US FISH AND WILDLIFE SERVICE

NORTHERN LONG-EARED BAT INTERIM CONFERENCE AND PLANNING GUIDANCE

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NORTHERN LONG-EARED BAT
INTERIM CONFERENCE AND PLANNING GUIDANCE

On October 2, 2013, the U.S. Fish and Wildlife Service (FWS) proposed the northern long-eared bat (*Myotis septentrionalis*; NLEB) for listing as endangered under the Endangered Species Act (ESA). The purpose of this document is to address the immediate information needs for section 7 conferences and conservation planning for the NLEB should it be listed. Please consider the following:

- The information and guidance in this document should not be considered final because the FWS is still making a listing decision for NLEB.
- This document provides the FWS' current suggestions and recommendations for NLEB-consideration in project planning. This document should not be considered mandatory, unless where stated by regulation (i.e., conference requirements).
- Much of the support and documentation (e.g., citations) for this document is contained in the attached appendices.

It is important to note that, due to the preliminary nature of the state of knowledge of the NLEB, the approaches and information contained within this guidance and appendices may change as we gain additional information on the NLEB and its habitat.

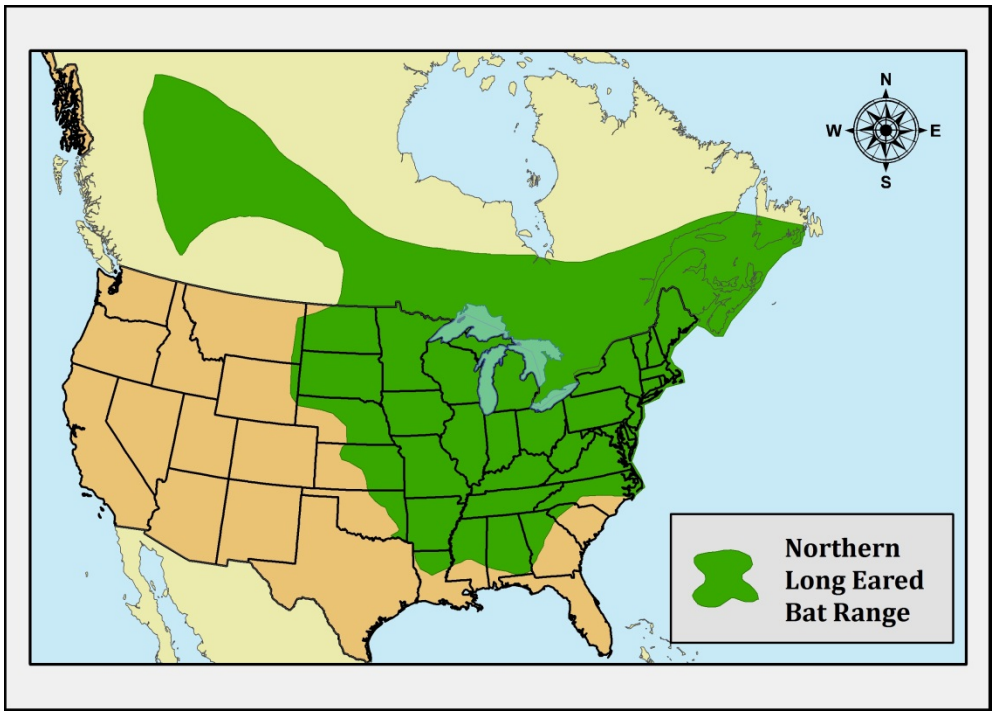
Species Overview

This section provides a brief overview of the NLEB ecology and threats. Please reference the listing proposal or the FWS website for further information. This information may be found at: http://www.fws.gov/midwest/endangered/mammals/nlba/index.html.

We recommend that project proponents or their representatives coordinate with the appropriate FWS Field Office to more clearly define the range and suitable habitat for their particular state/region as some differences in state/regional suitability criteria may be warranted. It may be useful to compare the habitat and ecology of the NLEB with that of the Indiana bat (Myotis sodalis). A comparison of these two bat species can be found in Appendix A.

NLEB Species Range

The NLEB is found in the United States from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, extending southward to parts of southern states from Georgia to Louisiana, even reaching into eastern Montana and Wyoming. In Canada it is found from the Atlantic Coast westward to the southern Yukon Territory and eastern British Columbia. Historically, the species has been found in greater abundance in the northeast and portions of the Midwest and Southeast, and has been more rarely encountered along the western edge of the range.



NLEB Winter Habitat and Ecology

Suitable winter habitat (hibernacula) for the NLEB includes underground caves and cave-like structures (e.g. abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with 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. NLEBs will typically hibernate between mid-fall through mid-spring each year[1]. NOTE: there may be other landscape features being used by NLEB during the winter that have yet to be documented.

NLEB Summer Habitat and Ecology

During summer NLEBs roost singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically ≥3 inches dbh). Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on presence of cavities or crevices or presence of peeling bark. NLEBs has also been occasionally found roosting in structures like barns and sheds (particularly when suitable tree roosts are unavailable). NLEB emerge at dusk to forage in upland and lowland woodlots and tree-lined corridors, feeding on insects, which they catch while in flight using echolocation. This species also feeds by gleaning insects from vegetation and water surfaces.

[1] Exact dates vary by location. See Appendix D for more information.

Suitable summer habitat 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 (i.e., live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities), 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. Individual trees may be considered suitable habitat when they exhibit characteristics of suitable roost trees and are within 1000 feet of other forested/wooded habitat[2]. NLEB has also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat[3]. NLEBs typically occupy their summer habitat from mid-May through mid-August each year[4] and the species may arrive or leave some time before or after this period.

NLEB maternity habitat is defined as suitable summer habitat used by juveniles and reproductive (pregnant, lactating, or post-lactating) females. NLEB home ranges[5], consisting of maternity, foraging, roosting, and commuting habitat, typically occur within three miles of a documented capture record or a positive identification of NLEB from properly deployed acoustic devices, or within 1.5 miles of a known suitable roost tree (see Appendix C for more information).

Suitable NLEB roost trees

Suitable NLEB roosts are trees (live, dying, dead, or snag) with a diameter at breast height (DBH) of three inches or greater that exhibits any of the following characteristics: exfoliating bark, crevices, cavity, or cracks. Isolated trees are considered suitable habitat when they exhibit the characteristics of a suitable roost tree and are less than 1000 feet from the next nearest suitable roost tree within a woodlot, or wooded fencerow.

NLEB Spring staging/Fall swarming Habitat and Ecology

Suitable spring staging/fall swarming habitat for the NLEB 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

[2] This number is based on observations of bat behavior indicating that such an isolated tree (i.e., ≥1000 feet) would be extremely unlikely to be used as a roost. This distance has also been evaluated and vetted for use for the Indiana bat. See the "Indiana bat Section 7 and Section 10 Guidance for wind Energy Projects," question 33, found at: http://www.fws.gov/midwest/endangered/mammals/inba/WindEnergyGuidance.html

[3] Trees found in highly-developed urban areas (e.g., street trees, downtown areas) are extremely unlikely to be suitable NLEB habitat.

[4] Exact dates vary by location. See Appendix D for more information.

[5] Note that the definition of a home range used here may differ from the use of this term in other sources (e.g., published literature).

1000 feet from the next nearest suitable roost tree, woodlot, or wooded fencerow. NLEBs typically occupy their spring staging/fall swarming habitat from early April to mid-May and mid-August to mid-November[6], respectively.

NLEB Migration

As with many other bat species, NLEBs migrate between their winter hibernacula and summer habitat. The spring migration period likely runs from mid-March to mid-May, with fall migration likely between mid-August and mid-October. Overall, NLEB is not considered to be a long-distance migrant (typically 40-50 miles) although known migratory distances vary greatly between 5 and 168 miles.

Potential Threats and Impacts to NLEB

No other threat is as severe and immediate for the NLEB as the disease, white-nose syndrome (WNS). If this disease had not emerged, it is unlikely the northern long-eared population would be declining so dramatically. Since symptoms were 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 NLEB have declined by 99 percent in the Northeast, which along with Canada, has been considered the core of the species' range. The degree of mortality attributed to WNS in the Midwest and Southeast is currently undetermined. Although there is uncertainty about how WNS will spread through the remaining portions of the species' range, it is expected to spread throughout the United States. In general, the FWS believes that WNS has reduced the redundancy and resiliency of the species.

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 NLEBs 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, and should be evaluated on a case-by-case basis.

While it is not possible to predict every possible threat to the NLEB, the following information includes common actions that could affect the NLEB and should be considered during conferencing and consultation if the species is listed.

[6] Exact dates vary by location. See Appendix D for more information.

Impacts to NLEB and/or Winter Hibernacula Habitat

- Wearing clothing or footwear or bringing equipment that was used in a WNS-affected state or region into a cave or mine in an unaffected state or region may exacerbate the spread of WNS.
- Impacts to hibernacula openings may restrict bat flight and movement and/or may modify air flow or microclimate, reducing suitability of the hibernaculum for bats or decreasing survivorship. A few degrees change may make a cave unsuitable for some hibernating bats.
- Entering a hibernaculum during the winter. Cave-dwelling bats, such as NLEB, are vulnerable to human disturbance while hibernating. Bats use up their energy stores when aroused and may not survive the winter or may result in termination of pregnancy.
- Blasting or drilling within ½ mile of caves or mines where NLEB hibernate during the winter may disturb hibernating bats.
- Impacting water resources that flow into NLEB hibernacula during the winter, which may affect the cave climate.
- Clearing trees within 5 miles of caves or mines where NLEB hibernate, reducing staging/swarming habitat.
- Human ignited fires (e.g., prescribed burning) near caves or mines where NLEB hibernate and where the smoke may enter the cave, disturbing the bats (during winter).

Impacts to NLEB and/or Summer Habitat

- The permanent or temporary removal of forested habitat from a variety of actions may adversely affect the NLEB by reducing the amount of habitat available for roosting, foraging, or travel. Additionally, bats may also be directly disturbed or killed if such projects are conducted while they are present.
- Burning, although potentially necessary to maintain habitat, could disturb or kill bats by smoke inhalation or scorching.
- Although many types of timber management, when properly designed, will not impact (or may improve) NLEB habitat, some types of timber management (e.g. clear-cutting) can reduce the viability of NLEB populations if key areas of a home range are removed.
- Removal of occupied suitable man-made roosting structures.
- Lethal bat removal from occupied homes/structures.
- Use of pesticides and herbicides in a way that exposes NLEBs (e.g., aerial application at night) or significantly reduces their prey.
- Loss of clean water sources (e.g., fill, degradation of water quality), which could reduce NLEB drinking sources, foraging habitat and/or prey.

Impacts during Migration

- Wind turbine operation has been documented to kill NLEB, particularly during the fall migratory period.

Measures to avoid and minimize impacts to NLEB

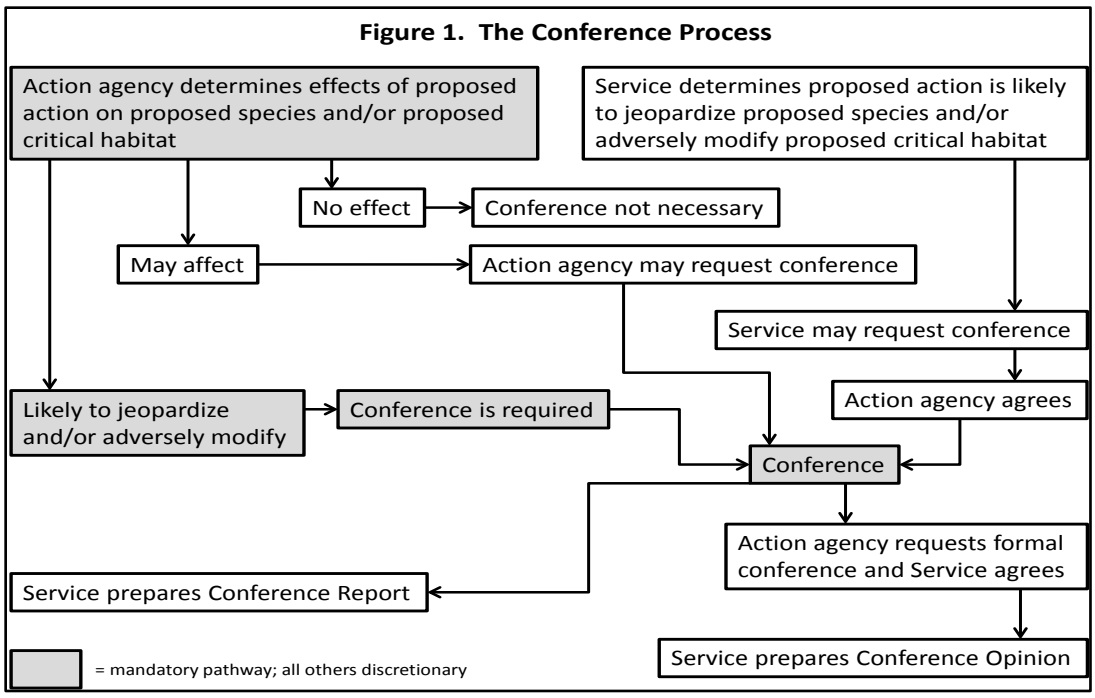
Please see Appendix D of this document for a list of potential conservation measures for the NLEB. In addition, Appendix B includes the FWS' current survey guidance protocols for the NLEB.

Conferencing for NLEB and the Jeopardy Analysis

A proposed species is any species where a proposed listing rule under section 4 of the ESA has been published in the Federal Register. For species that have been proposed for listing, the FWS has determined that there is enough information to warrant listing them as either threatened or endangered. The NLEB was proposed for federal listing under the ESA on October 2, 2013 and the final listing decision is expected within one year from this date.

While there is no prohibition for "taking" proposed species, there are certain statutory requirements under the ESA for proposed species. Section 7(a)(4) of the ESA states, "Each Federal agency shall confer with the Secretary on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed or result in the destruction or adverse modification of critical habitat proposed to be designated for such species." Conference is a process of early interagency cooperation involving informal and/or formal discussions between the action agency and the FWS pursuant to section 7(a)(4) of the ESA regarding the likely impact of an action on proposed species or proposed critical habitat.

While consultation under Section 7 of the ESA is required when a proposed action "may affect" a *listed* species, a conference is required only if the proposed action is likely to jeopardize the continued existence of a proposed species or destroy or adversely modify proposed critical habitat. The Conference process is discretionary for all other effect determinations besides jeopardy/adverse modification. However, it is in the best interest of the species, and our federal partners to consider the value of voluntary conservation measures in a conference opinion or conference report for projects that are not likely to cause jeopardy, but are likely to adversely affect the NLEB. Figure 1. Depicts the conference process with mandatory and discretionary actions.



Conference must be initiated when the FWS or action agency determines that the proposed action is likely to result in jeopardy of a proposed species or destroy/adversely modify proposed critical habitat. Conference may also be initiated when the action agency determines that the proposed action may affect a proposed species or proposed critical habitat. No designated critical habitat has been proposed for the NLEB at this time.

"To jeopardize the continued existence of" is defined by regulation as "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery of a listed species in the wild by reducing the reproduction, numbers or distribution of that species." This jeopardy determination must be based on the effects of the action to the entire species. Therefore, this analysis should be done in coordination with the FWS, the agency responsible for maintaining and tracking rangewide species status information.

Action agencies are not prohibited from unauthorized taking or jeopardizing the continued existence of a proposed species until the species becomes listed. However, as soon as the listing becomes effective, the section 7(a)(2) prohibition becomes effective 30 days after the publication of the final rule, regardless of an action's stage of completion[7]. Because of this, the timing of the proposed action should influence whether an informal or formal conference is conducted. Action agencies/applicants may experience significant project delays if the NLEB has not been addressed, either formally or informally, if the species is listed.

The FWS provides the following guidelines for considering whether, and to what extent, to engage in conference procedures:

[7] Section 7 and the requirements of this part apply to all actions in which there is discretionary Federal involvement or control.

- Informal Conference for the NLEB: If a proposed action may affect the NLEB, informal conference can be initiated. During an informal conference, the FWS assists the action agency in their determination of the effects and will advise the action agency on ways to avoid and minimize adverse effects to the NLEB[8]. If the FWS concurs that the proposed action is not likely to result in jeopardy of the NLEB, the FWS may issue a conference report that: (1) documents the rationale for a no jeopardy finding and (2) contains recommendations for avoiding and/or minimizing the adverse effects to the NLEB, if appropriate. For projects that will be completed prior to the final listing of the NLEB, no further action is necessary.

  Conference reports can vary in length and amount of detail depending on the complexity of the project. For example:

  - If the FWS issues a concurrence letter because adverse effects to other listed are unlikely, a paragraph pertaining to NLEB may be included.
  - If the FWS has been asked to provide conference reports for many projects with similar effects that would require the same analysis, a single conference report on the batched projects could be issued.

  Although not required, for projects that may adversely affect the NLEB, formal conference is advisable if the action will be ongoing subsequent to the listing. This is appropriate because, even though the proposed action may not result in jeopardy to the NLEB, the prohibition against taking a listed species under section 9 of the ESA (in addition to the prohibition against jeopardy) will apply as soon as the listing becomes effective (30 days after publication of the final rule), regardless of the proposed action's stage of completion. Therefore, formal conference and the issuance of a conference opinion that can be adopted as the biological opinion on the proposed action, should allow the project to proceed with little delay once the NLEB becomes listed. The conference opinion can then be adopted after listing as a biological opinion without interruption in the action, if both the FWS and action agency agree. If the NLEB becomes listed prior to project completion and the action agency has not conferred with the FWS, the action agency would need to cease action on the project and enter into formal consultation with the FWS if the action is likely to adversely affect the NLEB. This approach has the potential to result in significant delays and costs to applicants.

- Formal conference for the NLEB: Formal conference is required if the FWS and/or the action agency determine that the proposed action is likely to jeopardize NLEB. Formal conferences follow the same procedures as formal consultation and end with the issuance of a conference opinion. The conference opinion follows the same format and content of a biological opinion; however, the incidental take statement provided with a conference opinion for the NLEB does not take effect until the FWS and action agency

[8] The type of documentation for this analysis can vary, but may be similar in form to a biological assessment or evaluation.

adopt the conference opinion as a biological opinion on the proposed action, after the NLEB is listed.

Appendix E includes flow charts that depict a recommended process for completing conference procedures. The suggested conference processes separate projects that will be completed prior to any final listing action for the NLEB from those that may be completed after a final listing decision is issued. The flow charts include some section 7 language and steps that are not required in conference, however, FWS offices and action agencies are encouraged to employ these procedures.

When considering whether to engage in informal or formal conference, we recommend prioritizing the following types of projects:

1. Projects in the vicinity of known summer captures or acoustic detections, known roosts, known telemetry points, and known hibernacula.
2. Projects most likely to result in lethal impacts or significant adverse impacts to NLEB
    - Wind projects
        - Projects where NLEB fatalities have already been documented
        - All others
    - Projects that alter hibernacula
    - Extensive forest removal/conversion projects
3. Projects that will still be in progress during/after the final listing
    - An existing conference report or opinion, that can be converted to a concurrence letter or biological opinion, will facilitate the agency's consultation requirements for these projects

Additional information that may be useful in conferencing or otherwise evaluating impacts on the NLEB can be found in Appendix F: Guidance for Non-Federal Landowners and Project Proponents, Appendix G: Stepwise NLEB effects Analysis for Projects with Federal Agency Involvement, and Appendix H: Surface Coal Mining and the NLEB.

List of Appendices

Appendix A: Northern long-eared bat (NLEB) general comparisons with the Indiana bat

		NLEB	Indiana bat
Fall Swarming (Mating) – Around Hibernacula	Period	August - November[1] Swarming occurs August and September in Ontario, Canada (Caceres and Barclay 2000).	August to October or later, especially at southern sites (FWS 2007)
	Distances	Maximum distance from swarm site to roost tree =7,328 m (4.55 miles) (Lowe 2012)	P1/P2[2] – 20 miles, P3/P4 – 10 miles (FWS 2011; Q.32)
Winter Hibernation – At Hibernacula	Period	Hibernation may begin from September through early November and lasts through early March to April or May (Caceres and Barclay 2000).	Generally October through April (FWS 2007), but some may begin hibernating by mid-September (Hall 1960).
	Hibernacula type	Caves, Mines; but also use other types of habitat resembling caves or mines (e.g., railroad tunnels**, storm sewers, a well, and bunkers [FWS 2013]**).	Caves or mines; but have also used other types of habitat resembling caves or mines (e.g., railroad tunnels, an aqueduct and a dam) (FWS 2007).
	Hibernating population size	**Largely unknown** Historically, the NLEB was most abundant in the eastern portion its range (Caceres and Barclay 2000).	Highly variable from 1 to 123,000 bats. In 2013, about 75% of the 247 known hibernacula with extant populations had <200 bats with a median population size of 29 bats. In sharp contrast, the 10 largest hibernacula held 80% of the rangewide

[1] See Appendix D for guidance on specific dates for conservation measures.
[2] The FWS has defined Indiana bat hibernacula by priority or "P" numbers: P1 ≥ 10,000; P2 = 1,000-9,999; P3 = 50-1,000; and P4 = <50 bats.

	NLEB	Indiana bat
	Smaller observed counts than Indiana bats at largest known sites. For example, before WNS, large numbers of NLEB were found in larger hibernacula in Pennsylvania (e.g., an estimated 881 individuals in a mine in Bucks County, Pennsylvania in 2004). Counts rarely over 100 in a single hibernaculum (FWS unpublished data) – may be due to roosting habitat or that they haven't been targeted when doing hibernaculum counts. (See "Roosting habitat" below). But hundreds may be captured during fall swarming at a single cave. Sites may contain large numbers of hibernating that cannot be counted. 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).	population.
Roosting habitat	**Singly or in small groups**; typically in **cracks or tight crevices** and thus easily overlooked (FWS 2013).	Clustering in large dense groups (especially in P1 & P2 hibernacula). Typically roost on open ceilings and walls, but roost in cracks sometimes too. Indiana bats usually hibernate in large, dense clusters ranging from 300 bats per

		NLEB	Indiana bat
			square foot (LaVal and LaVal 1980) to 484 bats per square foot (Clawson et al. 1980, Hicks and Novak 2002), although cluster densities as high as 500 bats per square foot have been recorded (Stihler 2005). While the Indiana bat characteristically forms large clusters, small clusters and single bats also occur (Hall 1962, Hicks and Novak 2002) and cluster size may be inversely related to roost temperature (FWS 2007).
	Microclimate preference	Similar to Indiana bat. Relatively constant, cool temperatures, 0-9°C (32-48.2°F) with high humidity and minimal air currents (Fitch and Shump 1979, Van Zyll de Jong 1985, Raesly and Gates 1987, Caceres and Pybus 1997).	Most Indiana bats hibernate in caves or mines where the ambient temperature remains below 10°C (50.0°F) but infrequently drops below freezing (Hall 1962, Myers 1964, Henshaw 1965, Humphrey 1978), and the temperature is relatively stable (Tuttle and Kennedy 2002). Tuttle and Kennedy (2002) reported 3-7.2°C (37.4-45°F). However, Brack et al. (2005) reported that hibernacula temperatures below 5°C (41.0°F) are too cold because they observed that in hibernacula in Indiana the highest concentrations of Indiana bats were found at sites with mid-winter temperatures of 6-7°C (42.8-44.6°F).

	NLEB	Indiana bat
Arousals	NLEB information is unknown. Anticipated to be similar to Indiana bat.	Generally, a rhythm of approximately one arousal every 12 to 15 days for hibernating bats is considered typical, but considerable variation has been observed (Speakman and Thomas 2003).
Within season, inter-hibernacula movements	NLEB **often move between hibernacula** throughout the winter (Griffin 1940, Whitaker and Rissler 1992,Caceres and Barclay 2000). **More winter activity**. Whitaker and Mumford (2009, p. 210) found that this species flies in and out of some of the mines and caves in southern Indiana throughout the winter. NLEB appear more active than other species (such as little brown bat and tri-colored bat) hibernating in the cave.	Generally, little or no movement occurs among documented hibernacula in a single winter. However, Indiana bats may swarm at different sites than they hibernate (FWS 2007).
Site fidelity	Similar to Indiana bat **except multiple hibernacula may be part of the repeated use**. While NLEB may move among hibernacula within a given winter, they have shown a high degree of philopatry to the hibernacula used (using the same sites for multiple years) (Pearson 1962, p. 30), although they may not always return to the	It is generally accepted that most Indiana bats return to the same hibernaculum each year (LaVal and LaVal 1980).

		NLEB	Indiana bat
		same hibernaculum in successive seasons (Caceres and Barclay 2000, p. 2).	
Spring Migration	Period	Similar to Indiana bat. Can start in early March but generally April 1 to May 14	March 15 to May 15 (FWS 2007, FWS 2011; Q.19) The timing of annual spring emergence of Indiana bats from their hibernacula varies across the range, depending on latitude, and between years, depending on weather.
	Distances	Maximum documented for NLEB is **shorter** than maximum observed for Indiana bats. However, band recovery and identification is more difficult at hibernacula with NLEB compared to Indiana bats. Short migratory movements between summer roost and winter hibernacula between 56 km (35 mi) and 89 km (55 mi) have been documented most often (Nagorsen and Brigham 1993 p. 88; Griffin 1945, p. 53). However, movements from hibernacula to summer colonies may range from 8 to 270 km (5 to 168 mi) (Griffin 1945, p. 22).	Migration distances vary inter-regionally as well as intra-regionally. Bats from Michigan were associated with hibernacula in Indiana and Kentucky, an average migration distance of 477 km (296 mi), with a maximum migration of 575 km (357 mi) (Winhold and Kurta 2006). However, much shorter migration distances are also known to occur (e.g., NY, VT). See FWS 2011; Q. 18.
Summer General	Period	Similar to Indiana bat.	While bats may be in their summer habitat earlier, maternity colonies are expected to be formed/concentrated May 15 to August 15.

	NLEB	Indiana bat
Summer roosts (general)	Similar to Indiana bat (except see "Artificial roosts" below).	Indiana bats generally roost in trees in the summer.
Artificial roosts	**Appear to be used more frequently than Indiana bats.** Several published accounts of roosting in sheds and barns (Henderson and Broders 2008, Krochmal and Sparks 2007; Timpone et al. 2010) but the overwhelming majority of roosts were trees. Appears to be "rare" use, possibly when other suitable tree roosts are not available	During summer, female and juvenile Indiana bats roost almost always in trees, as do adult males. Some observations of artificial roost use: crevice in a utility pole, under metal brackets on utility pole, under concrete bridges, under artificial bark (e.g., Brandenbark). Four maternity colonies have been located in buildings. Nevertheless, there are several hundred roost trees for female Indiana bats, suggesting that use of buildings by maternity colonies is uncommon. (See p. 64-65, FWS 2007).
Tree species	Similar to Indiana bat in the number of species used. Over 35 species of trees.	At least 33 species of trees have supplied roosts for female Indiana bats and their young, and 87 percent are various ash (*Fraxinus*; 13 percent), elm (*Ulmus*; 13 percent), hickory (*Carya*; 22 percent), maple (*Acer*; 15 percent), poplar (*Populus*; 9 percent), and oak (*Quercus*; 15 percent). Importance of various species differs by region. For example, conifer snags are important in the southern Appalachians (Britzke et al. 2003).

	NLEB	Indiana bat
Roost tree features	NLEB appear to be **more flexible (plastic)** than Indiana bats (Carter and Feldhamer 2005, pp. 265–266; Timpone *et al*. 2010, p. 120–121). Live trees and/or snags, ranging from very small to large, and they are found in cracks, crevices, and under peeling bark. NLEB have been observed using stumps after a clear cut (K. Lott, pers. comm.). **More likely to roost in crevices or cavities** than Indiana bats (Carter and Feldhamer 2005, Lacki et al. 2009b). **More variability** than Indiana bats **in height of roosts above ground** (Lacki et al. 2009b). More use of cavities within roost trees and living trees than Indiana bats (Foster and Kurta 1999, p. 670). More use of live, shorter trees by NLEB than Indiana bats (Timpone *et al*. 2010 pp. 118–120). Although NLEB are more flexible/plastic than Indiana bats, there may be a small amount of roost selection overlap between the two species (Foster and Kurta 1999, p. 670; Timpone *et al*. 2010, pp. 120–121).	Live trees and/or snags. Under slabs of exfoliating bark, cracks, crevices. Generally do not use cavities. Primary maternity roosts have high solar exposure.

	NLEB	Indiana bat
Roost tree diameter at breast height (dbh)	≥3 inches dbh **More variability** than Indiana bats **in stem diameter of roost trees** (Lacki et al. 2009b). Carter and Feldhamer (2005) postulated that because NLEB form smaller groups than Indiana bats, they are able to use smaller trees.	≥5 inches dbh While trees <5 inches (<12.7 cm) dbh that have exfoliating bark, cracks, crevices, and/or hollows may have some potential to be male Indiana bat summer roosting habitat, the FWS does not generally consider early-successional, even-aged stands of trees <5 inches dbh to be suitable roosting habitat.
Canopy cover around roost trees	They appear to select roosts with **generally more canopy cover** than Indiana bats do. Canopy coverage at NLEB roosts has ranged from 56 percent in Missouri (Timone *et al.* 2010), 66 percent in Arkansas (Perry and Thill 2007), greater than 75 percent in New Hampshire (Sasse and Pekins 1996), to greater than 84 percent in Kentucky (Lacki and Schwierjohann 2001). Examples of studies that compared NLEB and Indiana bats directly: • Indiana bat 25% vs. NLEB 56% (Timpone et al. 2010) • Indiana bat 18% vs. NLEB 44% (Carter and Feldhamer 2005)	Mean values of canopy cover are highly variable among studies, ranging from <20 to 88 percent (FWS 2007). FWS (2007) "First, some variation undoubtedly is related to differences in methodology, because virtually every study measures canopy cover in a different way. Second, roosts found in closed-canopy forests, particularly primary roosts, are often associated with natural or man-made gaps (e.g., openings created when nearby trees fall, riparian edges, trail or forest road edges). Although the forest may be accurately described as closed canopy, the canopy in the immediate vicinity of the roost tree may have an opening that allows for solar radiation to reach the roost.

		NLEB	Indiana bat
			Regional differences in roost characteristics also account for some of the variability in canopy cover in the vicinity of Indiana bat roost sites. For example, average values for canopy cover may be higher in areas where many living shagbark hickories are used as alternate roosts (e.g., Palm 2003), compared with sites where most roost trees are dead and leafless (e.g., Kurta et al. 1996, 2002). In addition, Indiana bats may use sites that are more shaded during warm weather (e.g., Callahan et al. 1997)."
	Percent forest cover within summer home range	Uncertain.	Forest cover varies widely at the scale of individual maternity sites in some states (e.g., in Indiana landcover within 2.5 miles of the primary roosts of known maternity colonies ranges from 9% to over 80% forested) (FWS 2007). In Ohio, forest cover ranges from 3-60%)(K. Lott, pers. comm).
	Use of isolated trees	Similar response to Indiana bat expected.	Individual trees may be considered suitable habitat when they exhibit characteristics of suitable roost trees and are within 1,000 feet of other forested/wooded habitat (FWS 2011; Q.33).

		NLEB	Indiana bat
	# Roosts used by a colony (and by bat)	Limited colony information for NLEB. Johnson et al (2012) found colonies used 3-16 roost trees. Information on individuals: • Menzel et al. (2002) tracked 7 NLEB to 12 roosts in WV. • Foster and Kurta (1999) tracked 11 NLEB to 32 roosts over two years. Mean number of different trees used by each bat was 3.6 (range 2-7). • Over two years, Johnson et al. (2009) tracked 3 and 33 NLEB to 8 and 65 roost trees, respectively. • Jackson (2004) tracked 30 NLEB to 259 roosts in AR over two years. Mean number of different roosts used by each bat was 8.6 (range 2-11).	Maternity colonies typically use 10 to 20 trees each year, but only one to three of these are primary roosts used by the majority of bats for some or all of the summer (Callahan 1993, Callahan et al. 1997).
	Social behavior/primary roosts?	Similar fission/fusion behavior as the Indiana bat. NLEB form social groups in networks of roost trees often centered around a central-node roost tree (Johnson et al. 2012). Central-node roost trees were directly linked to 2-6 roost trees in roost	Fission/fusion behavior - where members frequently coalesce to form a group (fusion), but composition of that group is in perpetual flux, with individuals frequently departing to be solitary or to form smaller groups (fission) for a variable time before returning to the main unit (Barclay and Kurta 2007).

	NLEB	Indiana bat
	networks comprised of 3-16 roost trees. Central-node roost trees may be similar to Indiana bat primary roost trees (information exchange, thermal buffering) but they were not identified by number of individuals using the tree and were identified by the degree of connectivity with other roost trees used by the colony. In 2008, Johnson et al. (2012) clustered 32 NLEB into 16 social groups ranging in size from 1-5 individuals and groups roosted in 1-11 roost trees. In 2009, 38 NLEB were clustered into 11 social groups ranging in size from 1-12 individuals and groups roosted in 1-16 roost trees. There was geographic overlap of roosting areas among some groups. In Nova Scotia, 64 NLEB were clustered into 11 groups; at least one group was located in a geographically distinct area (separate colony) but the rest were interconnected (Patriquin et al. 2010). During the summer, females switched roosts almost daily but not all individuals moved together. Both Johnson et al. (2008) and Patriquin et al. (2010) found that some females formed preferred associations.	Indiana bat maternity colonies use 1-3 primary roosts (defined by Callahan et al. [1997] as roosts with >30 Indiana bat on one occasion) and multiple secondary/alternate roosts.

	NLEB	Indiana bat
Roost switching	Similar to Indiana bat Every two days or so (Carter and Feldhamer 2005; Foster and Kurta 1999; Sasse and Pekins 1996; Timpone et al. 2010). In WV, lactating females switched on average every 5 days (Menzel et al. 2002).	On average, Indiana bats switch roosts every two to three days, although reproductive condition of the female, roost type, and time of year affect switching (Kurta et al. 2002, Kurta 2005).
Foraging distances used to estimate FWS buffers for home ranges ("known habitat") See Appendix C	FWS guidance – 1.5 miles from roosts or 3 miles from captures, without additional site-specific data. In Missouri, Timpone et al. (2010) tracked 13 NLEB to 39 roosts and found the mean distance between the location where captured and roost tree was 1.7 km (1.1 mi) (range 0.07–4.8 km (0.04–3.0 mi), and the mean distance traveled between roost trees was 0.67 km (0.42 mi) (range 0.05–3.9 km [0.03–2.4 mi]). In Michigan, the longest distance the same bat moved between roosts was 2 km (1.2 mi) and the shortest was 6 m (20 ft) (Foster and Kurta 1999). In New Hampshire, the mean distance between foraging areas and roost trees was 602 m (1975 ft) (Sasse and Pekins 1996, p. 95).	FWS guidance – 2.5 miles from roosts or 5 miles from captures, without additional site-specific data (FWS 2011; Q.4).

		NLEB	Indiana bat
		Jackson (2004) tracked 30 NLEB to 259 roosts and reported a maximum distance traveled within a summer home range was 1.7 miles.	
	Maternity habitat (i.e., summer range or roosting/foraging area) fidelity	Fidelity to summer range (roosting/foraging area) is similar to Indiana bat. Fidelity to **individual roosts may be less** in NLEB. Female NLEB show some degree of inter-annual fidelity to single roost trees and/or maternity areas. Foster and Kurta (1999) found one banded bat used the same roost tree in two years. Also, Johnson et al. (2009) observed repeated use of four roost trees between two years. In contrast, Jackson (2004) and Sasse and Pekins (1996) found a low degree of fidelity to a single tree but high degree of fidelity to roosting areas. NLEB showed inter-annual site fidelity to a park in Nova Scotia between 2005 and 2007 (Patriquin et al. 2010). Perry (2011) recaptured NLEB (presumably foraging) in central Arkansas with one bat recaptured over a 5-year interval suggesting fidelity to foraging or commuting areas.	Philopatry of Indiana bat maternity colonies to their summer range is well documented. In addition to fidelity to the general summer range (maternity area), roost trees, although ephemeral in nature, may be occupied by a colony for a number of years until they are no longer available or suitable. Maternity colonies of Indiana bats appear to be faithful to their foraging areas within and between years (FWS 2007).

	NLEB	Indiana bat
	Over a consecutive 3 year period, Kniowski (2011) observed similar site fidelity patterns among NLEB and Indiana bats.	
Food sources	Similar to Indiana bat. Beetles, mayflies, moths (Brack and Whitaker 2001, Lee and McCracken 2004, Feldhamer *et al*. 2009) Potential differences Indiana bat, as gleaners, **NLEB eat more arachnids (spiders)** (Feldhamer *et al*. 2009) and **more orthopterans** than Indiana bat (Lee and McCracken 2004).	Flying insects. Consistent use of moths, flies, beetles, and caddisflies throughout the year at various colonies suggests that Indiana bats are selective predators to a certain degree, but incorporation of ants into the diet also indicates that these bats can be opportunistic (Murray and Kurta 2002). Hence, Brack and LaVal (1985) and Murray and Kurta (2002) suggested that the Indiana bat may best be described as a "selective opportunist," as are a number of other *Myotis* species (Fenton and Morris 1976).
Foraging behavior	Nocturnal. Both hawking and **gleaning** (Brack and Whitaker 2001, Feldhammer et al. 2009, Fenton and Bogdanowicz 2002; Ratcliffe and Dawson 2003). **Within canopy** more than Indiana bat (Nagorsen and Brigham 1993).	Nocturnal. Generally hawking. Indiana bats hunt primarily around, not within, the canopy of trees, but they occasionally descend to subcanopy and shrub layers. While Indiana bats appear to forage in a wide variety of habitats, they seem to tend to stay fairly close to tree cover.

		NLEB	Indiana bat
	Foraging height	**Lower** foraging heights expected. NLEB likely spend more time closer to the ground than Indiana bats, gleaning insects from vegetation. Most hunting occurs above the understory, 1 to 3 m (3.3 to 9.8 ft) above the ground, but under or within the canopy (Nagorsen and Brigham 1993).	Indiana bats usually forage and fly within an air space from 2 to 30 m (6 to 100 ft) above ground level (Humphrey et al. 1977).
	Foraging habitat	Upland forest. Although overlap in foraging habitats, niche partitioning appears to be occurring. NLEB seem to be focus in upland, mature forests (Caceres and Pybus 1998) with occasional foraging over forest clearings, water and along roads (Van Zyll de Jong 1985). However, most hunting occurs on forested hillsides and ridges, rather than along riparian areas (Brack and Whitaker 2001; LaVal et al. 1977)	Streams associated with floodplain forests, and impounded water bodies (ponds, wetlands, reservoirs, etc.) where abundant supplies of flying insects are likely found provide preferred foraging habitat for Indiana bats. Indiana bats also forage within the canopy of upland forests, over clearings with early successional vegetation (*e.g.,* old fields), along the borders of croplands, along wooded fencerows, and over farm ponds in pastures (FWS 2007).
Nightly Activity	Temperature	Expect similar responses by NLEB as Indiana bat.	Bat activity is known to decrease below 50°F (10°C), although this is not a hard cut-off (FWS 2011; Q, 24).
	Precipitation	Expect similar responses by NLEB as Indiana bat.	The experts consistently pointed to similar responses among all bat species in that activity declines in heavy rain, high wind, and cold (some specifically mentioned temperatures below 50-55°F) - conditions that impair flight or ability to

		NLEB	Indiana bat
			thermoregulate, or reduce insect activity. Heavy fog was also mentioned as causing reduced bat activity (FWS 2011; Q. 24).
	Wind speed	Expect similar responses by NLEB as Indiana bat.	Most activity is anticipated at wind speeds <6.9 meters/second (FWS in prep.)
	Time of day	Expect similar responses by NLEB as Indiana bat.	Indiana bats begin feeding activity shortly (20-30 minutes) after sunset and forage most of the night, with short bouts of asynchronous resting throughout the night, until shortly (10-40 minutes) before sunrise (Murray and Kurta 2004).
Demographics	Colony size	A bit **smaller than Indiana on average**. Perhaps a function of using smaller trees in some cases. Maternity colonies, consisting of females and young, can range from 7-100 individuals, although 30-60 may be most common. Examples from the literature: • max of 60 adults, mean of 17 ± 2 (Foster and Kurta 1999); • max of 65 (unclear if adults or adults and juveniles), mean of 25.6 ± 10.2 adults early in the season, mean of 13.5 ± 2.98 adults mid-season, and mean of 3.8 ± 1.66 adults late	Average max of 60-100 adults. Although most documented maternity colonies contained 100 or fewer adult females (Harvey 2002), as many as 384 bats have been reported emerging from one maternity roost tree in Indiana (Whitaker and Brack 2002). Whitaker and Brack (2002) indicated that average maternity colony size in Indiana was approximately 80 adult female bats. Kurta (2005) reviewed 12 studies and found mean maximum emergence count after young began to fly was approximately 119 bats, suggesting that 60 to 70 adult females were present (assuming that most adult females successfully raise one pup to

		NLEB	Indiana bat
		season (Lacki and Schwierjohann 2001); • max of 36 total bats (could be adults and young) (Sasse and Pekins 1996); • max of 65 total bats (could be adults and young), mean of 31.3 ± 16.9 (Menzel et al. 2002); and • max of 51 total bats (could be adults and young), mean of 17.8 (Perry and Thill 2007).	volancy).
	Max # Pups/Year	1	1
	Females Gestation Period	Similar to Indiana bat	April 1 to June
	Parturition to volancy	Mid-May to mid-July (Caceres and Barclay 2000, FWS 2013)	June or early July (FWS 2007)
	Volancy (when pups can fly)	Similar to Indiana bat. For example: ~3 weeks after birth (Krochmal and Sparks 2007)	3-5 weeks after birth (FWS 2007)
Fall Migration	Period	Expect similar responses by NLEB as Indiana bat. Mid-August through October	Most fall migration occurs between August 15 and October 15; however, a small number of bats will be migrating outside this window (FWS 2011; Q.19).

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Appendix B: NLEB Interim Presence/Absence Survey Guidance for 2014

The following document provides recommendations for conducting: (1) summer presence/absence; and (2) potential winter hibernaculum presence/absence surveys for the northern long-eared bat (NLEB) in 2014. This survey guidance is only intended to determine presence or probable absence of NLEB within the project area. Supplemental survey efforts may be coordinated with the appropriate U.S. Fish and Wildlife Service (FWS) Field Office(s) in areas of known presence to further evaluate use of the area by NLEB (e.g., determine location of primary maternity roosts, distinguish non-maternity from maternity.) **NOTE:** There are no protocols currently available to survey for NLEB during migration.

I. NLEB 2014 SUMMER PRESENCE/ABSENCE SURVEYS

Summer presence/absence surveys for the NLEB may be conducted from May 15 through August 15 and should follow the Indiana Bat Summer Survey Guidance (with the exceptions noted in **BOLD** below). The FWS is currently evaluating methodologies to determine presence/absence of NLEB and may revise these protocols in the future. The most recent version of the Indiana Bat Summer Survey Guidance document can be found at:
http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html

PHASE 1 – INITIAL PROJECT SCREENING

Step 1. Coordinate with the FWS Field Office(s)[1] regarding existing NLEB summer occurrence information[2].

[*Projects located within known NLEB summer habitat (i.e., maternity and non-maternity) will not proceed to Phase 2 of this process (i.e., presence has been confirmed).*]

a) If there are known **NLEB** documented summer records (e.g., known roost trees, capture locations, foraging locations) within the project action area[3]; **OR**

if there are no known **NLEB** documented summer records within the proposed project area itself, but the project area is located within known summer habitat buffer[4]; **OR**

[1] Coordinate with the appropriate state natural resource agencies and any involved Federal Action agencies whenever "FWS" coordination is listed. FWS FO(s) may direct project sponsors to state agencies for existing occurrence information. Coordinate with your local FWS FO(s) to understand the process for their area of jurisdiction.

[2] A habitat map of known occurrences is being developed by the FWS; however, while the species is proposed, this is likely to be incomplete for most states. In the absence of known occurrence data, FOs should consider suitable habitat within the project area as "potential habitat".

[3] 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. [50 CFR Section 402.02]

[4] For more information, see Appendix B: Guidance on Delineating a NLEB Home Range

if the project is located outside of known summer habitat buffer, but is within the range of the NLEB (can change over time), then proceed to Step 2.

Step 2. Conduct Habitat Assessment (Desktop or Field-based).

a) If suitable summer habitat[5] is present within the action area, then proceed to Step 3.

b) If suitable summer habitat is absent within the action area, then presence/absence summer surveys are not necessary; however, additional coordination with the FWS FO(s) will be necessary if NLEB may be present during any other season and may be affected by the proposed project.

Step 3. Assess potential for adverse effects to NLEB.

Refer to 2014 Indiana Bat Summer Survey Guidance and replace Indiana bat with NLEB throughout.

PHASE 2, 3, 4 – PRESENCE/ABSENCE SURVEYS

Refer to 2014 Indiana Bat Summer Survey Guidance and replace Indiana bat with NLEB throughout these Phases.

II. NLEB 2013-2014 POTENTIAL WINTER HIBERNACULA SURVEYS

Project proponents will develop sufficient information as to whether potentially suitable winter NLEB habitat exists within a proposed project area. This knowledge will be derived from, but not limited to, the following sources: on-site visits, review of aerial photography and other maps, previous mining records (if applicable), forest inventories, previous species survey reports, and the work of consultants or other designees. NLEBs have been documented using caves (and their associated sinkholes, fissures, and other karst features), quarries, railroad tunnels, and abandoned mine portals (and their associated underground workings) as winter hibernation habitat.

PHASE 1 – INITIAL PROJECT SCREENING

Step 1. Coordinate with the FWS Field Office(s)[6] regarding existing NLEB winter hibernacula occurrence information[7].

[5] Please see the Species Overview section of the Conference Guidance for more information on suitable NLEB habitat.

[6] Coordinate with the appropriate state natural resource agencies and any involved Federal Action agencies whenever "FWS" coordination is listed. FWS FO(s) may direct project sponsors to state agencies for existing occurrence information. Coordinate with your local FWS FO(s) to understand the process for their area of jurisdiction.

Prior to initiating fall or spring surveys of potential NLEB hibernacula, the appropriate State Natural Resource Agency(ies) and/or FWS FO must be contacted to determine if any identified cave or abandoned underground mine portal, quarry (and their associated underground workings), or other feature have been previously documented as hibernation habitat for federally listed bat species. Any proposed surveys of previously documented hibernacula must be coordinated directly with these agencies to ensure that adverse effects to listed species do not occur as a result of the survey.

Step 2. Conduct Habitat Assessment to Determine Presence of Suitable Winter Habitat (hibernacula).

A qualified biologist[8] will determine whether potentially suitable winter habitat exists within the project area by conducting a Phase 1 Habitat Assessment on all potential hibernacula that could be affected by the proposed project as described below. These assessments can be completed at any time of year. The results of these assessments should be submitted to the FWS for review and approval. Results will be valid for a minimum of two years.

In general, openings can be dismissed from bat surveys when:

a. There is only one horizontal opening, and it is less than 6 inches (15.2 centimeters) in diameter;
b. Vertical shafts are < 1 foot (0.3 meters [m]) in diameter;
c. Passage continues < 50 feet (15.2 m) and terminates with no fissures that bats can access;
d. Openings are prone to flooding, collapsed shut and completely sealed, or otherwise are inaccessible to bats; and
e. Openings that have occurred recently (i.e., within the past 12 months) due to creation or subsidence. (Include written documentation verifying this determination).

This assessment includes all entrances or openings that will be directly or indirectly impacted by the proposed project. This would include those caves, quarries, or portals that are within the project site or that are connected to any underground mine or quarry workings that will be directly or indirectly impacted by the proposed project.

[7] A habitat map of known occurrences is being developed by the FWS; however, while the species is proposed, this is likely to be incomplete for most states. In the absence of known occurrence data, FOs should consider suitable habitat within the project area as "potential habitat".

[8] A qualified biologist is an individual that holds a FWS Recovery Permit (Federal Fish and Wildlife Permit) for federally listed bats in the state they are conducting the survey and/or has been authorized by the State to survey for bats.

PHASE 2 – PRESENCE/ABSENCE SURVEYS

Surveys to Confirm Use of Suitable Winter Habitat

If suitable winter habitat is discovered as a result of the habitat assessments above, do not alter, modify, or otherwise disturb entrances or internal passages of caves, mines, or other entrances to underground voids (potential hibernacula) within the action area until a "Determination of Suitable Winter Habitat for NLEB" is completed. The survey protocols to make this determination are provided below and should be followed to determine if the suitable habitat is in fact, occupied. Some surveys will require modification (or clarification) of these guidelines; therefore, coordination with the FWS FO(s) responsible for the state(s) in which the site-specific project occurs is necessary prior to initiating suitable winter habitat surveys. Results of completed summer and winter surveys should be submitted to the responsible FWS FO(s) prior to clearing of identified habitat. The FWS will accept the results of these surveys for the purposes of determining whether and to what degree take is anticipated.

FALL AND SPRING SURVEY PROTOCOLS FOR IDENTIFYING POTENTIAL NORTHERN LONG-EARED BAT HIBERNACULA

A temporary, voluntary moratorium has been placed on entering any caves/mines in the majority of states within the northern long-eared bat's (NLEB) range due to WNS. All research conducted in caves/mines should be coordinated with the appropriate State Agency and FWS Field Office prior to initiation.

Entry of abandoned mine portals, quarries, or caves can be extremely dangerous because of the potential for ceiling collapse and presence of toxic gases. Safety or health problems may occur as a result of entering abandoned mines. The FWS does not authorize or require anyone to enter any potential hibernaculum that is or could be unsafe while implementing these survey protocols. These guidelines do not require any applicant or applicant employee, consultant, lessee, or other such designee to enter into any cave, quarry, or mine portal.

NLEBs have been documented using caves, quarries, and abandoned mine portals (and their associated underground workings) as winter hibernation habitat. A fall or spring[9] survey of such potential hibernacula is necessary to determine if such sites are utilized as hibernacula by NLEBs. Caves that have large enough openings to allow the safe entrance of surveyors should be directly surveyed for the presence of federally listed bat species, including the proposed NLEB, during mid-winter. Only properly trained and qualified individuals with the appropriate equipment should attempt these surveys. If the qualified biologist does not have the necessary experience to complete cave survey work, then this portion of the project should be subcontracted to another individual or group that does. If the cave is impossible to enter or it is believed that significant portions of the cave system are inaccessible, it should be treated like an abandoned mine portal or quarry and the following guidance should be used to determine presence or probable absence of federally listed bat species, including the proposed NLEB.

The following protocols shall apply to all such surveys:

1. For linear projects (e.g., transmission lines, natural gas pipelines, highways, haul roads), a field survey, where access can be obtained, of all land within one-half mile of the edge of the project footprint and documentation (i.e., literature search) of all known caves and abandoned mine portals within 3 miles of the outside edge of the project footprint should be conducted.

2. Fall portal/cave surveys must be conducted between September 1 and October 31 and prior to any tree clearing by the project applicant. A minimum of two nights of sampling is required at each suitable entrance as determined by the Phase 1 Habitat Assessment.

[9] Spring portal surveys may not be allowed in some states due to weather variation. Always coordinate with the appropriate FWS FO prior to conducting potential hibernaculum surveys.

Each night of sampling must be separated by at least two weeks of the survey window. This sampling is in addition to any summer habitat survey that is required.

3. Spring portal/cave surveys must be conducted between April 1 and April 21 and prior to any tree clearing by the project applicant. Conducting surveys during the spring emergence is typically more complex than conducting fall surveys due to a greater number of uncontrollable factors (e.g., weather related factors). Thus, a minimum of three nights of sampling per week for three weeks (i.e., 9 nights of sampling) is required at each suitable entrance as determined by the Phase 1 Habitat Assessment. Due to the need to monitor weather conditions closely, each proposed spring portal/cave survey must be coordinated with the appropriate FWS FO prior to sampling to ensure that adequate survey results are achieved. This sampling is in addition to any summer habitat mist survey that is required.

4. The sampling period should begin at sunset and continue for at least 5 hours each night. During this time, harp traps and/ or mist nets should be monitored for captured bats on 10-minute intervals to minimize the number of bats that escape the nets.

5. If bat activity or captures increase during the survey or if 6 or more bats of any species were captured during the last hour of monitoring, the survey effort must continue until activity declines or fewer than 6 bats are captured per hour. If bat activity declines during the first 2.5 hours, the survey must be postponed. The FWS can accept partial night surveys but only if a minimum of 2.5 hours of surveys, beginning at sunset, have been accomplished and all other requirements in this Portal/Cave Survey guidance are met. However, a total of 10 (fall) or 45 (spring) hours of sampling must take place for a portal/cave survey to be approved.

6. Severe weather adversely affects the activity levels of bats. If any of the following weather conditions exist during the fall or spring cave/portal survey, the time and duration of such conditions must be noted on the data sheets and in the survey report, and the survey effort for that night must be repeated: (a) winds sufficiently strong and variable to move equipment more than 50 percent of the time; and (b) precipitation, including rain and/or fog, that does not stop within 30 minutes or continues intermittently during the survey period; and (c) temperatures that are less than 50° F (10° C) for the first 2 hours, and that drop below 35° F (1.6° C) at any point during the survey.

7. Harp traps are the preferred method for sampling entrances as they are less stressful on captured bats. Mist nets can also be deployed along corridors immediately adjacent to the entrance to increase survey effectiveness. Mist nets may also be used at the entrance when the portal or cave configurations are not suitable to harp trapping; however, net set-up should be approved by the appropriate FWS FO and State Natural Resource Agency. Mist nets should be made of the finest, lowest visibility mesh commercially available. Currently, this is 2-ply, 50-denier nylon (denoted 50/2). The

mesh should be approximately 1.5-inch in size. No other specific mist netting hardware is required.

8. When harp trapping, entrances must be entirely enclosed by the survey gear. If mist nets are used, entrances should not be entirely enclosed by the survey gear.

9. All entrances that are potentially inter-connected should be surveyed on the same night. In cases where one team of surveyors cannot feasibly sample all entrances in one night, a modified method could also be used. This method can only be used in situations where the entrances are known to be interconnected. In this modified method, half of the interconnected entrances are surveyed on the first night, and the other half of the entrances are completely blocked using plastic or other impervious material. On the second night, survey efforts are reversed. Plastics or other materials used to block the entrances should be removed each night immediately after conducting the survey. Disconnected entrances do not have to be surveyed simultaneously.

10. If NLEBs (or other federally listed species) are captured during fall or spring portal/cave surveys, notification to the appropriate FWS FO and State Natural Resource Agency(ies) is required within 24 hours. Radio telemetry of captured NLEBs is optional.

11. A bat detector should be on site to monitor bat activity when trapping or netting. Bat passes should be monitored and tallied hourly. Bat tallies should be reported along with the time sampled. Report the beginning time and number of bat passes in hour blocks.

12. Noise, the use of lights, or other potential disturbances should be kept to a minimum within 300 feet (91.4 m) of the sampling site.

13. At least one member of each survey crew must hold, and have in his or her possession, a valid endangered species collection permit issued by FWS and/or the appropriate State Natural Resource Agency that allows the qualified biologist to collect bats, including federally listed species.

14. The capture of an NLEB during a fall or spring portal survey requires that the applicant complete three additional nights of sampling per week for three consecutive weeks in order to determine the significance of the portal(s) and/or cave(s) and their associated underground workings to the NLEB. If the portal/cave survey season (i.e., September 1 to October 31 for fall sampling and April 1 to April 21 for spring sampling) ends prior to the completion of the required sampling, any additional sampling must be completed the following fall or spring.

15. All survey efforts must follow FWS decontamination protocols regarding WNS.

Phase I Habitat Assessment Sample Data Sheet

Location _____

Observers _____

Latitude _____ Longitude _____

Date _____ Time _____ Temp (outside) _____

	Portal #1	Portal #2	Portal #3	Portal #4
Opening (e.g., cave, quarry, shaft)				
Opening Size: Height x Width (or Diameter)				
Internal Dimensions: Height x Width				
Slope (up or down from entrance)				
Entrance Stable?				
Direction of Airflow (In or out?)				
Amount of Airflow (e.g., none, slight, heavy)				
Air warmer or cooler than outside temp.				
Evidence of collapse?				
Ceiling Condition				
Amount of water in opening				
Evidence of past flooding?				
Observed length of portal				
Distance to nearest water source				
% Canopy Cover at portal entrance				
Foraging Signs? (e.g., moth wings)				

Are any portals suspected or known to be connected? Which ones?

Any observable side passages?

Additional comments:

Entry of abandoned mine portals, quarries, or caves can be extremely dangerous because of the potential for ceiling collapse and presence of toxic gases. Safety or health problems may occur as a result of entering abandoned mines. The FWS does not authorize or require anyone to enter any potential hibernaculum that is or could be unsafe while implementing surveys. These guidelines do not require any applicant or applicant employee, consultant, lessee, or other such designee to enter into any cave, quarry, or mine portal.

Sample Data Sheet for Surveys of Potential Hibernacula

DATE:	TEMPERATURE	Start:	End:
PRECIPITATION:		WIND:	
MOONLIGHT:	TIME	Start:	End:
PERSONNEL:		LOCATION (lat/long):	

Time	Species	Age	Sex	Repro Cond.	RFA (mm)	Mass (g)	Guano / Hair	Wing Score	Flight Direction (in or out)	Band # (if applicable)

**Repro. Cond (Reproductive Condition): (P) pregnant; (L) lactating; (PL) post-lactating; (NR) non-reproductive, (TD) testes descended

Appendix C: Guidance on Delineating a NLEB Home Range ("Known Habitat")

The following offers guidance on how to delineate areas that we would consider "known habitat" during project reviews. In many cases, limited information (e.g., a capture point) is available to assist with this delineation and the discussion below will standardize approaches in those cases. For projects with far more detailed information (e.g., multiple roosts, multiple years of colony tracking, foraging data), simple buffers may not be the best solution and site-specific analyses should be conducted to ensure all points (captures, roost trees, acoustic data, and radio telemetry) are included within "known habitat."

Guidance for delineating "known habitat" based on:

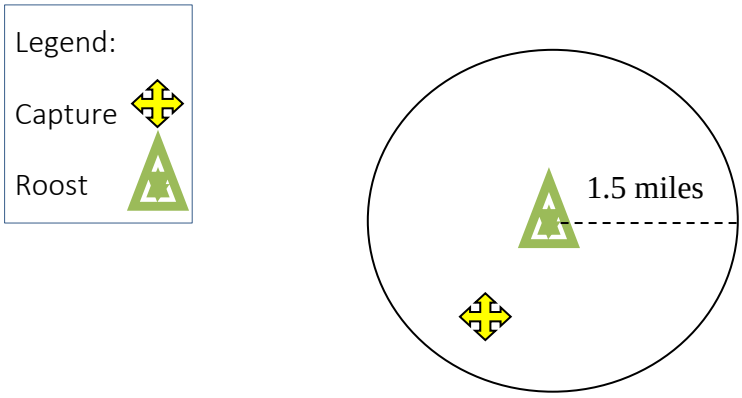
A. Hibernacula - all suitable habitat[1] located within 5 miles of a hibernaculum[2].
B. Mist-net Capture(s) - If a NLEB is captured within the standard summer survey window (May 15 to August 15) but no other information (e.g., radio telemetry) is available for the area, buffer the capture location(s) by 3 miles[3]. Consider all suitable habitat within the polygon(s).
C. Acoustic Detection(s)[4] - If NLEB(s) have been documented (through acoustic detections) but no mist-net capture or roost tree data are available, buffer points by 3 miles. Consider all suitable habitat within the polygon(s).
D. Capture and Roost Trees - If roost tree(s) have been documented (through telemetry) but no foraging data are available:
    1. Single roost – buffer roost by 1.5 miles unless the distance between the capture location and roost tree is larger. In that case, use the longer distance to create the polygon (see Figure 1). Consider all suitable habitat within the polygon.
    2. Two or more roosts – draw lines between roost trees to create a line (2 trees) or polygon (3 or more trees). Buffer the line or polygon by 1.5 miles unless the distance between the capture location(s) and/or roost trees is larger. In that case, use the longer distance to create the polygon (see Figure 2).

[1] During summer NLEBs roost singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically ≥3 inches dbh). See main guidance document for complete definition.
[2] Hibernacula with known NLEB occurrences or is otherwise identified by the FWS as important to future NLEB recovery efforts.
[3] This is calculated by multiplying average foraging distance (1.5 miles) (Sasse and Pekins 1996; Jackson 2004) by 2 - because the capture location could be at the edge of the home range and we do not know which direction(s) the bat may fly. As a comparison, for Indiana bats we use 5 miles from a capture without successful follow-up radio tracking.
[4] Acoustic detections can be thought of as similar to capturing a bat during foraging or traveling between roosting and foraging locations.

Figures 1-2: Capture and Roost Tree Scenarios

Figure 1. Single roost tree- home range may include all suitable habitat within ≥1.5 miles of roost.

i. capture point is within 1.5 miles of roost



ii. capture point is greater than 1.5 miles from roost

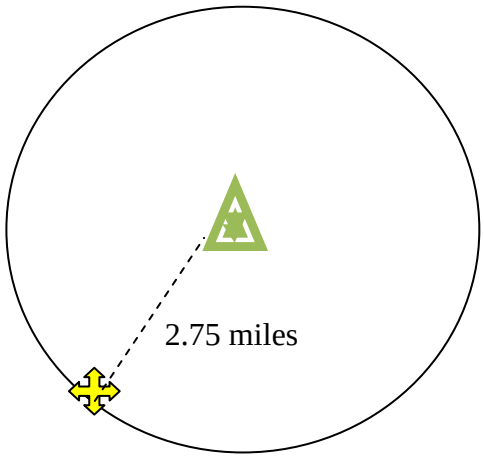
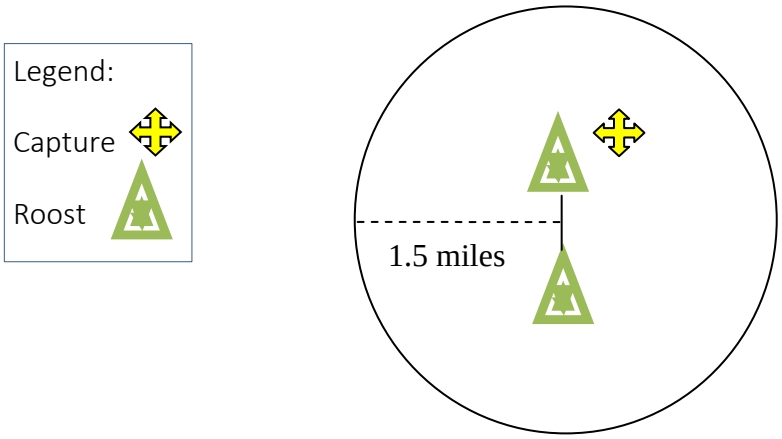
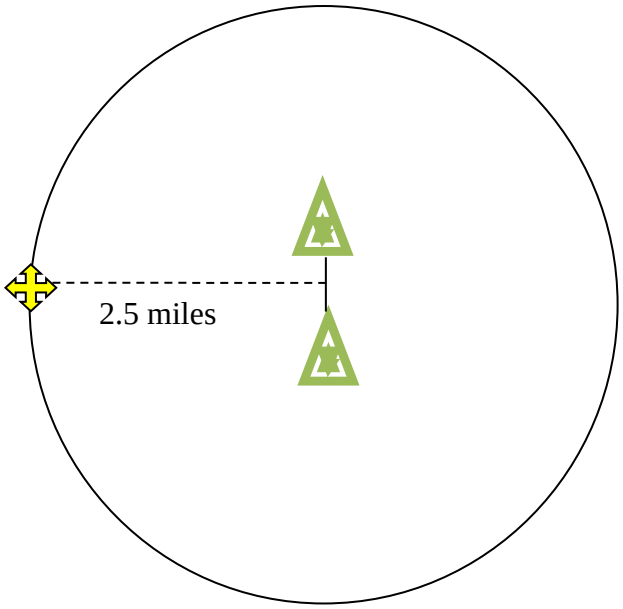


Figure 2. Multiple documented roost trees- home range may include all suitable habitat within ≥1.5 miles of center line between the roosts.

i. capture point is within 1.5 miles of roost



ii. capture point is greater than 1.5 miles from roosts



References

Jackson, J. L. 2004. Effects of Wildlife Stand Improvements and Prescribed Burning on Bat and Insect Communities: Buffalo Ranger District, Ozark-St. Francis National Forest, Arkansas. M.S. Thesis. Arkansas State University. 162 pp.

Sasse, D.B., and P.J. Pekins. 1996. Summer roosting ecology of northern long-eared bats (*Myotis septentrionalis*) in the White Mountain National Forest. Pp. 91-101 in Proceedings of the bats and forests symposium (R.M.R. Barclay and R.M. Brigham, eds.). British Columbia Ministry of Forests, Victoria, British Columbia, Canada.

Appendix D: Conservation Measures for the NLEB

This appendix provides a list of recommended conservation measures for the NLEB. Conservation measures are considered any measures that contribute to the conservation of the NLEB and include, but are not limited to, avoidance measures, minimization measures, mitigation measures, and proactive measures. The basis for these suggestions come from our knowledge and experience with the Indiana bat, and may change in the future as we learn more about the specific needs of the NLEB.

These conservation measures should further be considered as advisory recommendations by the FWS since there are no requirements to avoid or minimize impacts to a proposed species unless it becomes listed. Also, note that application of any of these measures should be based on the anticipated effects of a specific project on the NLEB in a specific area; therefore, not all measures will be appropriate for all projects.

The seasonality of NLEB habitat use varies somewhat throughout its range, and thus the time periods associated with conservation measures varies accordingly. These differences are due to local and regional variability in climate, which are known or anticipated to drive NLEB seasonal habitat use. For example, the summer maternity season may be longer in the southerly portions of the species' range versus the northerly portions. When referenced in a conservation measure, please see the table at the end of this appendix for the appropriate time period based on the project location.

The FWS may adjust the seasonal dates or other aspects of these conservation measures based on site-specific and project-specific information.

Conservation Measures for NLEB Hibernacula and 5-mile Buffer:

NLEB may be present in hibernacula during the regional or local hibernation season (see Table 1). They may also be present in larger numbers within a 5-mile radius of hibernacula during spring staging and fall swarming. However, males and non-reproductive females may be closer to hibernacula year-round.

1. Take actions to protect NLEB hibernacula. Where a known NLEB hibernaculum is experiencing threats, work with the FWS and other partners to provide the necessary protections (e.g. limit human disturbance, install bat-friendly gates, ensure the use of "clean" clothing and gear).

2. Participate in actions to manage and reduce the impacts of WNS on NLEB. A national plan was prepared by the FWS and other state and federal agencies that details actions needed to investigate and manage white-nose syndrome. Many

state and federal agencies, universities and non-governmental organizations are researching this disease in an attempt to control its spread and address its effects.

3. Avoid disturbing/injuring hibernating bats.
    - Avoid entering NLEB hibernacula during the hibernation season, unless authorized for survey, research, or other management purposes.
    - Comply with all cave and mine closures, advisories, and regulations.
    - Avoid burning or other sources of smoke within 0.25 mile of known or assumed NLEB hibernacula during hibernation season, or coordinate with the local FWS office.
    - Activities involving continuing (i.e., longer than 24 hours) noise disturbances greater than 75 decibels measured on the A scale (e.g., loud machinery) should be avoided within a one-mile radius of known or assumed NLEB hibernacula.

4. Avoid destruction/alteration (e.g., fill, cause collapse of) of caves/mines that may support hibernating bats.
    - Avoid woody vegetation or spoil (e.g., soil, rock, etc.) disposal within 100 feet of known or assumed NLEB hibernacula entrances and associated sinkholes, fissures, or other karst features.
    - When blasting within 0.5 miles of a known or presumed occupied hibernacula entrances and passages, coordinate with the local FWS office to ensure that the blasting will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula.
    - When drilling or fracking within 0.5 miles of a known or presumed occupied hibernacula entrances and passages, coordinate with the local FWS office to ensure that the drilling will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the hibernacula Since fracking can affect lateral geology for much greater distances, a wider buffer may be necessary to protect hibernacula from this activity.
    - Avoid modifying cave or mine entrances that may support hibernating bats. If there are safety concerns or concerns about bats (e.g., disturbance, vandalism) at a site, install only “bat friendly” cave/mine gates. Consult the FWS office in your state for more information on “bat friendly” cave/mine gates.

5. Avoid/minimize alterations of clean drinking water and foraging areas.
    - Protect potential recharge areas of cave streams and other karst features that are hydrologically connected to known or assumed hibernacula.

        - Set back equipment servicing and maintenance areas at least 300 feet away from streambeds, sinkholes, fissures, or areas draining into sinkholes, fissures, or other karst or mine features.
        - Follow available standards on spill prevention, containment, and control.
    - Restrict use of herbicides for vegetation management near known or assumed NLEB hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands).
    - Implement strict adherence to sediment and erosion control measures, ensure restoration of pre-existing topographic contours after any ground disturbance, and restore native vegetation (where possible).

6. Avoid disturbing/killing/injuring NLEBs during spring staging/fall swarming.
    - Avoid clearing of suitable spring staging and fall swarming habitat within a 5-mile radius of known or assumed NLEB hibernacula during the staging and swarming seasons.
    - Activities involving continuing (i.e., longer than 24 hours) noise disturbances greater than 75 decibels measured on the A scale (e.g., loud machinery) within a five-mile radius of known or assumed NLEB hibernacula should be avoided during the spring staging and fall swarming seasons.
    - During spring staging and fall swarming, use tanks to store waste fluids to ensure no loss of bats by entrapment in waste pits within 5 miles of known or presumed hibernacula or assumed NLEB hibernacula.
    - Avoid prescribed burning or other sources of smoke in known or assumed NLEB habitat during the swarming/staging or hibernation season, or coordinate with the local FWS office.
    - Operate wind turbines during periods (e.g., months, hours, wind speeds) when NLEB activity is unlikely.

7. Avoid or minimize the spread of White-Nose Syndrome (WNS).
    - If you must enter a cave or mine that could harbor hibernating bats, and it does not have a cave and mine closure policy, follow approved WNS decontamination protocols (see whitenosesyndrome.org/topics/decontamination). Under no circumstances should clothing, footwear, or equipment that was used in a WNS-affected state or region be used in unaffected states or regions.

8. Maintain spring staging/fall swarming forested habitat within a 5-mile radius of known or assumed NLEB hibernacula.
    - Retain snags, dead/dying trees, and trees with exfoliating (loose) bark ≥3-inch diameter at breast height (dbh) in areas ≤ one mile from water.
    - Minimize impacts to all forest patches.

- Maintain forest patches and forested connections (e.g., hedgerows, riparian corridors) between patches.
- Maintain natural vegetation between forest patches/connections and developed areas.

Conservation Measures for NLEB in Known or Potential Summer Habitat

NLEB may be present in suitable summer habitat during the regional or local summer season (see Table 1). See the main guidance document for a description of suitable NLEB summer habitat. See Appendix C for assistance in establishing a NLEB home range based on capture records.

9. Determine where NLEB occur in the summer.
    - Coordinate with partners to gather and evaluate NLEB location information.
        - Review both positive and negative data (e.g., acoustic transect surveys).
        - For wind facilities, review project pre-construction surveys and post-construction fatality reports for detection of NLEB.
    - We recommend that large landholders (e.g., U.S. Forest Service, Department of Defense, National Wildlife Refuges, state natural resource agencies) perform baseline bat surveys.

10. Take actions to protect NLEB and their habitat within known NLEB homeranges.

11. Avoid killing or injuring NLEB during tree clearing activities.
    - Do not clear maternity colony summer habitat during the summer maternity season to avoid direct effects to females (pregnant, lactating, and post-lactating) and juveniles (non-volant and volant).

12. Minimize other direct effects to NLEB.
    - Avoid clearing of summer habitat during the time of year when females are pregnant or the pups are non-volant (consult the FWS office for these times).
    - Minimize use of pesticides (e.g., rodenticides, sticky traps) in and around structures with roosting bats.
    - During prescribed burns, where the proposed perimeter fire line is constructed by hand, construct it at least two tree-lengths away from any known NLEB habitat, or potential roost trees that have been identified. If such trees are adjacent to a fixed part of the fire line such as the road, a trail, or the river, they will have fire line constructed around the bases, so long as their remaining in place does not jeopardize firefighter safety.

- Whenever possible, conduct prescribed burns outside of the summer maternity season. Burns conducted during the summer maternity season should be low/moderate intensity to minimize direct impacts to NLEB.
- Fire-effects monitoring should be used before, during, and after the burns to ensure that burning conditions and effects are within the desired ranges.
- Use tanks to store waste fluids to ensure no loss of bats by entrapment in waste pits.
- Avoid conducting construction activities after sunset in known or suitable summer habitat to avoid harassment of foraging NLEBs.
- Operate wind turbines during periods (e.g., months, hours, wind speeds) when NLEB activity is unlikely.

13. Avoid/minimize altering clean drinking water and foraging areas.
    - Minimize use of herbicides and pesticides. If necessary, spot treatment is preferred over aerial application.
    - Minimize use of chemicals (e.g., colorants) in/around storm water detention basins.
    - Minimize potential lighting impacts (e.g., reduce the number of lights, use motion sensors, use shields/full cut-off lens, angle lights downward and away from forest).
    - Contaminants, including but not limited to oils and solvents, should be strictly controlled so the quality, quantity, and timing of prey resources are not affected.
    - Implement sediment and erosion control measures, ensure restoration of pre-existing topographic contours after any ground disturbance, and restore native vegetation (where possible).
    - Site equipment servicing and maintenance areas at least 300 feet away from waterbodies (e.g., wetlands, streams). Follow available standards on spill prevention, containment, and control.
    - Avoid filling, channelizing, or degrading streams, wetlands, and other watering areas.

14. Maintain summer maternity habitat.
    - Retain and avoid impacting potential roost trees, which includes live or dead trees and snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, or cavities. Do not remove trees surrounding potential roosts to maintain the microclimate.
    - Where possible and not a safety hazard, leave dead or dying trees standing.
    - Avoid reducing the suitability of forest patches with known NLEB use.
    - Maintain or improve forest patches and forested connections (e.g., hedgerows, riparian corridors) between patches.

- Clearly demarcate trees to be protected vs. cut to help ensure that contractors do not accidentally remove more trees than anticipated.
- Avoid/minimize tree clearing that fragments large forested areas or tree lined corridors. For example, route linear features along the edge of a woodlot instead of through the middle of it; use horizontal directional drilling for pipeline crossings of wooded stream corridors and upland tree lines.

15. Conduct humane exclusion of NLEB in structures.
    - Minimize use of pesticides (e.g., rodenticides, sticky traps) in and around structures with roosting bats.
    - If bats (of any species) are using structures (e.g., barns or other out-buildings) as roosts, and these structures are proposed for removal, removal should be performed outside of the summer maternity season, unless there are human health or safety concerns associated with the structure. Consult a nuisance wildlife specialist for humane exclusion techniques[1].
    - Prior to the initiation of any construction activities on bridges, including the removal of any bridge structures, we recommend the underside of each bridge be carefully examined for the presence of bats. If any bats are found roosting in the bridge, contact your state FWS office.

Conservation Measures for NLEB During Migration

16. During spring and fall migration, operate wind turbines during periods (e.g., months, hours, wind speeds) when NLEB activity is unlikely.
17. Use of feathering below a cut-in speed of 6.9 m/s at night during migratory seasons has been used to avoid mortality of the Indiana bat. When NLEB are potentially exposed to wind turbines, we suggest that this cut-in speed be used to avoid mortality of migrating NLEBs.

[1] Ensure that all required state and federal permits are in place.

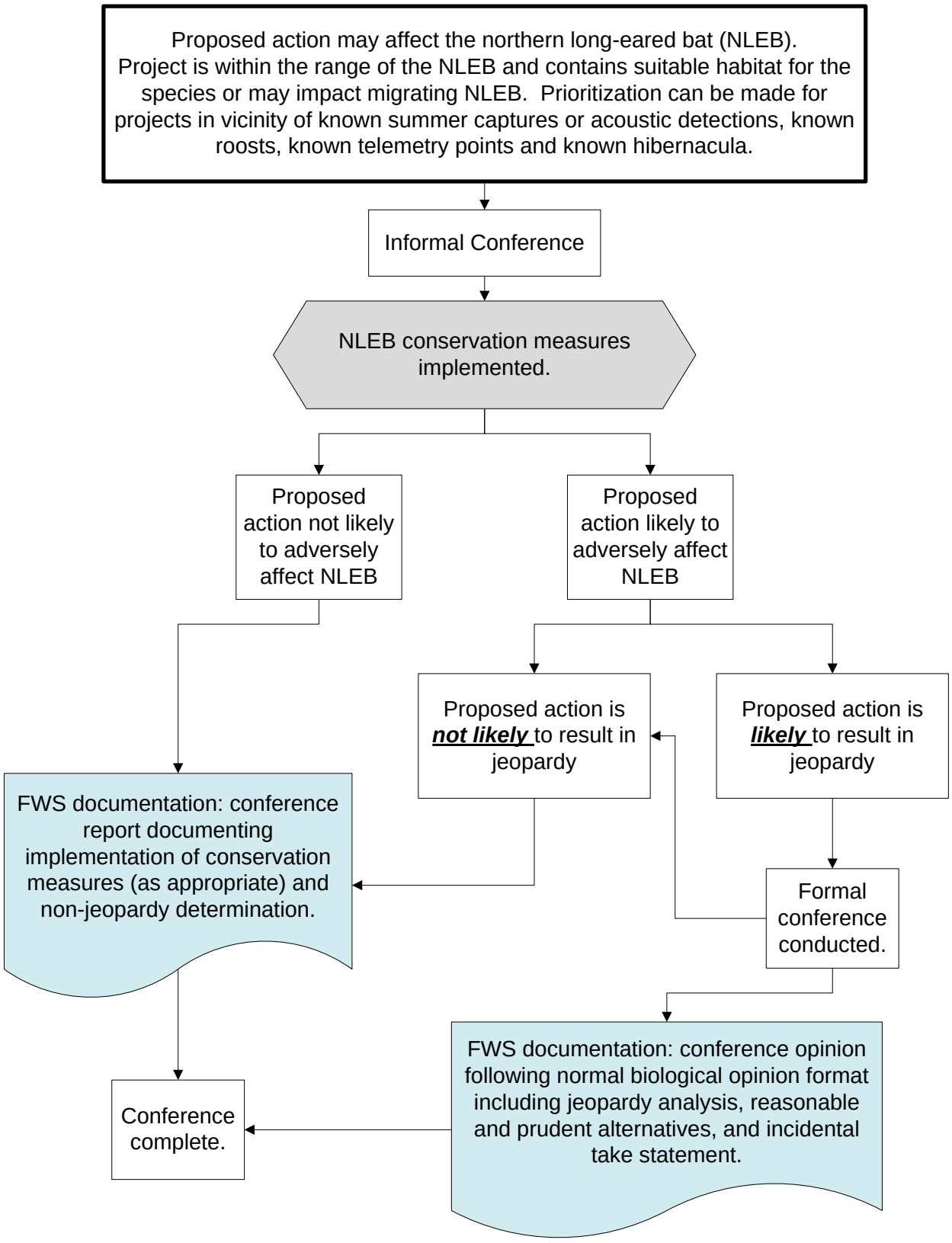
Table 1. Estimated annual NLEB seasonal habitat use time periods by state. Dates currently unavailable for some states (blank cells). Contact those FWS offices for more information.

State/Region	Hibernation Season	Spring Staging Season	Summer Maternity Season	Fall Swarming Season
Maine				
Vermont				
New Hampshire				
Massachusetts				
Connecticut				
New York	Oct 1-May 1		Apr 1-Sep 30	Aug 1-Oct 30
New Jersey (Northern)	Nov 15-Apr 1		Apr 1-Sep 30	Aug 16-Nov 15
Minnesota	Oct 1-May 15		Apr 1-Sep 30	
Wisconsin	Oct 1-May 15	Apr 1-May 15	Apr 1-Sep 30	Aug 15-Oct 15
Michigan			Apr 1-Sep 30	
North Dakota	Oct 1-May 15		Apr 1-Sep 30	
South Dakota	Oct 1-Apr 1		Apr 1-Sep 30	
Montana	Oct 1-May 15		Apr 1-Sep 30	
Wyoming	Oct 1-Apr 1		Apr 1-Sep 30	
Nebraska	Nov 15-Mar 15		Apr 1-Sep 30	
Ohio	Nov 15-Mar 15	Mar 16-May 14	Apr 1-Sep 30	Aug 16-Nov 15
Iowa	Nov 1-Mar 31		Apr 1-Sep 30	
Indiana	Nov 15-Mar 31	Apr 1-May 14	Apr 1-Sep 30	Aug 16-Nov 15
Pennsylvania				
Illinois	Nov 1–Mar 31		Apr 1-Sep 30	Aug 16-Nov 15
Kentucky	Nov 15-Mar 31	Apr 1-May 14	May 15-Aug 15	Aug 16-Nov 15
Missouri	Nov 1-Mar 31	Apr 1-May 14	May 15-Aug 15	Aug 16-Nov 15
North Carolina	Oct 15-Apr 15	Apr 1-May 14	May 15-Aug 15	Aug 16-Nov 15
Virginia	Nov 15-Mar 31	Apr 1-May 14	Apr 15-Sep 15	Aug 16-Nov 15
West Virginia	Nov 15-Mar 31	Apr 1-May 14	Apr 1-Nov 14	Aug 15-Nov 14
Tennessee	Oct 15-Mar 31	Mar 16-May 14	May 15-Aug 15	Aug 16-Nov 15
Kansas	Nov 1-Mar 31		May 15-Aug 15	
Oklahoma	Nov 1-Mar 31	Apr 1-May 14	May 15-Aug 15	Aug 16-Nov 15
Arkansas	Dec 1-Mar 15	Apr 1-May 14	Apr 1-Aug 15	Aug 16-Nov 30
Louisiana	Dec 1-Mar 15	Apr 1-May 14	May 15-Aug 15	Aug 16-Nov 30
Mississippi	Dec 1-Mar 15	Apr 1-May 14	May 15-Aug 15	Aug 16-Nov 30
Alabama	Dec 1-Mar 15	Apr 1-May 14	May 15-Aug 15	Aug 16-Nov 30
Georgia	Dec 1-Mar 15	Apr 1-May 14	May 15-Aug 15	Aug 16-Nov 30

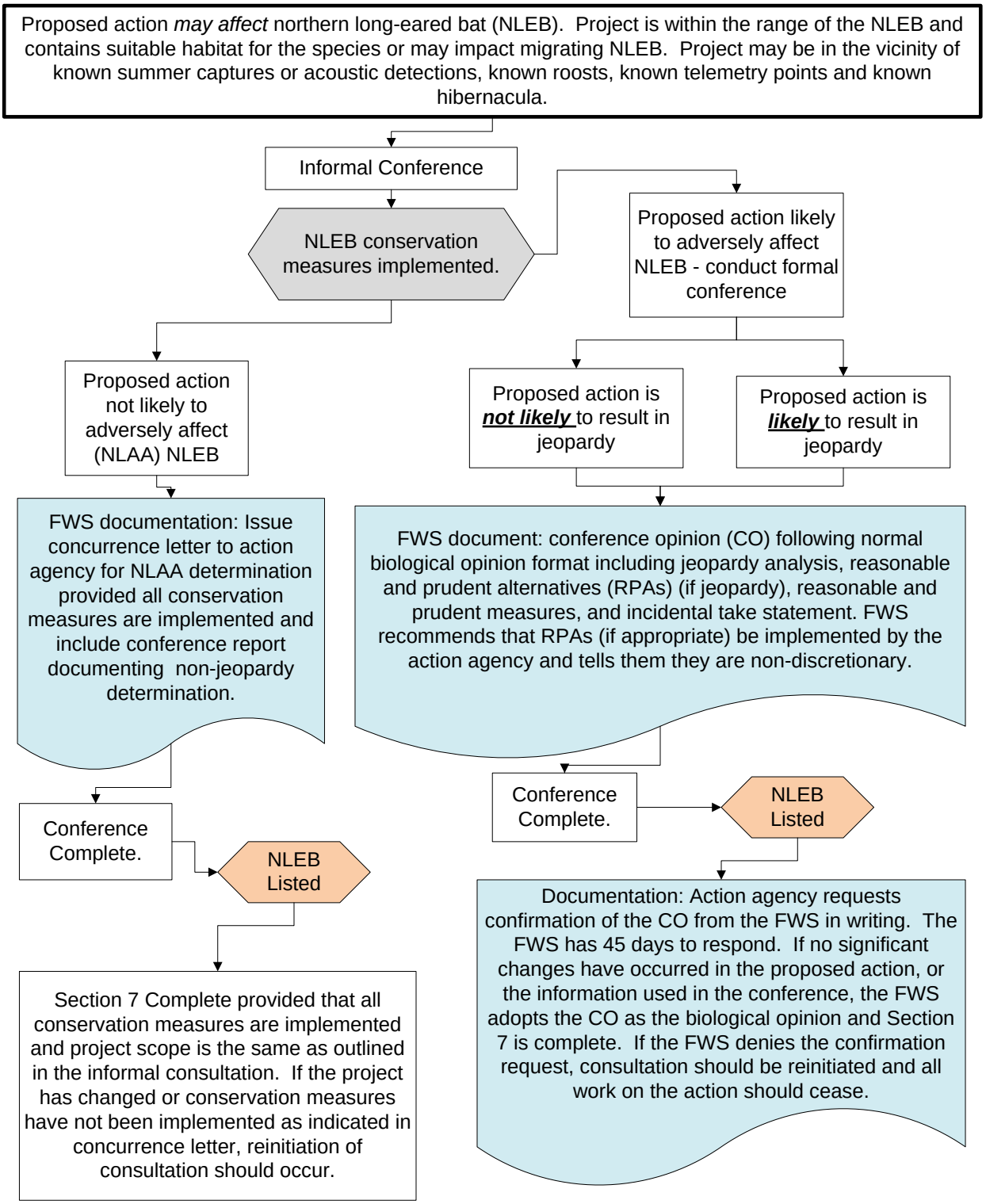
Appendix E: NLEB Conference Procedures Flow Charts

Appendix E *includes flow charts that depict a recommended process for completing conference procedures. The suggested conference processes separate projects that will be completed prior to any final listing action for the NLEB from those that may be completed after a final listing decision is issued.*

Conference for projects that will be completed prior to final listing.



Conference for projects that will be completed after final listing.



Appendix F: Guidance for Non-federal Landowners/Project Proponents During Proposed Listing of Northern Long-eared Bat

Background

The Northern long-eared bat (*Myotis septentrionalis*) (NLEB) was proposed for federal listing under the Endangered Species Act (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) on October 2, 2013, and a final listing decision is expected within one year. For species that have been proposed for listing, the U.S. Fish and Wildlife Service (FWS) has determined that listing as either threatened or endangered is warranted. NLEB populations have declined by as much as 99% in the Northeast U.S., primarily due to the disease white-nose syndrome (WNS). WNS has (and continues to) spread rapidly from the Northeast to the Midwest and the Southeast. The degree of mortality attributed to WNS in the Midwest and Southeast is currently unknown.

The NLEB has been found in the United States from Maine to North Carolina on the Atlantic Coast, extending southward to parts of southern states from Georgia to Louisiana, westward to eastern Oklahoma and north through the Dakotas, even reaching into eastern Montana and Wyoming. In Canada it is found from the Atlantic Coast westward to the southern Yukon Territory and eastern British Columbia.

During the summer, NLEBs roost singly or in colonies in a wide variety of forested habitats, in cavities and crevices or underneath bark of both live and dead trees of all sizes. NLEBs have also been occasionally documented roosting in man-made structures (i.e., buildings, barns, bridges, etc.) during the summer. They forage for insects in upland and lowland woodlots and tree lined corridors. During the winter, NLEBs predominately hibernate in caves and abandoned mines.

Legal Protection

While the ESA prohibits take[1] of fish and wildlife species *listed* as endangered or threatened, *proposed* species are not afforded this protection. However, upon publishing of a final listing rule, the ESA section 9 take prohibition becomes effective 30 days later. The take prohibition for listed species applies to all individuals, companies, and organizations. The FWS anticipates that the final listing rule, if warranted, will be published by early October 2014. The FWS encourages all non-federal landowners and project proponents to implement measures to avoid and minimize impacts to NLEB, whether proposed or listed. For projects that will be ongoing after the final listing decision, and that could cause take of NLEB, we advise coordinating with the FWS promptly. Early coordination will help to ensure that potential delays due to listing are avoided as much as possible.

Coordination with the FWS

The FWS is interested in working with non-federal project proponents and land managers to determine what measures are appropriate to avoid and minimize take of the NLEB both before

[1] Section 3 of the ESA defines "Take" as, "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

and after listing. Please contact the FWS Field Office (FO) in your state with questions. Contact information for each state office is available at: www.fws.gov/offices/index.html.

Over the short-term, we recommend that you review the list of the types of projects that may take NLEB and review the list of conservation measures to determine measures that could be applied to avoid and minimize take. Further, you may coordinate with your local FWS FO regarding the specific project type and location to determine the most appropriate conservation measures for your situation. At this point, we recommend focusing your discussions with the FWS on those actions that will be ongoing after the final listing decision and that may require authorization for take.

Otherwise lawful non-federal activities that are likely to result in take may be permitted under section 10(a)(1)(B) of the ESA. Pursuant to this provision, the project proponent typically develops a Habitat Conservation Plan (HCP) which describes the impact of the taking, the avoidance, minimization, and mitigation measures that will be implemented, and whether the residual impacts will jeopardize the species. Upon receipt of an adequate HCP, the FWS issues an Incidental Take Permit (ITP) authorizing a limited amount of incidental take. Close coordination with the FWS is necessary in developing the HCP and associated documents. In order to maintain compliance with Section 9 of the ESA, no take of listed species may occur until an ITP is issued. If your project will cause take, it will be necessary to implement avoidance measures upon listing and when an ITP is issued. More information about HCPs is available at http://www.fws.gov/endangered/what-we-do/hcp-overview.html.

Types of actions that may take NLEB

The following includes, but is not limited to, the types of projects that *could* cause take of NLEB:

Impacts to NLEB and/or Winter Hibernacula Habitat

- Wearing clothing or footwear or bringing equipment that was used in a WNS-affected state or region into a cave or mine in an unaffected state or region may exacerbate the spread of WNS.
- Impacts to hibernacula openings may restrict bat flight and movement and/or may modify air flow or microclimate, reducing suitability of the hibernaculum for bats or decreasing survivorship. A few degrees change may make a cave unsuitable for some hibernating bats.
- Entering a hibernaculum during the winter. Cave-dwelling bats, such as NLEB, are vulnerable to human disturbance while hibernating. Bats use up their energy stores when aroused and may not survive the winter or may result in termination of pregnancy.
- Blasting or drilling within ½ mile of caves or mines where NLEB hibernate during the winter may disturb hibernating bats.
- Impacting water resources that flow into NLEB hibernacula during the winter, which may affect the cave climate.

- Clearing trees within 5 miles of caves or mines where NLEB hibernate, reducing staging/swarming habitat.
- Human ignited fires (e.g., prescribed burning) near caves or mines where NLEB hibernate and where the smoke may enter the cave, disturbing the bats (during winter).

Impacts to NLEB and/or Summer Habitat

- The permanent or temporary removal of forested habitat from a variety of actions may adversely affect the NLEB by reducing the amount of habitat available for roosting, foraging, or travel. Additionally, bats may also be directly disturbed or killed if such projects are conducted while they are present.
- Burning, although potentially necessary to maintain habitat, could disturb or kill bats by smoke inhalation or scorching.
- Although many types of timber management, when properly designed, will not impact (or may improve) NLEB habitat, some types of timber management (e.g. clear-cutting) can reduce the viability of NLEB populations if key areas of a home range are removed.
- Removal of occupied suitable man-made roosting structures.
- Lethal bat removal from occupied homes/structures.
- Use of pesticides and herbicides in a way that exposes NLEBs (e.g., aerial application at night) or significantly reduces their prey.
- Loss of clean water sources (e.g., fill, degradation of water quality), which could reduce NLEB drinking sources, foraging habitat and/or prey.

Impacts during Migration

- Wind turbine operation has been documented to kill NLEB, particularly during the fall migratory period.

Measures to avoid and minimize taking NLEB

The FWS has developed a detailed list of conservation measures to protect NLEB. Please reference Appendix D to determine measures appropriate for your project.

APPENDIX G: CONFERENCE GUIDANCE FOR NLEB DETERMINATIONS FOR FEDERAL PROJECTS

Step 1. Is the project within the range of NLEB?

Y – Step 2

N – End

Step 2. Is suitable summer or winter habitat present?

Y – Step 4

N – Step 3

Step 3. Is lethal take during migration possible?

Y – Step 6 (no currently available survey options for migration period)

N – End

Step 4. Is there an existing summer or winter occurrence record(s) near the project area (e.g., within 1.5 miles of a known roost tree, 3 miles of a capture location, or 5 miles of a hibernaculum)?

Y – NLEB has been documented previously in the vicinity (summer or winter record) or captured at the project site → Step 6

N – No existing records of summer or winter occurrence near the project area, but no summer and hibernacula surveys have been conducted. Conduct surveys (see Appendix B for survey guidance) → Step 5 **OR** assume NLEB summer presence → Step 6

N – No existing records of summer or winter occurrence near the project area. Summer and/or hibernacula surveys were conducted within the last two[1] survey seasons with negative results (no NLEB documented). Presence is unlikely → End

Step 5. Was the presence of NLEB documented during surveys?

Y – Step 6

N – Presence is unlikely; survey results are valid for two[1] survey seasons → End

Step 6. Is this an existing or on-going project within the range of the Indiana bat with a prior determination for Indiana bat?

Y – *May Affect – NLAA*: Review conservation measures and determine if NLAA is appropriate for NLEB (see potential conservation measures in Appendix D)

Y – *May Affect – LAA*: Biological Opinion in place

[1] The timeframe may be reduced if significant habitat changes have occurred in the area or increased based on local information.

- Review project activities to determine if similar adverse effects are anticipated for NLEB (see conservation measures in Appendix D)
- Review AMMs for Indiana bat and determine if project is likely to jeopardize NLEB

N – This is a new project within the range of the Indiana bat or a project outside of the range of the Indiana bat, therefore no prior determination for Indiana bats has been made → Initiate new conference on NLEB

Appendix H: Surface Coal Mining and the NLEB

The northern long-eared bat (NLEB) was proposed for federal listing under the Endangered Species Act (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) on October 2, 2013. No critical habitat has been proposed at this time. Species proposed for listing are not afforded protection under the ESA; however as soon as a listing becomes effective, the prohibition against jeopardizing its continued existence and "take"[1] applies regardless of an action's stage of completion[2].

The final listing decision for the NLEB is expected in October 2014. Given the nature of surface coal mining projects, many projects are likely to still be in the permitting phase or actively mining at the time of a final listing decision. This could cause project delays, if potential adverse effects to the NLEB have not been previously addressed. Therefore, the U.S. Fish and Wildlife Service (FWS) strongly encourage applicants to address the NLEB while it is proposed for listing.

The 1996 Biological Opinion and Conference Report requires that each State "must implement and require compliance with any species-specific protective measures developed by the FWS field office and the regulatory authority with the involvement, as appropriate, of the permittee and OSM." In order to address this requirement, the FWS, Office of Surface Mining (OSM), and State Regulatory Authorities (RA) must implement species-specific protective measures, as specified in Protection and Enhancement Plans (PEP), to minimize adverse effects to federally listed species and avoid jeopardy.

The FWS, OSM, and State RAs intend to develop range-wide PEP Guidelines for NLEB; however, *in the interim,* it is the FWS's recommendation that applicants choosing to address potential adverse effects to the NLEB during the time the species is proposed, utilize the Rangewide Indiana Bat Protection and Enhancement Plan Guidelines, Revised 2012 (IN Bat PEP Guidelines).

http://www.osmre.gov/lrg/docs/INBatPEPGuidelines.pdf

While the FWS recognizes that the protective measures in the IN Bat PEP will provide a certain level of protection to the NLEB, applicants should use the definitions of suitable NLEB habitat, described below, to evaluate whether or not habitat is present within the project area to minimize the potential for incidental take.

- Suitable forested habitat: Suitable forested habitat is used to describe known or potential summer maternity/non-maternity habitat and known or potential spring staging/fall swarming habitat. Suitable habitat for NLEB consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include

[1] Take is defined in Section 3 of the ESA as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.
[2] Section 7 and the requirements of this part apply to all actions in which there is discretionary Federal involvement or control.

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 (i.e., live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities), 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 1000 feet from the next nearest suitable roost tree, woodlot, or wooded fencerow.

- Suitable winter habitat: Suitable winter habitat is used to describe known or potential hibernacula that include underground caves and cave-like structures (e.g. abandoned mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cooler temperatures (0-9ºC) and with high humidity and minimal air currents.

As with the Indiana bat, the local FWS field office will provide the State RA with the most recent occurrence data for the NLEB, as it becomes available[3].

Potential NLEB habitat includes any suitable forested habitat or winter habitat within the consultation range of the species (see the NLEB Species Range of the main document conference guidance), but for which no survey or other data is available showing that NLEB are present.

Known NLEB habitat includes the following minimum buffers[4] around documented NLEB occurrences (see Appendix C for additional information on delineating known habitat):

1) Known Summer Habitat:
   - Suitable forested habitat within 1.5 miles of a NLEB summer roost tree/trees;
   - Suitable forested habitat within 3.0 miles of a NLEB summer capture or acoustic detection.
2) Known Spring Staging/Fall Swarming:
   - Suitable forested habitat within 5.0 miles of a NLEB hibernaculum.
3) Known Winter Habitat:
   - Underground caves and cave-like structures where NLEBs have been documented.

The FWS recommends that projects within known NLEB habitat (a) submit a PEP for the NLEB or (b) demonstrate a lack of adverse effects to avoid project delays once the species is listed. The FWS also recommends that projects within potential NLEB habitat (a) assume presence and

[3] A map of known occurrences is being developed by the FWS; however, while the species is proposed, this is likely to be incomplete in most states. In the absence of known occurrence data, FOs should consider suitable habitat within the project area as "potential habitat".
[4] Buffer distances may change based on site-specific data.

submit a PEP for the NLEB, (b) conduct the appropriate surveys to determine probable presence/absence, or (c) demonstrate a lack of adverse effects to avoid project delays once the species is listed.

Please note these recommendations are only appropriate while the NLEB is proposed for listing. Species-specific NLEB guidelines are anticipated to be used once the species is listed. Applicants that have fully addressed potential adverse effects to the NLEB by following the IN Bat PEP Guidelines should not be required to implement additional protective measures if the species is listed.

Appendix I: Glossary of Terms

This appendix provides a glossary of some important terms used in this document.

Conference: a process of early interagency cooperation involving informal and/or formal discussions between the action agency and the FWS pursuant to section 7(a)(4) of the ESA regarding the likely impact of an action on proposed species or proposed critical habitat.

Conservation measures: Measures that contribute to the conservation of the NLEB and include, but are not limited to, avoidance measures, minimization measures, mitigation measures, and proactive measures.

Home range: Areas that include maternity, foraging, roosting, and commuting habitat, typically occurring within three miles of a documented capture record or a positive identification of NLEB from properly deployed acoustic devices, or within 1.5 miles of a known suitable roost tree (see Appendix C for more information).

Known habitat: Areas known to be used by NLEBs. (1) All suitable habitat located within 5 miles of a documented hibernaculum; (2) All suitable habitat located within 3 miles of a documented NLEB capture record; (3) All suitable habitat located within 1.5 miles of a documented maternity roost tree; (4) Hibernacula with known NLEB occurrences or is otherwise identified by the FWS as important to future NLEB recovery efforts.

Maternity habitat: Suitable summer habitat used by juveniles and reproductive (pregnant, lactating, or post-lactating) females. Maternity foraging and roosting habitat typically occurs within 3 miles of a documented maternity capture record or a positive identification of NLEB from properly deployed acoustic devices, or 1.5 miles of a suitable roost tree that has been documented as a maternity roost tree.

Occupied habitat: Known and suitable habitat that is expected or presumed to be in use by NLEBs at the time of impact. See Table 1 in Appendix D for estimated occupancy dates.

Suitable habitat: Summer and/or winter habitat that is appropriate for use by NLEB.

a. Suitable winter habitat (hibernacula) is restricted to underground caves and cave-like structures (e.g. abandoned mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cooler temperatures (0-9 degrees C) and with high humidity and minimal air currents.

b. Suitable summer habitat for NLEB consists of the variety of forested/wooded habitats where they roost, forage, and travel. 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 1000 feet from the next nearest suitable roost tree, woodlot, or wooded fencerow.

c. Suitable spring staging/fall swarming habitat for NLEBs consists of the variety of forested/wooded habitats where they roost, forage, and travel 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 1000 feet from the next nearest suitable roost tree, woodlot, or wooded fencerow.

Suitable roost tree: During summer NLEBs roost singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees and snags, typically ≥3 inches dbh.

Unoccupied habitat: refers to suitable habitat not expected to be in use by NLEBs at the time of impact. See Table 1 in Appendix D for estimated occupancy dates.

Take: Take is defined in Section 3 of the ESA as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.