sized losses in heavily forested areas (e.g., Appalachians and northern forests). Also, the impact of habitat loss within a northern long-eared bat’s home range is expected to vary depending on the scope of removal. Silvis et al. (2014) modeled roost loss of NLEBs and Silvis et al. (2015) removed known NLEB roosts during the winter in the field to determine how this would impact the species. Once removals totaled 20–30 percent of known roosts, a single maternity colony network started showing patterns of break-up. As explained in the Status of Species section, sociality is hypothesized to increase reproductive success (Silvis et al. 2014); thus, smaller colonies are expected to have lower reproductive success.

Longer flights to find alternative suitable habitat and colonial disruption may result from removal of roosting or foraging habitat. NLEB emerge from hibernation with their lowest annual fat reserves, and return to their summer home ranges. Since NLEBs have summer home range fidelity (Foster and Kurta 1999; Patriquin et al. 2010; Broders et al. 2013), loss or alteration of forest habitat may put additional stress on females when returning to summer roost or foraging areas after hibernation. Females (often pregnant) are forced to seek out new roosts or foraging areas and must expend additional, but limited, energy. Hibernation and reproduction are the most energetically demanding periods for temperate-zone bats, including the NLEB (Broders et al. 2013). Bats may reduce metabolic costs of foraging by concentrating efforts in areas of known high prey profitability, a benefit that could result from the bat’s local roosting and home range knowledge and site fidelity (Broders et al. 2013). Cool spring temperatures provide an additional energetic demand, as bats need to stay sufficiently warm or enter torpor (state of mental or physical inactivity). Entering torpor comes at a cost of delayed parturition; bats born earlier in the year have a greater chance of surviving their first winter and breeding in their first year of life (Frick et al. 2009). Delayed parturition may also be costly because young of the year and adult females would have less time to prepare for hibernation (Broders et al. 2013). Female NLEB typically roost colonially, with their largest population counts occurring in the spring, presumably as one way to reduce thermal costs for individual bats (Foster and Kurta 1999). Therefore, similar to other temperate bats, NLEB have multiple high metabolic demands (particularly in spring), and must have sufficient suitable roosting and foraging habitat available in relatively close proximity to allow for successful reproduction.

In summary, implementation of the Harris Branch Project may result in some adverse fitness consequences for individuals occurring within the action area. These adverse consequences are most likely to be either as injury or death of individual Northern long-eared bats from direct exposure to timber harvest during the summer time period. However, we expect the potential for death or injury to be minimal given the lack of documented maternity use on the project area, low quality of habitat within the project area, and adherence to the standard and guidelines provided in Appendix A of the 2005 programmatic BO. Also, the timber harvest could have both adverse and beneficial effects on habitat suitability for the NLEB as described above. In addition, the Harris Branch Project will affect a minor amount of the potential NLEB habitat on the Shawnee National Forest. The 225 acre project area represents 0.47 percent of the total acres of pine forest across the Forest and 0.086 percent of the total acres of forested habitat available across the forest. As a result, we conclude that the overall habitat suitability or availability on the Shawnee National Forest should be minimally affected by the timber harvest activities under the proposed action.

Prescribed Burning

The USFS has proposed conducting fires during the hibernation period.

Death/Injury

Conducting prescribed fires outside the hibernation period could result in direct mortality or injury to NLEB by burning, heat exposure, or smoke inhalation. Bats also may be exposed to elevated concentrations of potentially harmful compounds within the smoke (e.g., carbon monoxide and irritants) (Dickinson et al. 2009). Exposure risk depends on a variety of factors including height of roosts, timing and behavior of fire, winds, proximity of fire to roosts. Risk of direct mortality and injury to bats from prescribed fire is low as long as fire intensity and crown scorch height are low (Dickinson 2010). Due to the anticipated timing of the burns, NLEB's are not expected to be present during the majority of the burns and most bats should be mobile during the burning activities. In summary, we do not expect lethal take from prescribed fires but NLEB may be forced to flee from roosting and foraging areas. However, these effects are expected to be short-term and localized and not result in negative fitness consequences.

Response to Removal or Alteration of Roosting/Foraging Habitat

Indirect effects may include short-term loss of roost trees and decreases in prey abundance, followed by long-term increases in roost abundance and suitability, and in prey abundance (Boyles and Aubrey 2006, Dickinson 2010, Dickinson et al. 2009, Johnson et al. 2009, Johnson et al. 2010, Lacki et al. 2009, Timpone et al. 2009). These types of both adverse and beneficial effects have been noted for both the Indiana bat and the NLEB. While there are some differences in roosting and foraging habitat preferences between these species, there is also much overlap in habitat usage between these species, and in most cases general conclusions based on research on one species will also be applicable to the other.

Prescribed fire can create a greater abundance of potential roost trees for NLEB because fires can cause bark of live trees to peel away from the sapwood creating the sloughing bark that is often used for roosting (Johnson et al. 2010). The availability of suitable roosts (including roosts with cavities and exfoliating bark) is greater in burned areas compared to unburned areas (Boyles and Aubrey 2006, Dickinson et al. 2009, Johnson et al. 2010). NLEB have been found to use roost extensively in burned habitats immediately after prescribed burning (Lacki et al. 2009) with roosts shifting from primarily beneath bark before burning to inside cavities after burning.

Tree species that consistently form high quality bat roosts include shellbark hickory (*Carya laciniosa*), shagbark hickory (*C. ovata*), and white oak (*Quercus alba*). Regeneration of white oak and hickory increases as a result of low-intensity fires and/or repeated fires below open canopies (Johnson et al. 2010, Dickinson et al. 2009). Similarly, fire creates canopy gaps that allow for regeneration of shade-intolerant species such as black locust, a preferred roost tree species for the NLEB in some locations (Dickinson et al. 2009, Johnson et al. 2009). Therefore, over the long-term, prescribed fire is anticipated to increase the abundance of tree species that form high quality NLEB roosts.

Fires can also create a more open canopy structure that can improve roost quality by increasing the amount of solar radiation reaching the roost. Canopy light penetration was higher and canopy tree density was lower in burned forest than in unburned forest (Boyles and Aubrey 2006). Additionally, canopy gaps in the burned area are associated with slightly higher maximum daily temperatures at roost trees (Johnson et al. 2009). Higher roost temperatures could facilitate more rapid growth of developing juvenile bats (Johnson et al. 2009). As a result, the abundance of trees with characteristics suitable for roosting, and the percentage of the forested area with suitable bat roosts, should be increased after fires (Boyles and Aubrey 2006). Studies in West Virginia found that the NLEB responded favorably to prescribed fire by using new roost trees that were located in canopy gaps created as a result of the fire (Johnson et al. 2009). Conversely, fire may also destroy or accelerate the decline of existing roost trees, particularly of older snags, by burning the bases of the trees and weakening their structure, causing them to fall over quicker (Johnson et al. 2009, Dickinson et al. 2009). One study found that up to 20 percent of existing standing snags were lost post-fire, and that few new snags were created (Lacki et al. 2009).

In summary, prescribed fire may result in both adverse and beneficial effects on roosting habitat through immediate loss of existing roosts and creation of some new roosts, followed by short-term increases in the suitability of remaining and created roosts, and long-term changes in forest composition towards a greater abundance of trees likely to create suitable roosts in the future. Unfortunately, existing data are insufficient to fully quantify or compare the relative impact of these adverse and beneficial effects. For instance, the long-term tradeoff between roost creation and roost loss in mixed oak forests under burning regimes is unknown (Dickinson et al. 2009). One research project concluded that prescribed fire, at minimum, provoked no response from the Indiana bat in terms of roost tree selection, and in some cases may create additional roost resources (Johnson et al. 2010). As a result, we conclude the overall effect of the prescribed fire portion of the proposed action on roost availability may be neutral to potentially beneficial.

Prescribed fire may affect foraging habitat by changing the structure of the forest and by changing the abundance of prey within the area (Dickinson et al. 2009). NLEBs have shown a preference for foraging in heavily forested mid-slope areas, regardless of burn condition, suggesting these bats feed in and around closed canopies and are likely clutter-adapted (Lacki et al. 2009). These studies suggest that the reduction in canopy closure as a result of prescribed burning could have a negative effect on foraging suitability for the NLEB. However, that same data do not indicate that bats avoid foraging in or around areas that have been burned. For example, the size of female NLEB home ranges and core areas did not vary between bats radio tracked before and after fires, and the home ranges of these bats were located closer to burned habitats following fires than to unburned habitats (Lacki et al. 2009). The researchers for this study suggest that NLEBs responded to habitat alterations resulting from prescribed fires by shifting the location of their foraging areas to take advantage of changes in insect prey availability (Lacki et al. 2009). Immediately after fires, insect abundance typically declines (Lacki et al. 2009). Therefore, fires conducted in the late winter and early spring may reduce abundance of bat prey during critical periods when bats are coming out of hibernation, are migrating, or are pregnant (Johnson et al. 2009). However, over a longer-term (within one year), abundance of coleopterans (beetles), dipterans (flies), and all insects combined has been shown to increase following prescribed fires (Lacki et al. 2009). These increases can last for up to 16 years post-burn. Because lepidopterans (moths and butterflies), coleopterans, and dipterans are important groups of insect prey for Myotis species, researchers have concluded that fire does indeed improve foraging conditions in the long-term by increasing prey quantity in the form of insects attracted to post-fire dead wood (Lacki et al. 2009, Dickinson 2010). As a result, we conclude that prescribed fire may have a short-term adverse and long-term beneficial effect on prey abundance, and thus foraging habitat suitability in the action area.

In summary, given NLEBs frequent use of live trees and snags, multiple roosting structures, and ability to arouse and move during fires, and positive or neutral response for roosting and foraging within burned areas, NLEBs are expected to experience minimal impacts from prescribed fire in the Harris Branch Project Area. The potential for effects from prescribed fire will be minimized by adhering to the standards and guidelines for prescribed fire provided in Appendix A of the 2005 Programmatic BO.

Effects from Noise, Disturbance

Noise and vibration and general human disturbance are stressors that may disrupt normal feeding, sheltering, and breeding activities of the NLEB. Many activities may result in increased noise/vibration/disturbance that may result in effects to bats. Bats may be exposed to noise/vibration/disturbance from various USFS activities near their roosting, foraging, or swarming areas.

Significant changes in noise levels in an area may result in temporary to permanent alteration of bat behaviors. The novelty of these noises and their relative volume levels will likely dictate the range of responses from individuals or colonies of bats. At low noise levels (or farther distances), bats initially may be startled, but they would likely habituate to the low background noise levels. At closer range and louder noise levels (particularly if accompanied by physical

vibrations from heavy machinery and the crashing of falling trees) many bats would probably be startled to the point of fleeing from their day-time roosts and in a few cases may experience increased predation risk. For projects with noise levels greater than usually experienced by bats, and that continue for multiple days, the bats roosting within or close to these areas are likely to shift their focal roosting areas further away or may temporarily abandon these roosting areas completely.

There is limited literature available regarding impacts from noise (outside of road/traffic) on bats. Gardner et al. (1991) had evidence that an NLEB conspecific, Indiana bat, continued to roost and forage in an area with active timber harvest. Also see the timber harvest Section above regarding other similar studies for NLEB. They suggested that noise and exhaust emissions from machinery could possibly disturb colonies of roosting bats, but such disturbances would have to be severe to cause roost abandonment. Callahan (1993) noted that the likely cause of the bats in his study area abandoning a primary roost tree was disturbance from a bulldozer clearing brush adjacent to the tree. However, his last exit count at this roost was conducted 18 days prior to the exit count of zero.

In summary, given NLEBs frequent use of live trees and snags, multiple roosting structures, and ability to arouse and move if necessary, NLEBs are expected to experience minimal impacts from noise disturbance on the Harris Branch Project.

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 biological opinion. 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 ESA. Any actions conducted on Shawnee National Forest lands will either be conducted by the USFS, or will require approval by the USFS and thus will require separate section 7 consultation. Therefore, cumulative effects, as defined in the ESA, are not expected to occur on Shawnee National Forest lands.

Summary of Effects

Impacts to Individuals

Implementation of the Harris Branch Project may result in some adverse fitness consequences for individuals occurring within the action area. These adverse consequences are most likely to be either as injury or death of individual Northern long-eared bats from direct exposure to timber harvest during the summer time period. However, we expect the potential for death or injury to be minimal given the lack of documented maternity use on the project area, low quality of habitat within the project area, and adherence to the standard and guidelines provided in Appendix A of the 2005 programmatic BO. NLEBs are expected to experience minimal impacts from prescribed fire and noise impacts in the Harris Branch Project Area given NLEBs frequent use of live trees and snags, multiple roosting structures, and ability to arouse and move if necessary. The potential for effects from prescribed fire will be minimized by adhering to the

standards and guidelines for prescribed fire provided in Appendix A of the 2005 Programmatic BO.

In addition, the Harris Branch Project will affect a minor amount of the potential NLEB habitat on the Shawnee National Forest. The 225 acre project area represents 0.47 percent of the total acres of pine forest across the Forest and 0.086 percent of the total acres of forested habitat available across the forest. Also, the timber harvest and prescribed burning could have both negative and beneficial effects on habitat suitability for the NLEB. As a result, we conclude that the overall habitat suitability or availability on the Shawnee National Forest should be minimally affected by the timber harvest activities under the proposed action.

While none of the USFS's proposed actions will alter the amount or extent of mortality or harm to NLEB resulting directly from WNS, the USFS's proposed action can be negative and beneficial to bats. The continued implementation of the USFS's monitoring effort will provide additional information on the effect of the USFS's actions on affected bats. No cumulative effects are expected.

While analyzing the effects of the proposed action, we identified the life stages that would be exposed to the stressors associated with the proposed action, and analyzed how those individuals would respond upon exposure to the stressors. From this analysis, we determined that:

1) There is no proposed critical habitat for the NLEB, and thus, none will be adversely affected.

2) No known hibernating bats nor their hibernacula will be exposed to the project stressors as there are no hibernacula within the vicinity of the Action Area.

3) NLEB during the spring-fall period will be exposed to various project stressors and are likely to adversely respond to some of them. As stated in the environmental baseline, we believe that individuals may occur in the Action Area.

In summary, there may be impacts to individual bats in either their annual survival or reproductive rates.

Impacts to Populations

As we have concluded that individual bats are likely to experience reductions in either their annual or lifetime survival or reproductive rates, we need to assess the aggregated consequences of the anticipated reductions in fitness (i.e., reproductive success and survival), of the exposed individuals on the population(s) to which these individuals belong.

The USFS's previous and ongoing efforts have served to identify areas of NLEB maternity activity, and after completion of the action, the area will continue to provide suitable habitat conditions for NLEB foraging and roosting during the summer period. While there is potential for direct take of the species, given the small-scale of the proposed action in relation to the action

area, and the current distribution and abundance of the NLEB within the action area (as described in the Environmental Baseline), the NLEB should be able to continue to survive and reproduce on the Shawnee National Forest.

We recognize the potential for a small amount of lethal take of adults and/or non-reproductive individuals, but we believe the NLEB population affected should be able to sustain the worst-case losses discussed above.

Impacts to the Species

As stated above, reductions in the population fitness are unlikely to occur. In fact, we find that many of the proposed actions of the USFS are likely to result in benefits to the species over the long term due to the maintenance of a mosaic of forest types. Thus, no component of the proposed action is expected to reduce the reproduction, numbers, or distribution of the NLEB rangewide. While we recognize that the status of the species is uncertain due to WNS, given the environmental baseline, and the intensity, frequency, and duration of the project impacts, we find that the proposed project is unlikely to have population-level impacts, and thus, is also unlikely to decrease the overall reproduction, numbers, or distribution of the NLEB. Therefore, we do not anticipate a reduction in the likelihood of both survival and recovery of the species as a whole.

Based on the analysis above, the proposed action should not decrease the reproduction, numbers, or distribution of the NLEB in a way or to the extent that would cause an appreciable reduction in the likelihood of both survival and recovery of the species as a whole.

CONCLUSION

After reviewing the current status of this species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the northern long-eared bat. No critical habitat has been designated for this species; therefore, none will be affected.

Implementation of the Harris Branch Project may result in some adverse fitness consequences for individuals occurring within the action area. These adverse consequences are most likely to be either as injury or death of individual Indiana bats from direct exposure to management actions. We do not expect these individual consequences will elicit population or species-level effects. On the contrary, we anticipate the overall beneficial effects of the proposed action will maintain and improve roosting and foraging habitat and hence the fitness of Northern long-eared bats occurring within the action area. Thus, overall impact on the conservation status of the populations in which these individuals belong to and on the species rangewide is positive. So, we conclude that the proposed action is not expected to, directly or indirectly, reduce appreciably the likelihood of both the survival and recovery of this species in the wild by reducing their reproduction, numbers, or distribution.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or 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 (50 CFR § 17.3). Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it 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(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

AMOUNT OR EXTENT OF TAKE

If NLEB are present or utilize an area proposed for timber harvest, prescribed fire, or other disturbance, incidental take of NLEB could occur. The Service anticipates incidental take of the NLEB will be difficult to detect for the following reasons: (1) the individuals are small and occupy summer habitats where they are difficult to find; (2) NLEB form small, widely dispersed maternity colonies under loose bark or in the cavities of trees, and males and non-reproductive females may roost individually which makes finding the species or occupied habitats difficult; (3) finding dead or injured specimens during or following project implementation is unlikely; (4) the extent and density of the species within its summer habitat in the action area is unknown; and (5) in many cases incidental take will be non-lethal and undetectable.

Monitoring to determine actual take of individual bats within an expansive area of forested habitat is a complex and arduous task. Unless every individual tree that contains suitable roosting habitat is inspected by a knowledgeable biologist before management activities begin, it would be impossible to know if a roosting NLEB is present in an area proposed for harvest or prescribed burn. Inspecting individual trees is not considered by the Service to be a practical survey method and is not recommended as a means to determine incidental take. However, the areal extent of potential roosting and foraging habitat affected can be used as a surrogate to monitor the level of take.

The Service anticipates that no more than 225 acres of potential NLEB foraging and low quality roosting habitat will be disturbed as a result of timber harvest, dormant season burning, and site preparation at the Harris Branch Project.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take

is not likely to result in jeopardy to NLEB. No critical habitat has been designated for NLEB, so none would be impacted.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to further minimize take of NLEB.

1. Decrease possible adverse impacts to NLEBs due to the removal of suitable roost trees during timber harvest/management through compliance with Terms and Conditions set forth below.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the ESA, the USFS must comply with the following terms and conditions, which implement the reasonable and prudent measures. These terms and conditions are non-discretionary.

1. To reduce the possible impacts to NLEBs due to the removal of potentially suitable roost trees from timber harvest/management, the following is necessary:

    a. If an occupied roost tree and/or occupied roost trees are documented in the project area, additional coordination with the Marion Illinois Sub-Office will occur and appropriate buffers and/or protective measures may be established.

REPORTING REQUIREMENTS

1. The USFS shall provide report summarizing the activities (and acreages) described in this ITS upon completion of the project(s).

2. The USFS shall make all reasonable efforts to educate personnel to report any sick, injured, and/or dead bats (regardless of species) located on the Shawnee National Forest immediately to the lead USFS biologist. The USFS point of contact will subsequently report to the Service's Marion Illinois Sub-Office (MISO) (618-998-5945). No one, with the exception of trained staff or researchers contracted to conduct bat monitoring activities, should attempt to handle any live bat, regardless of its condition. If needed, MISO will assist in species determination for any dead or moribund bats. If an NLEB is identified, MISO will contact the appropriate Service law enforcement office. Care must be taken in handling dead specimens to preserve biological material in the best possible state. In conjunction with the care of sick and injured fish or wildlife and the preservation of biological materials from dead specimens, the USFS has the responsibility to ensure that information relative to the date, time, and location of NLEB, when found, and possible cause of injury or death of each is recorded and provided to the Service. In the extremely rare event that someone has been bitten by a bat, please keep the bat in a container and contact the local health department.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid the adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information.

The Service has identified the following actions that, if undertaken by the USFS, would further the conservation of the NLEB. We recognize that limited resources and other agency priorities may affect the ability of the USFS to conduct these activities at any given time.

1. Assist with WNS investigations, where feasible. For example:
    a. Monitor the status/health of known colonies;
    b. Collect samples for ongoing or future studies;
    c. Allow USFS staff to contribute to administrative studies (on or off of USFS lands).

2. Monitor pre- and post-WNS distribution of NLEB on the National Forest.
    a. Search for hibernacula within the National Forest;
    b. Conduct inventory surveys;
    c. Conduct radio telemetry to monitor status of NLEB colonies; and
    d. Participate in North American Bat Monitoring Program (NABat; a national effort to monitor and track bats) through submission of survey data.

3. Encourage research and administrative studies on the summer habitat requirements NLEB on the National Forest that:
    a. Investigate habitat characteristics of the forest in areas where pre- and post-WNS NLEB occurrences have been documented (acoustically or in the hand) (e.g. forest type, cover, distance to water).
    b. Investigate NLEB use (acoustics, radio telemetry) of recently managed areas of different prescriptions.

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

REINITIATION NOTICE

This concludes formal consultation for the USFS's actions outlined in your request dated March 11, 2015. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over an action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in

a manner or to an extent not considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such a take must cease pending reinitiation.

LITERATURE CITED

Amelon, S., and D. Burhans. 2006. Conservation assessment: *Myotis septentrionalis* (northern long-eared bat) in the eastern United States. Pages 69-82 *in* Thompson, F. R., III, editor. Conservation assessments for five forest bat species in the eastern United States. U.S. Department of Agriculture, Forest Service, North Central Research Station, General Technical Report NC-260. St. Paul, Minnesota. 82pp.

Barbour, R.W., and W.H. Davis. 1969. Bats of America. The University of Kentucky Press, Lexington, Kentucky. 311pp.

Barclay, R. M. R., and A. Kurta. 2007. Ecology and behavior of bats roosting in tree cavities and under bark. Pages 17-59 in Bats in forests: conservation and management. (M. J. Lacki, J. P. Hayes, and A. Kurta, eds.). Johns Hopkins University Press, Baltimore, Maryland.Brack, V., Jr. and R.K. LaVal. 1985. Food habits of the Indiana bat in Missouri. Journal of Mammalogy 66:308-315.

Boyles, J.G., and D.P. Aubrey. 2006. Managing forests with prescribed fire: Implications for a cavity-dwelling bat species. Forest Ecology and Management, 222:108-115.

Broders, H. G. and G. J. Forbes. 2004. Interspecific and intersexual variation in roost-site selection of northern long-eared and little brown bats in the Greater Fundy National Park Ecosystem. Journal of Wildlife Management 68(3):602-610.

Broders, H.G., G.J. Forbes, S. Woodley, and I.D. Thompson. 2006. Range Extent and Stand Selection for Roosting and Foraging in Forest-Dwelling Northern Long-Eared Bats and Little Brown Bats in the Greater Fundy Ecosystem, New Brunswick. The Journal of Wildlife Management, 70(5):1174-1184.

Broders, H.G., L.E. Burns, and S.C. McCarthy. 2013. First Records of the Northern Myotis (*Myotis Septentrionalis*) from Labrador and Summer Distribution Records and Biology of Little Brown Bats (*Myotis lucifugus*) in Southern Labrador. The Canadian Field-Naturalist, 127:266-269.

Caceres, M.C. and M.J. Pybus. 1997. Status of the northern long-eared bat (*Myotis septentrionalis*) in Alberta. Alberta Environmental Protection, Wildlife Management Division, Wildlife Status Report No. 3, Edmonton, AB, 19pp.

Caceres, M.C. and R.M.R. Barclay. 2000. Myotis Septentrionalis. Mammalian Species, **634**:1-4.

Callahan, E.V. 1993. Indiana bat summer habitat requirements. M.S. Thesis, University of Missouri Columbia.

Carter, T.C., and G. Feldhamer. 2005. Roost tree use by maternity colonies of Indiana bats and northern long-eared bats in southern Illinois. Forest Ecology and Management, **219**: 259-268.

Davis, M.A. 2014. Assessing Illinois bat populations in the age of white nose syndrome. Report by the Illinois Natural History Survey, Prairie Research Institute.

Department of the Air Force. 2007. Survey for the federally endangered Indiana bat (*Myotis sodalis*) at Scott Air Force Base in St. Clair County, Illinois. Prepared for US Air Force Center for Engineering and the Environment.

Department of the Air Force. 2010. Final endangered species management plan for the federally endangered Indiana bat (*Myotis sodalis*) at Scott Air Force Base in St. Clair County, Illinois. Prepared for US Air Force Center for Engineering and the Environment.

Dickinson, M.B., M.J. Lacki, and D.R. Cox. 2009. Fire and the endangered Indiana bat. Proceedings of the 3rd Fire in Eastern Oak Forests Conference GTR-NRS-P-46, p. 51-75.

Dickinson, M.B. 2010. Burning and bats: fire's effect on the endangered Indiana bat. Fire Science Brief 109:1-6.

Environment Yukon. 2011. Yukon Bats. Government of Yukon, Environment Yukon, Whitehorse, Yukon. 22pp.

Foster, R.W., and A. Kurta. 1999. Roosting ecology of the northern bat (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). Journal of Mammalogy 80(2):659-672.

Frick, W.F., D.S. Reynolds, and T.H. Kunz. 2009. Influence of climate and reproductive timing on demography of little brown myotis *Myotis lucifugus*. Journal of Animal Ecology 79(1):128-136.

Gardner, J.E., J.D. Garner, and J. Hofmann. 1991. Summer roost selection and roosting behavior of Myotis sodalis (Indiana bat) in Illinois. Final Report.

Garroway, C.J., and H.G. Broders. 2007. Nonrandom association patterns at northern long-eared bat maternity roosts. Canadian Journal of Zoology, **85**:956-964.

Griffin, D.R. 1940. Notes on the life-histories of New England cave bats. Journal of Mammology 21:181-187.

Henderson, L.E., and H.G. Broders. 2008. Movements and resource selection of the northern

long-eared myotis (*Myotis septentrionalis*) in a forest-agriculture landscape. Journal of Mammalogy, **89**(4):952-963.

Johnson, J.B, J.W. Edwards, W.M. Ford, and J.E. Gates. 2009. Roost tree selection by northern myotis (*Myotis septentrionalis*) maternity colonies following prescribed fire in a Central Appalachian Mountains hardwood forest. Forest Ecology and Management, 258:233–242.

Johnson, J.B, J.W. Edwards, W.M. Ford, J.L. Rodrigue, and C.M. Johnson. 2010. Roost selection by male Indiana myotis following fires in Central Appalachian Hardwood Forests. Journal of Fish and Wildlife Management 1(2):111-121.

Johnson, J.B., W.M. Ford, and J.W. Edwards. 2012. Roost networks of northern myotis (*Myotis septentrionalis*) in a management landscape. Forest Ecology and Management 266:223-231.

Lacki, M.J., and J.H. Schwierjohann. 2001. Day-roost characteristics of northern bats in mixed mesophytic forest. The Journal of Wildlife Management 65(3):482-488

Lacki, M.J., D.R. Cox, L.E. Dodd, and M.B. Dickinson. 2009. Response of northern bats (*Myotis septentrionalis*) to prescribed fires in eastern Kentucky forests. Journal of Mammalogy, 90(5):1165-1175

Menzel, M.A., S.F. Owen, W.M. Ford, J.W. Edwards, P.B. Wood, B.R. Chapman, and K.V. Miller. 2002. Roost tree selection by northern long-eared bat (*Myotis septentrionalis*) maternity colonies in an industrial forest of the central Appalachian mountains. Forest Ecology and Management, **155**:107-114.

Meteyer, C.U., E.L. Buckles, D.S. Blehert, A.C. Hicks, D.E. Green, V. Shearn-Bochsler, N.J. Thomas, A. Gargas, and M.J. Behr. 2009. Histopathologic criteria to confirm white-nose syndrome in bats. Journal of Veterinary Diagnostic Investigation 21:411-414.

Nagorsen, D.W. and R.M. Brigham. 1993. Bats of British Columbia.
Royal British Columbia Museum, Victoria, and the University of British Columbia Press, Vancouver. 164 pp.

Owen, S.F., M.A. Menzel, W.M. Ford, B.R. Chapman, K.V. Miller, J.W. Edwards, and P.B. Wood. 2003. Home-range size and habitat used by the Northern Myotis (*Myotis septentrionalis*). American Midland Naturalist, **150**(2):352-359.

Owen, S.F., M.A. Menzel, W.M. Ford, J.W. Edwards, B.R. Chapman, K.V. Miller, and P.B. Wood. 2002. Roost tree selection by maternal colonies of Northern long-eared Myotis in an intensively managed forest. USDA Forest Service. Newtown Square, Pennsylvania. 10 pp.

Patriquin, K.J. and R.M. Barclay. 2003. Foraging by bats in cleared, thinned and unharvested boreal forest. Journal of Applied Ecology, 40:646-657.

Patriquin, K.J., M.L. Leonard, H.G. Broders, and C.J. Garroway. 2010. Do social networks of female northern long-eared bats vary with reproductive period and age? Behavioral Ecology and Sociobiology, **84**:899-913.

Perry, R.W., and R.E. Thill. 2007. Roost selection by male and female northern long-eared bats in a pine-dominated landscape. Forest Ecology and Management **247**:220-226.

Reeder, D.M., C.L. Frank, G.G. Turner, C.U. Meteyer, A. Kurta, E.R. Britzke, M.E. Vodzak, S.R. Darling, C.W. Stihler, A.C. Hicks, R. Jacob, L.E. Grieneisen, S.A. Brownlee, L.K. Muller, and D.S. Blehert. 2012. Frequent arousal from hibernation linked to severity of infection and mortality in bats with white-nose syndrome. PLoS ONE 7(6):1-10.

Reichard, J.D. and T.H. Kunz. 2009. White-nose syndrome inflicts lasting injuries to the wings of little brown myotis (*Myotis lucifugus*). Acta Chiropterologica 11(2):457-464.

Sasse, D.B., and P.J. Pekins. 1996. Summer roosting ecology of northern long-eared bats *(Myotis septentrionalis)* in the white mountain national forest. Bats and Forests Symposium October 1995, Victoria, British Columbia, Canada, pp.91-101.

Silvis, A., W.M. Ford, E.R. Britzke, and J.B. Johnson. 2014. Association, roost use and simulated disruption of Myotis septentrionalis maternity colonies. Behavioural Processes 103:283-290.

Silvis, A., W.M. Ford, and E.R. Britzke. 2015. Effects of hierarchical roost removal on Northern Long-Eared Bat (Myotis septentrionalis) maternity colonies. PloS ONE 10(1):1-17.

Timpone, J.C, J.G. Boyles, K.L. Murray, D.P. Aubrey, and L.W. Robbins. 2010. Overlap in roosting habits of Indiana bats (Myotis sodalis) and northern bats (Myotis septentrionalis). The American Midland Naturalist 163(1): 115-123.

U.S. Fish and Wildlife Service. 2014. Northern Long-eared Bat Interim Conference and Planning Guidance. USFWS Regions 2, 3, 4, 5, & 6. Available at: http://www.fws.gov/midwest/endangered/mammals/nlba/pdf/NLEBinterimGuidance6Jan2014.pdf

Warnecke, L., J.M. Turnera, T.K. Bollinger, J.M. Lorch, V. Misrae, P.M. Cryan, G. Wibbelt, D.S. Blehert, and C.K.R. Willis. 2012. Inoculation of bats with European *Geomyces destructans* supports the novel pathogen hypothesis for the origin of white-nose syndrome. PNAS 109(18):6999-7003.

Whitaker, J.O., and W.J. Hamilton. 1998. Mouse-eared bats, Vespertilionidae. In *Mammals of the eastern United States, Third Edition.* Comstock Publishing Associates, a Division of Cornell University Press, Ithaca, New York, pp.89-102.

Whitaker, J.O., and L.J. Rissler. 1992. Seasonal activity of bats at copperhead cave. Proceedings of the Indiana Academy of Science, 101:127-134.

Yates, M.D., and R.M. Muzika. 2006. Effect of forest structure and fragmentation on site occupancy of bat species in Missouri Ozark Forests. The Journal of Wildlife Management, 70(5):1238-1248.

DOCUMENTED CORRESPONDENCE, PERSONAL COMMUNICATIONS, AND UNPUBLISHED DATA

Carter, T. 2012. Phone Conversation between T. Carter, Assistant Professor, Ball State University, and J. Utrup, U.S. Fish and Wildlife Service Green Bay Field Office (dated 01/12/2012).

Kath, J. 2013. Email Communication sent by J. Kath, Endangered Species Manager, Illinois Department of Natural Resources to J. Utrup, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service Green Bay, Wisconsin Field Office (dated 04/09/2013).

Mengelkoch, J. 2014. Unpublished data from bat surveys in Illinois, 2010-2014 (received 12/19/2014).

Powers, L. 2014. Email correspondence from L. Powers, University of Illinois at Urbana-Champaign to S. Marquardt, Fish and Wildlife Biologist, Columbia, Missouri Field Office (sent 12/19/2014).

U.S. Fish and Wildlife Service (Service).2011-2015.Compiled unpublished data.

APPENDIX A – CONSULTATION HISTORY

June 17, 2004 – Technical assistance letter regarding the Harris Branch Project provided to the USFS.

December 2005 – Programmatic Biological Opinion for the Shawnee National Forest 2006 Forest Plan provided to the USFS.

May 24, 2007 – Tier II Biological Evaluation for the proposed Harris Branch Hardwood Restoration Project provided to the Service.

June 8, 2007 – Tier II Biological Opinion for the Harris Branch Hardwood Restoration Project provided to the USFS

September 17, 2014 – Supplemental Information Report reviewing the effects on the Indiana bat from continued implementation of the Harris Branch Hardwood Restoration Project provided to the Service.

September 17, 2014 – Signed Supplemental Information Report provided to the USFS

March 11, 2015 – Formal Conference request letter provided to the Service.

March 24, 2015 – Formal Conference acknowledgement letter sent to the USFS.

May 1, 2015 – Conference Opinion provided to the USFS for review.

June 12, 2015 – USFS review of Conference Opinion provided to the Service.