Final Environmental Assessment

Final 4(d) Rule for the Northern Long-eared Bat

U.S. Fish and Wildlife Service
Midwest Regional Office
Division of Ecological Services
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FIGURES

PURPOSE AND NEED FOR ACTION

1.1 Introduction

This Environmental Assessment (EA) prepared by the U.S. Fish and Wildlife Service (Service) evaluates and publically discloses the potential environmental impacts that could result from issuance of a final rule under section 4(d) of the Endangered Species Act (ESA) for the northern long-eared bat (*Myotis septentrionalis*) (NLEB). It was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), NEPA implementing regulations at 40 CFR § 1500-1508, and Service policies and procedures for compliance with those laws and regulations (See Department Manual[1] and DOI regulations at 43 CFR § 46). The Service was the Federal agency responsible for preparation of this EA.

The EA describes and analyzes three alternatives: (1) issue a final 4(d) rule that reflects an affirmation of the Interim 4(d) rule (status quo or no action alternative); (2) withdraw the interim 4(d) rule that was published on April 2, 2015, and apply the general provisions for threatened wildlife provided under 50 CFR §17.31 and 17.32; and (3) issue a final 4(d) rule for the NLEB that better reflects the disproportionate effect that white-nose syndrome (WNS) is having on the species (proposed action).

A discussion of the potentially affected environments provides a context and baseline from which our impact analysis was structured. These include physical environments (e.g., forest resources, groundwater resources), biological environments (e.g., NLEBs, other cave-dwelling species, migratory birds and other wildlife), and socioeconomic environments (e.g., wind energy development, land management and development activities). The scope of our analysis covers impacts that are reasonably foreseeable, potentially significant, and likely to occur as a result of our issuance of a final 4(d) rule.

The EA process will culminate with a decision made by the Service's Midwest Region Regional Director on one of the three alternatives found in Chapter 2 of this EA. Once an alternative is selected, the Regional Director will decide whether the alternative selected will significantly impact the quality of the human environment, as defined by the NEPA and its implementing regulations. If he finds that the alternative selected will not result in significant environmental impacts, he will issue a "Finding No Significant Impact." If he finds that the alternative selected will result in significant environmental impacts, he will issue a Notice of Intent to prepare an Environmental Impact Statement (EIS).

[1] http://elips.doi.gov/ELIPS/DocView.aspx?id=1739

1.2 Background

1.2.1 Listing of the NLEB

On January 21, 2010, the Service received a petition from the Center for Biological Diversity requesting that the NLEB be listed as threatened or endangered and that critical habitat be designated under the ESA. On June 29, 2011, we published a 90-day finding that the petition to list the NLEB presented substantial information indicating that the requested action may be warranted, and we initiated a status review of the species. Following the status review, on October 2, 2013, we determined that listing the NLEB was warranted primarily due to the threat of WNS. On October 2, 2013, we published a proposed rule to list the NLEB as an endangered species under the ESA (78 FR 61046). On April 2, 2015, we published a final rule to list the NLEB as a threatened species under the ESA (80 FR 17974).

1.2.2 Interim 4(d) Rule for the NLEB

On January 16, 2015, we published a proposal to create a special rule under section 4(d) of the ESA that would provide regulations that are necessary and advisable to provide for the conservation of the NLEB, if it were to be listed as a threatened species (80 FR 2371). On April 2, 2015, concurrent with the publication of our final decision to list the NLEB as a threatened species, we published an interim 4(d) rule and opened a 90-day comment period on the interim rule (80 FR 17974). At that time, the Service committed to revisit the interim 4(d) rule over the spring, summer, and fall months of 2015, complete a review pursuant to the NEPA, and issue a final 4(d) rule for the NLEB by the end of the calendar year 2015.

1.3 Purpose and Need for the Proposed Action

At the time we listed the NLEB as a threatened species under the ESA, the Service determined that issuance of a "special rule" under section 4(d) of the ESA was the most appropriate regulatory action the Service could take for the species at that time. That determination was made after a careful review of the current threats, stressors, and conservation needs of the species; input from the public and agency stakeholders; and input from a variety of species experts. We adopted an interim rule under section 4(d) of the ESA to provide exceptions to the take prohibition of 50 CFR § 17.31 for some activities, as we deemed necessary and advisable for the conservation of the species. We determined that it was appropriate to provide some protections for the species during its most sensitive life stages, including prohibitions against most forms of purposeful take.

The purpose of the proposed action is to establish regulations through a final 4(d) rule for the NLEB that are both necessary and advisable, and specifically tailored to the conservation needs of the species. This means ensuring NLEBs are adequately protected when they are most vulnerable (e.g., from birth to flight, when in and around hibernacula), acknowledging WNS as the primary measure to arrest and reverse the decline of the species, while being careful not to establish regulations that lack conservation value, or that could impede activities that are otherwise consistent with the conservation needs of the species.

Unlike other Federally-listed cave-dwelling bats where habitat loss and human disturbance were considered primary causal factors in their declines, NLEB declines are exclusively attributed to WNS. Since it was first documented in the State of New York in 2007, WNS has spread rapidly to 30 States and five Canadian provinces, killing millions of bats in its wake (NLEBs occur in 37 States, the District of Columbia, and 13 Canadian Provinces)(Figure 1). WNS has caused precipitous and dramatic declines in NLEB numbers (in many areas, 90–100 percent declines) where the disease has occurred. As WNS continues to spread across the NLEBs range, NLEB numbers will continue to decline. The Service anticipates that WNS will spread throughout the range of the NLEB by 2023-2028 (80 FR 17974).

In the absence of WNS, NLEBs have demonstrated a great deal of plasticity within their environments (e.g., living in highly fragmented forest habitats to contiguous forest blocks from the southern United States to Canada's Yukon Territory). Land management activities that have been on-going in these areas for centuries (e.g., forest management, forest conversion) have not been shown to have negative population level impacts on the species. The Service believes that but-for the emergence and spread of WNS, NLEB numbers would not have experienced precipitous declines. We also believe that our ability to affect future NLEB declines at meaningful scales is dependent on controlling WNS.

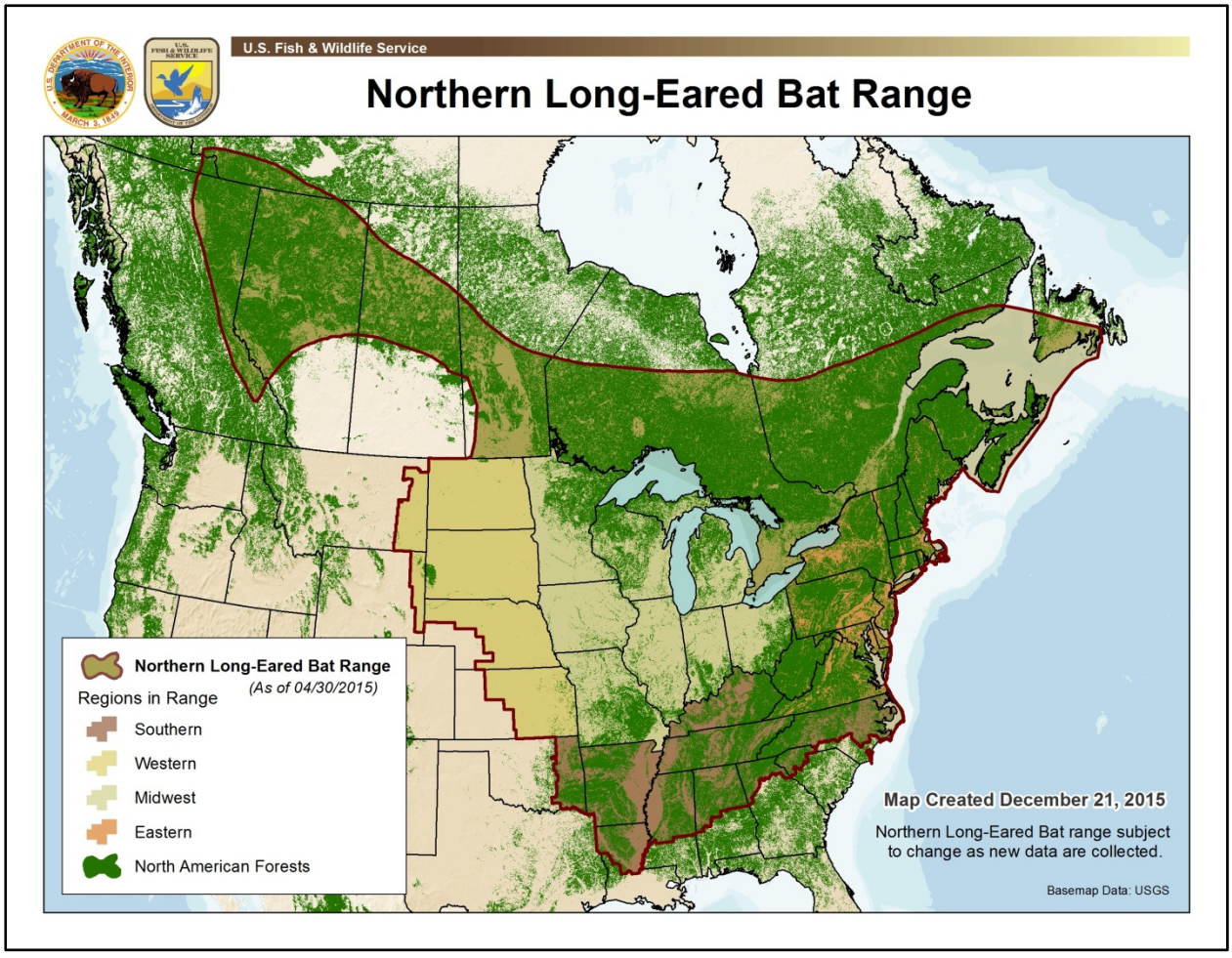

Figure 1 - Geographic Extent of the NLEB Range

Notwithstanding the severity of the impact of WNS to the NLEB, the Service acknowledges that there are other sources of anthropogenic mortality to NLEBs. NLEB hibernacula may be impacted by humans altering or closing hibernacula entrances. Forest conversion and management may result in habitat loss, fragmentation of existing habitats, and direct and indirect injury and mortality of individual bats. Tree removal around maternity roosts and hibernacula may cause injury and death to individual NLEBs. Environmental contaminants, in particular insecticides, pesticides, and inorganic contaminants, such as mercury and lead, may also have detrimental effects on individual NLEBs. NLEBs also collide with wind turbines during their spring and fall migrations.

To address the threat from WNS, the Service is working with a variety of State and Federal agencies, tribes, conservation organizations, institutions and individuals on management strategies to both control the spread of WNS, and to minimize the impact WNS is having on bat species. In 2011, the Service, in partnership with several other State, Federal, and Tribal agencies, finalized a national response plan[2] for WNS to provide a common framework for the investigation and management of WNS. In 2012, a sister plan was finalized for WNS in Canada[3] allowing for a broader, coordinated response to the disease throughout the two countries. In 2012, the Service developed a "National White-Nose Syndrome Decontamination Protocol"[4] which provides decontamination procedures (i.e., cleaning and treatment to disinfect exposed materials) for individuals who come in contact with infected bats and hibernacula. Many State and Federal forests have proactively closed caves to the public to control the spread of WNS. Many private landowners have installed "bat friendly" gates on their caves to control public access and the possible spread of WNS. The Service and our partners are also substantially funding WNS-related research. For example, in 2015, the Service alone provided $1.5 million dollars to investigate issues related directly to the management of WNS. Over $45 million has been spent on WNS in the U.S.

To address other NLEB threats, particularly from land management and development activities and wind energy development, the Service is actively working with Federal, State and local agencies, and private companies on Habitat Conservation Plans (HCP's)(section 10 of the ESA), Biological Opinions (BOs)(section 7 of the ESA), and a variety of non-regulatory "tools" for conserving NLEBs. For example, NiSource Inc. completed a multi-species/multi-state bat HCP that covers land management and development activities on over nine million acres of land and 15,000 miles of ROW across 14 eastern States. The States of Minnesota, Michigan, and Wisconsin are developing a multi-species/multi-state cave-dwelling bat HCP to cover forest management activities on public and private land. The State of Pennsylvania has developed a multi-species bat HCP to cover forest management activities on 3.8 million acres of public land. The State of Indiana is developing a multi-species bat HCP for forest land in Indiana. Within the 21 States that make up the Midwest and Northeast Regions of the Service, there roughly 18 wind energy HCPs either completed in or-the-works, including a multi-species/multi-state bat HCP covering wind energy development across eight Midwestern states. In partnership with others, the Service has completed NLEB BOs[5] and conference opinions[6] that cover a variety of land

[2] https://www.whitenosesyndrome.org/national-plan/white-nose-syndrome-national-plan
[3] http://www2.cwhc-rcsf.ca/publications/Canadian%20WNS%20Management%20Plan.pdf
[4] https://www.whitenosesyndrome.org/sites/default/files/resource/national_wns_revise_final_6.25.12.pdf
[5] https://www.fws.gov/Midwest/endangered/mammals/nleb/nlebBOs.html.

management and development activities Many State and Federal agencies and non-government organizations are directing funding to conserve and restore habitat for bats and other pollinator species (e.g., monarch butterfly), which are critical to many agricultural crops across the range of the NLEB. Many State and Federal agencies are undertaking research and monitoring efforts to gain more information about habitat needs of and use by NLEBs.

1.4 Public Involvement, including Issues and Concerns

On January 16, 2015, the Service published a draft 4(d) rule for the NLEB, initiating a 60-day public review and comment period (80 FR 2371). During that review and comment period, the Service requested comments or information from Federal and State agencies, the scientific community, or any other interested party concerning the proposed 4(d) rule (see 80 FR 2371for the nature of that request). We also sought peer review from knowledgeable individuals with scientific expertise to review our analysis of the best available science and application of that science and to provide any additional scientific information to improve the proposed 4(d) rule. On April 2, 2015, concurrent with the publication of the final listing rule for the NLEB, the Service published an interim 4(d) rule for the NLEB and initiated a 90-day public review and comment period (80 FR 17974). Thus to-date, the Service has had two public review and comment periods totaling 150-days on the proposed and interim 4(d) rules.

In response to the proposed and interim 4(d) rules, the Service received approximately 40,500 comments, reflecting a variety of issues and concerns. A summary of and response to these comments can be found in the **Summary of Comments and Recommendations on the Proposed and Interim 4(d) Rules** section of the final4 (d) rule.

All of the issues and concerns expressed through these processes were acknowledged and addressed in our administrative record. Consistent with the Council on Environmental Quality (CEQ) guidance, the issues and concerns identified for analysis in this EA represent potential unresolved conflicts or issues with potentially significant environmental effects (43 CFR 1500.1(b)). These include:

1.4.1 Conservation and Recovery of the NLEB

Several people commented that the proposed and interim 4(d) rules did not go far enough in protecting the NLEB from threats beyond WNS. Others felt they went too far, arguing that the species is only imperiled because of WNS, and nothing but a cure for WNS will reverse its decline. Some felt the rule did not do anything to address the spread of WNS, suggesting the Service should include decontamination requirements for cavers and cave closures in the rule.

[6] https://www.fws.gov/northeast/virginiafield/pdf/NLEBinterimGuidance6Jan2014.pdf

1.4.2 Protective Buffers around NLEB Hibernacula

Several people commented that the proposed 0.25 mile (radius) protective buffer around NLEB hibernacula was inadequate. Some felt a greater than 0.25-mile buffer was needed to protect NLEBs. Others felt a 0.25-mile protective buffer was too restrictive for landowners, and that certain activities (e.g., selective timber harvest) should not be restricted within the protective buffer. One commenter suggested establishing a 5-mile protective buffer around known hibernacula for operating wind farms.

1.4.3 Protective Buffers around NLEB Maternity Roost Trees

A number of people recommended that we establish year-round protections for maternity roost trees, or conversely, that we remove the protections for maternity roost trees entirely because it is either ineffective, serves as a disincentive for conducting surveys, or may encourage maternity roost tree removal during the non-active season. Others felt that the seasonal nature of the protections should be expanded and tailored to when NLEBs emerge from hibernation to the end of the maternity/pup season (i.e., April 1 through October 1 rather than June 1 through July 31). Several people commented that most NLEB maternity roost tree locations were unknown; therefore, the Service should require landowners who wish to utilize the 4(d) rule to conduct surveys to determine NLEB maternity roost tree presence or absence. Similar to the hibernacula buffer, some felt the 0.25-mile buffer around known maternity roost trees was excessive, while others felt it was too small.

1.4.4 WNS Zone

Several people took issue with the concept of a WNS zone. Some felt there should be no WNS zone at all (i.e., NLEB incidental take prohibitions should apply across the entire species range). Others felt the WNS zone was too big, or that it should be modified to accommodate a more site-specific approach, based on proximity to hibernacula. Some commented that the WNS zone will likely change over time and the Service may not be able to provide landowners with certainty about whether and when regulations apply to them. The WNS zone currently includes all or most of the States within the species' range except North Dakota, Montana, and Wyoming.

1.4.5 Socioeconomics

Several commenters expressed concern that the take prohibitions in the interim 4(d) rule could impact business and industry, particularly those involved with land management and development and wind energy activities.

1.5 Regulatory Framework

1.5.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA) is "our basic national charter for protection of the environment" (40 § CFR 1500.1). According to CEQ regulations, the NEPA process is intended to "help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment" (40 CFR § 1500.1(c)). NEPA's procedural requirements apply to a Federal agency's decisions for actions, including financing, assisting, conducting, or approving projects or programs; agency rules, regulations, plans, policies, or procedures; and legislative proposals (40 CFR § 1508.18), and when the Federal agency has discretion to choose among one or more alternative means of accomplishing a particular goal (40 CFR § 1508.23).

Federal agencies can satisfy their NEPA procedural requirements either by preparing an EA or an EIS, or by showing that the proposed action is categorically excluded from having to prepare an EA. A list of these exclusions for the Service can be found at 43 CFR § 46.210. Service policies, guidance and regulations pertaining to the NEPA, including our preparation of EA's and EIS's, can be found in the Service Administrative Manual at http://www.fws.gov/policy/manuals), CEQ Regulations at 40 CFR § 1500-1508, and Department of Interior (DOI) Regulations at 43 CFR § 46.

The purpose of an EA is to explore reasonable alternatives to a proposed Federal action that may have effects on the quality of the human environment (40 CFR §1508.14), and to determine whether those potential effects are significant or not. The CEQ has defined reasonable alternatives as those that are economically and technically feasible and show evidence of common sense (CEQ 1987), and that substantially meet the agency's purpose and need for action (CEQ 2007). CEQ regulations at 40 CFR § 1508.27 provide that the determination of a significant environmental impact is a function of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole, the affected region, the affected interests, and the locality. Intensity refers to the severity of impacts (see 40 CFR § 1508.27 for a list of possible impact areas). DOI Regulations at 43 CFR § 46.310 discuss the contents of an EA, which must include brief discussions of: 1) the proposal; 2) the need for the proposal; (3) the environmental impacts of the proposed action; 4) the environmental impacts of the alternatives considered; and 5) a list of agencies and persons consulted.

1.5.2 Endangered Species Act

The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the Service and the National Marine Fisheries Service (NMFS). The Service has primary responsibility for terrestrial and freshwater organisms, while the NMFS has primary responsibilities for marine wildlife. Service policies, guidance, and regulations pertaining to the ESA can be found at http://www.fws.gov/endangered/laws-policies/regulations-and-policies.html.

Under section 9 of the ESA it is illegal for any person subject to the jurisdiction of the United States to take (i.e., harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or attempt any of these), import or export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any wildlife species listed as an endangered species, without written authorization. It also is illegal under section 9(a)(1) of the ESA to possess, sell, deliver, carry, transport, or ship any such wildlife that is taken illegally. However, when a species is listed as threatened under the ESA, no prohibitions automatically cover the species. Rather, the establishment of protective regulations for threatened species is at the discretion of the Service, as delegated from the Secretary of the Interior.

Section 4 (d) of the ESA provides that "whenever any species is listed as a threatened species pursuant to subsection (c) of this section, the Secretary shall issue such regulations as (s)he deems necessary and advisable to provide for the conservation of such species". "Necessary" means "essential, required to be done, achieved, or presently needed." "Advisable" means "recommended, sensible, prudent, and/or judicious." "Conservation" means "to use all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided by the ESA are no longer necessary." The Service exercised this discretion in the original set of regulations implementing the ESA by developing prohibitions (50 CFR 17.31) and exceptions to those prohibitions (50 CFR 17.32) that apply to most threatened wildlife species. Through those regulations the Service determined that nearly all of the prohibitions that apply to endangered species would also apply to threatened species, unless otherwise provided for through a "special rule" under section 4(d) of the ESA (42 FR 46561; September 16, 1977).

Section 7 of the ESA requires all Federal agencies, in consultation with the Service, to ensure that any action "authorized, funded, or carried out" by any such agency "is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification" of critical habitat. Before initiating an action, the Federal action agency, or their designated non-Federal representative, must determine whether the proposed project may affect listed or proposed species and/or their critical habitat. If the action agency determines that their proposed project would have no effect on listed or proposed species or their critical habitat, no further consultation is required under the ESA. If the determination is that a project may have an effect, further consultation is required. If the Federal action agency determines (and the Service concurs) that the project is neither likely to adversely affect any listed species or adversely modify designated critical habitat, the consultation (informal to this point) is concluded and the Service's concurrence is provided. If the action agency determines that a project may adversely affect a listed species and/or designated critical habitat, there must be formal consultation for listed species.

During formal consultation, the Service prepares a biological opinion in response to the information provided by the Federal action agency (normally provided as a biological assessment or BA). The biological opinion analyzes the effects on the listed species and determines whether the Proposed Action would be likely to jeopardize the continued existence of the species or destroy or adversely modify designated critical habitat. If the biological opinion reaches a jeopardy or adverse modification conclusion, the Service (in cooperation with the action agency) must develop a "reasonable and prudent alternative(s)" that would avoid that result. If

the biological opinion concludes that the project, as proposed, would involve the take of a listed species, but not to an extent that would jeopardize the species' continued existence, the biological opinion includes an incidental take statement and specifies reasonable and prudent measures to minimize the impact of the take. The incidental take statement specifies an amount of take that the Service believes may occur as a result of the action. The Service may also make conservation recommendations, which are non-binding, such as: identifying additional discretionary conservation measures to reduce adverse effects: identifying additional needed studies, monitoring or research, and recommending how the action agency might assist species conservation in furtherance of ESA Section 7(a)(1). If the action complies with the biological opinion and the incidental take statement, it may be implemented without violation of the ESA, and the take is thereby exempted.

Issuance of this final 4(d) rule for the NLEB is a Federal action that requires formal consultation under section 7 of the ESA. For this 4(d) rule, the Service has completed an intra-Service consultation (biological opinion) on our action of issuing a final 4(d) rule and whether projects and activities implemented that are likely to adversely affect the NLEB, but would not cause take prohibited under the final 4(d) rule, are likely to jeopardize the continued existence of the NLEB. It is the Service's biological opinion that the Action, as proposed, is not likely to jeopardize the continued existence of the NLEB. Federal agencies can rely upon the finding of the BO to fulfill their project-specific section 7(a)(2) responsibilities if they utilize the optional framework provided to streamline consultation. If a Federal agency is unable to follow the criteria in the optional framework, standard section 7 consultation procedures will apply.

Federal agencies can rely upon the finding of this BO to fulfill their project-specific section 7(a)(2) responsibilities if they utilize the optional framework as described. The framework requires prior notification of activities that may affect the NLEB, along with a determination that the action would not cause prohibited incidental take. Service concurrence with the action agency determination is not required, but the Service may advise the action agency whether additional information indicates project-level consultation for the NLEB is required. If the Service does not respond within 30 days, the action agency may consider its project responsibilities under section 7(a)(2) with respect to the NLEB fulfilled through this programmatic BO. Action agencies must also report if actions deviate from the determination, along with the surveys of any surveys.

Section 10 of the ESA establishes a program whereby persons seeking to pursue activities that otherwise could give rise to liability for unlawful "take" of federally-protected species as defined in Section 9, may receive an Incidental Take Permit (ITP), which exempts them from such liability. To obtain an ITP, the applicant must submit an application that includes a conservation plan that meets certain criteria (16 USC § 1539(a)(1)(B) and 1539(a)(2)(A)). To obtain a permit under section 10 of the ESA, an applicant must submit a HCP to the Service that specifies; 1) the impact which will likely result from such taking; 2) what steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps; 3) what alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and 4) such other measures that the Secretary may require as being necessary or appropriate for purposes of the plan. Once an applicant has

satisfied these and other statutory and regulatory criteria, the Service will issue the applicant an incidental take permit.

1.5.3 National Historic Preservation Act

Section 106 of the National Historic Preservation Act, as amended, requires Federal agencies to take into account the effects of their *undertakings* on historic properties, and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by ACHP (36 CFR Part 800). An *undertaking* in 36 CFR § 800.16(y) of the NHPA's implementing regulations is defined as "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval." Under this definition, we have determined that the issuance of special rule under section 4(d) of the ESA for the NLEB does not constitute an undertaking that has potential effects on historic properties. Therefore, the agency has no further Section 106 obligations.

DESCRIPTION OF ALTERNATIVES

2.1. Process used to Develop Alternatives to the Proposed Action

The Service considered a range of options and alternatives during the development of this EA. Alternative development focused primarily on identifying actions that would:

- Achieve the proposed action's purpose and need (section 1.3);
- Address the conservation needs of the species (section 3.2.1);
- Respond to public input on the proposed and interim 4(d) rules (section 1.4); and
- Consider future compliance obligations with the ESA (section 1.5.2).

2.2. Alternatives Considered, but Dismissed from Detailed Analysis

2.2.1 Alternative Conservation Measures

In general, we considered a number of alternative conservation measures for protecting hibernacula and maternity roost trees, including whether protective buffers were needed at all, the optimum size of the protective buffers, when the protective buffers should be in-place, and whether certain activities where incidental take was unlikely, but could otherwise improve the habitat around these areas, should be exempted from incidental take prohibitions (e.g., selective timber harvest when bats are absent).

Our rationale for establishing 0.25 mile (0.4 km) buffer around known NLEB hibernacula includes the following: 1) it will help to protect micro-climate characteristics of the hibernacula; 2) for many known hibernacula, bats use multiple entrances that may not be reflected in the primary location information (e.g., bats may use other smaller entrances that are often spread out from the main entrance accessed for surveys or other purposes) and the hibernacula may have extensive underground features that extend out from known entrances; 3) in the late summer and fall when bat behavior begins to center on hibernacula (swarming), it appears that NLEBs may roost in a widely dispersed area, which may reduce the potential that any activity outside of this buffer would affect the species; 4) outside of the maternity period, NLEBs have demonstrated the ability to adapt to forest-management-related and other types of disturbances; and 5) regardless of the buffer size, bats will remain fully protected from take while in the hibernacula, when they are most vulnerable.

Within hibernacula, microclimates, temperature, humidity, and air and water flow are important variables. Studies that have evaluated the depth of edge influence from forest edge or tree removal on temperature, humidity, wind speed, and light penetration suggest that although highly variable among forest types and other site-specific factors (such as aspect and season), the depth of edge influence can range from 164 feet (50 m)(Matlack 1993) to over 1,312 feet (400 m) (Chen et al. 1995). Further, NLEB hibernacula can be large and complex spatially, and may not be fully represented in locational information contained in species records held by State or Federal agencies or by natural heritage programs. For example, one limestone mine in Ohio used by NLEBs had approximately 44 miles (71 km) of passages and multiple entrances (Brack

2007). We believe a 0.25 mile (0.4 km) buffer is adequate for protecting the spatial extent of most known NLEB hibernacula.

Within the 0.25-mile hibernacula buffer, we have proposed prohibitions for the incidental take of NLEBs from tree-removal activities under specific circumstances. However, that does not mean that all tree-removal activities within the 0.25-mile (0.4 k) buffer will result in incidental take. For example, timber harvest might be conducted within 0.25 miles (0.4 km) of a hibernaculum at a time when bats are unlikely to be roosting in trees within the buffer (e.g., winter), in a manner that fully protects any bats in the hibernaculum, as well as the hibernaculum's suitability for bats (i.e., access, microclimate), and does not significantly change the suitability of the habitat for foraging by NLEBs. In such a case, the timber harvest, although closer than 0.25 miles (0.4 km) to the hibernaculum, is not likely to result in incidental take, so it was unnecessary to provide specific exceptions for these types of activities.

We also considered a number of alternative conservation measures for protecting known, occupied maternity roost trees throughout the year. This ranged from no protections at all, to year-round protection of known roost trees and associated habitat (e.g., foraging areas). We also considered requirements for conducting occupied maternity roost tree presence/absence surveys prior to initiation of certain land management activities. One of the most sensitive life stages of the NLEBs is the "pup season." Adult females give birth to a single pup (Barbour and Davis 1969). Upon birth, the pups are unable to fly and females return to nurse the pups between foraging bouts at night. In other *Myotis* species, mother bats have been documented carrying flightless young to a new roosting location (Humphrey et. al. 1977). The ability of a mother to move young may be limited by the size of the growing pup. Juvenile volancy (flight) often occurs by 21 days after birth (Krochmal and Sparks 2007, Kunz 1971) and has been documented as early as 18 days after birth (Krochmal and Sparks 2007). Prior to gaining the ability to fly, juvenile bats are particularly vulnerable to tree-removal activities. Based on this information, we determined the most sensitive period to protect pups at maternity roost trees is from June 1 through July 31. With regard to requiring presence/absence surveys for occupied maternity roost trees prior to certain land management activities; the Service lacks authority under the ESA to require private landowners to survey for Federally listed species on their land. Many Federal and State agencies already conduct endangered species surveys on their land. However, Federal and State forest land ownership within the States that make up the WNS zone only represents approximately seven percent of the total forest land in the WNS zone (see section 3.1.1), leaving potentially 93 percent in some form of non-public ownership.

With regard to how much protection is needed for known occupied maternity roost trees during the pup season, we considered a number of different "protective buffers" ranging in size from 39-feet to 0.25-miles around known, occupied maternity roost trees. In the interim 4(d) rule we established 0.25-mile buffers around known, occupied maternity roost trees. For the final 4(d) rule, we have established 150-foot (45-meter) protective buffers around known, occupied maternity roost trees. We believe a 150-foot (45-meter) buffer will protect NLEB females and their pups from potential destruction caused by tree removal activities, and from wind throw and micro-climate changes. O'Keefe (2009) documented that a 39-foot (12-meter) buffer around maternity roost trees during a harvest in May allowed the roost to be successfully used through late July, and that one buffered tree was used two years in a row. Our proposed 150-foot buffer is

almost four times the size of the buffer discussed by O'Keefe (2009). At that size, it also accounts for the variation in forest types used by the NLEB, and any slopes that might influence how large a buffer may need to be in order to prove effective. Further, roost trees used by NLEBs are often in fairly close proximity to each other. As Sasse (1995) noted, "some roost sites appeared to be "clustered" together." Badin (2014) observed a distance between roost trees as small as 5 m, while Jackson (2004) observed a distance of 36 m in another study. Therefore, we believe a 150-foot buffer around known occupied roost trees will also provide protections to other "unknown" roost trees used by female NLEBs during the pup season. Given the overall small percentage of the species range potentially affected by forest management activities in any given year (see section 4.2.1), it remains unclear whether larger buffers would meaningfully change the conservation outlook for the species.

Two other alternative that we considered were whether or not to "buffer" the WNS zone and whether or not to incorporate WNS "control measures" into a final 4(d) rule. Over the past five years, an average of 97 percent of the new discoveries of the fungus responsible for WNS *Pseudogymnoascus destructans (Pd)* or WNS counties in any single year were within 150 miles (241 km) of a county that was *Pd*- or WNS-positive in a prior year (Service 2015, unpublished data). The fungus *Pd* is generally present for a year or two before symptoms of WNS appear and mortality of bats begins to occur. Given the relatively short amount of time between detection and population level-impacts, we felt it was important that we protect those buffer areas and the bats within them with the same regulations as those in known WNS positive counties. Therefore, the positive counties, plus an area encompassing 150-miles from known occurrences, is the basis for the WNS zone.

As discussed in section 1.3, the Service is currently working with a variety of Federal and State agencies, Tribal governments, conservation organizations, and numerous institutions and individuals on management strategies to both control the spread of WNS and to minimize the impact WNS is having on bat species. We dismissed including WNS control methods as an alternative because the Service and numerous others are actively engaged in developing and implementing conservation measures to help control the spread of WNS. Regulating measures such as decontamination protocols, cave closures, and cave gating would not likely change the spread of WNS at meaningful scales. Currently, WNS is found in 30 of the 37 State NLEB range.

2.2.2 No Take Prohibition 4(d) Rule

Another alternative we considered, but dismissed from consideration, was the concept of issuing a 4(d) rule that eliminated all of the take prohibitions in the Service's general ESA regulations (50 CFR 17.31) for the NLEB. We dismissed this alternative because many NLEB experts, including the Service, believe that it is appropriate to prohibit most forms of purposeful take and provide protections to the species during its most sensitive life stages (i.e., hibernation and when the pups are unable to fly).

2.3 Definitions Common to all Alternatives

“Active season” for purposes of this EA (alternative 2) is from March 15 - October 15.

“Buffer areas” are the areas around known hibernacula and known occupied maternity roost trees where incidental take of NLEBs due to tree removal activities would be prohibited.

”Human structures” are defined as houses, garages, barns, sheds, and other buildings designed for human entry.

“Harassment” as defined under our ESA regulations refers to “an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering’’ (50 CFR 17.3).

“Harm” is “an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering’’(50 CFR 17.3).

“Incidental take” is defined at 50 CFR 17.3 as “any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, an otherwise lawful activity.” Incidental take within the context of the alternatives is regulated in distinct and separate manners relative to the geographic location of the activity in question.

“Known hibernacula” are defined as locations where northern long-eared bats have been detected during hibernation or at the entrance during fall swarming or spring emergence.

“Known, occupied maternity roost trees” are defined as trees that have had female northern long-eared bats or juvenile bats tracked to them or the presence of females or juveniles is known as a result of other methods.

“Long-term” refers to a time span greater than 25 years.

“Pup Season” for purposes of this EA is June 1 through July 31.

“Scope” refers to the extent of the evaluation. For this EA, it includes impacts that are reasonably foreseeable, potentially significant, and likely to occur as a result of the proposed action.

“Short-term” refers to a time span of up to 7 years.

“Temporary” refers to a time span of roughly 1 - 2 years.

“Tree removal” is defined as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, shrubs, stumps, or any other form of woody vegetation likely to be used by NLEBs.

"WNS Zone[7]" (Figure 2) represents the area impacted by WNS. To estimate the area impacted by WNS, we have used data on the presence of the fungus *Pd,* or evidence of the presence of the disease (WNS) in the bats within a hibernaculum. The WNS zone currently includes all or most of the States within the species' range except North Dakota, South Dakota, Montana, and Wyoming.

2.4 Alternatives

The following alternatives (alt. 2 and alt. 3) are other ways of meeting the purpose and need for action (43 C.F.R. §1502.14). The "no action" alternative (alt. 1) represents no change from current management direction (43 CFR § 46.30). Table 1 (pg. 21) is a summary and comparison of alternatives.

2.4.1 Alternative 1

No Action (Status Quo) - Affirmation of the Interim 4(d) Rule

Under this alternative, the Service would issue a final 4(d) rule for the NLEB that reflects an "affirmation of the interim 4(d) rule." All of the prohibitions and exceptions in the Service's general ESA regulations at 50 CFR 17.31 and 50 CFR 17.32 would apply to the NLEB. A summary of the major provisions of this proposed final 4(d) rule are as follows.

This species-specific 4(d) rule for the NLEB would prohibit purposeful take throughout the species' range, except in instances of removal of NLEBs from human structures, and authorized capture and handling of NLEBs by individuals permitted to conduct these same activities for other bats until May 3, 2016. Take from the removal of hazardous trees for the protection of human life or property is also excepted from the take prohibitions.

Outside the WNS zone (Figure 2), incidental take of NLEBs from otherwise lawful activities is excepted from the take prohibitions.

Inside the WNS zone, incidental take is prohibited, except for incidental take that is attributable to forest management, maintenance and expansion of existing rights of-way (ROW) and transmission corridors, prairie management, and minimal tree removal projects that:

- Occur more than 0.25 mile (0.4 km) from a known occupied hibernacula;
- Avoid cutting or destroying known occupied roost trees during the pup season (June 1 - July 31);

[7] http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSBufferZone.pdf.

- Avoid clear-cuts (and similar harvest methods, e.g., seed tree, shelter-wood, and coppice) within 0.25 mile (0.4 km) of known occupied roost trees during the pup season (June 1–July 31);

- Involve routine maintenance within an existing corridor or ROW, carried out in accordance with the previously described conservation measures;

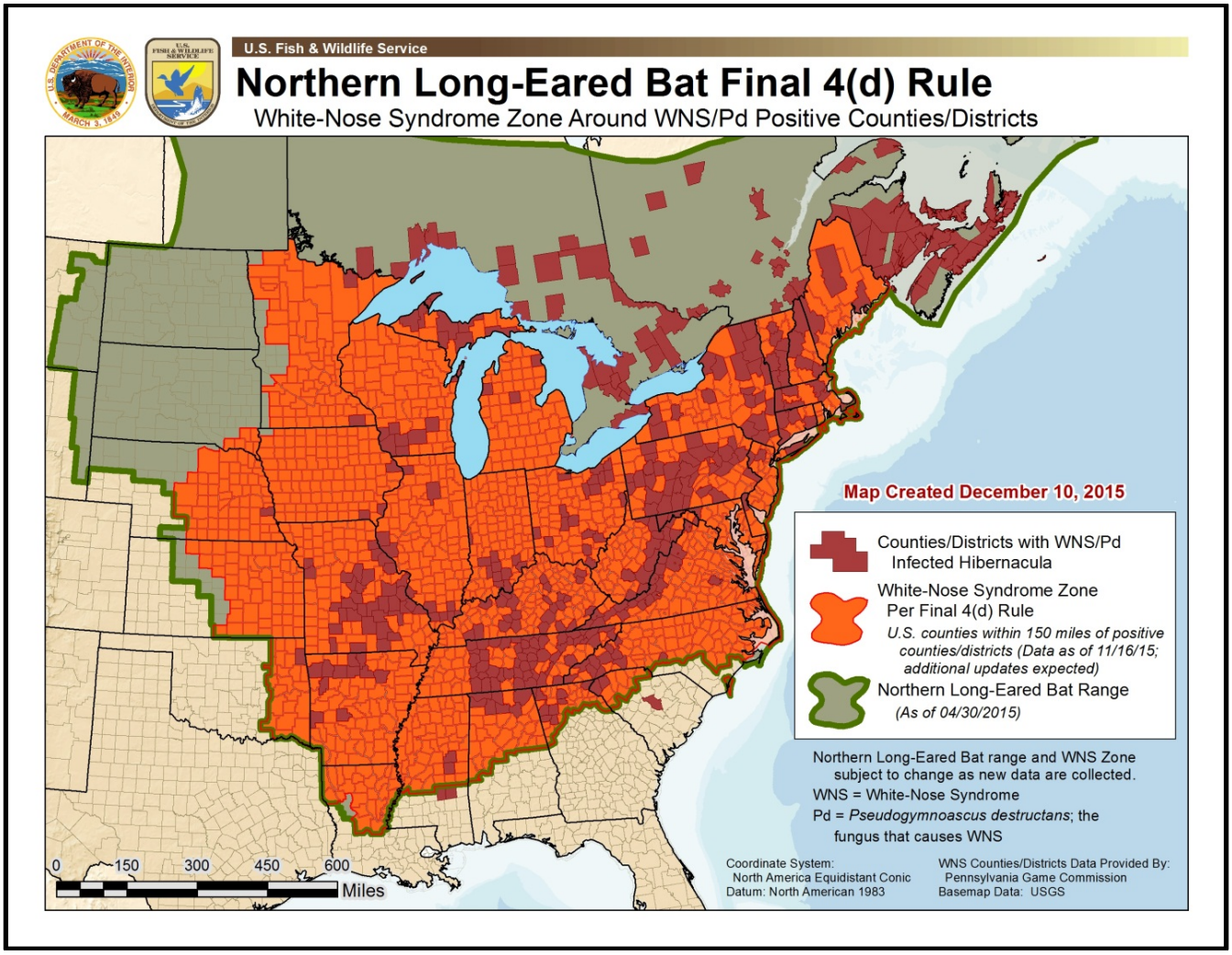

Figure 2. – Geographic Extent of the WNS Zone

- Involve expansion of a corridor or ROW by up to 100 feet (30 m) from the edge of an existing cleared corridor or ROW, carried out in accordance with the previously described conservation measures; and

- Involve an acre or less of contiguous habitat or one acre in total within a larger tract, whether that larger tract is entirely forested or a mixture of forested and non-forested cover types. The conversion of tracts larger than one acre is not excepted from the incidental take prohibitions.

Activities that may cause incidental take of NLEBs may still occur in these areas during these times, but only after consultation with the Service. Incidental take may be authorized through other means provided in the ESA (e.g., section 7 consultation for Federal agencies; or an incidental take permit for non-Federal entities).

2.4.2 Alternative 2

Withdraw the Interim 4(d) Rule and Apply the General Regulatory Provisions for Threatened Species at 50 CFR 17.31 and 17.32

Under this alternative, the Service would withdraw the interim 4(d) rule for the NLEB and apply the general regulatory provisions for threatened wildlife provided under 50 CFR 17.31 and 17.32, which also incorporate most of the provisions of 50 CFR 17.21 and 17.22. The Service would not issue a special rule under section 4(d) of the ESA for the NLEB that provides prohibitions and exceptions tailored to the current conservation needs of the species. All purposeful take and incidental take of NLEBs would be prohibited throughout the NLEBs U.S. range (Figure 2). Activities that cause incidental take of NLEBs could still occur, but only after consultation with the Service under section 7 of the ESA (Federal agencies) or section 10 of the ESA (non-Federal entities)(see section 1.5.2).

To facilitate the analysis and comparison of alternatives in this EA, we have developed an alternative that reflects conservation measures that were previously established under section 7 of the ESA (Federal agencies) and section 10 of the ESA (non-federal entities) for land management, development, and wind energy-related activities. These are only examples of conservation measures that were established for past projects (e.g., see Service, 2015) through these processes. This alternative assumes that future section 7 and section 10 processes would include similar conservation measures, at least over the short-term. Each consultation/HCP process may result in alternative measures that are equally appropriate and effective for that specific situation.

For example, to protect known hibernacula, including spring staging and fall swarming habitat, we might ask project proponents to implement the following conservation measures.

- Avoid disturbing or disrupting hibernating NLEBs when they are in their hibernacula, or altering the hibernaculum's entrance or environment such that it impairs essential behavioral patterns, including sheltering NLEBs.

- Avoid cutting or destroying roost trees within a 0.25-mile area around known hibernacula during the active season (e.g., March 15-October 15).

- Avoid clearing more than 1 acre of contiguous known spring staging and fall swarming habitat within 5-miles of known hibernacula during the active season (e.g., March 15-October 15).

- Avoid tree "side-trimming" along existing ROWs that contain known spring staging and fall swarming habitat within 5 miles of known hibernacula from during the active season (e.g., March 15-October 15).

- Avoid aerial application of herbicides on existing ROWs that contain known spring staging and fall swarming habitat within 5 miles of known hibernacula during the active season (e.g., March 15-October 15).

To protect known maternity habitat, we might ask project proponents to:

- Avoid cutting or destroying roost trees within a 0.25-mile area around known occupied maternity roost trees during the active season (e.g., March 15-October 15).

- Avoid clearing more than 1 acre of contiguous known summer habitat within 1.5 miles of a known occupied maternity roost tree during the active season (e.g., March 15-October 15).

- Avoid tree "side-trimming" along existing ROWs that contain known summer habitat within 1.5 miles of a known occupied maternity roost tree during the active season (e.g., March 15-October 15).

- Avoid aerial application of herbicides on existing ROWs that contain known summer habitat within 1.5 miles of a known occupied maternity roost tree during the active season (e.g., March 15-October 15).

As a way to protect NLEBs during their spring and fall migrations, we have advised wind energy companies that they can avoid and minimize take of NLEBs by:

- Curtailing their turbines to a cut-in wind speed of 6.9 m/s, from 30 minutes before sunset to 30 minutes after sunrise, during spring and fall migrations (avoidance).

- Curtailing their turbines to a cut-in wind speed of 5.0 m/s, from sunset to sunrise, during spring and fall migrations (minimization).

- Siting their turbines away from known roosting and foraging habitat (minimization).

2.4.3 Alternative 3

Establish Regulations for the NLEB under Section 4(d) of the ESA (Preferred Alternative)

Under this alternative, the Service would issue a final rule through section 4(d) of the ESA for the NLEB that contains targeted prohibitions and exceptions tailored to the conservation needs of the species. A summary of the major provisions of this final 4(d) rule are as follows.

Throughout the species range, all purposeful take of NLEBs would be prohibited, except in instances of removal of NLEBs from human structures, defense of human life (including for public health monitoring), and removal of hazardous trees for protections of human life and property. For those situations involving removal from human structures, we provide the following recommendations: 1) minimize use of pesticides (e.g., rodenticides) and avoid use of sticky traps as part of bat evictions/exclusions; 2) conduct exclusions during spring or fall unless there is a perceived public health concern from bats present during summer and/or winter; and 3) contact a nuisance wildlife specialist for humane exclusion techniques.

After May 3, 2016, a permit pursuant to Section 10(a)(1)(A) of the ESA is required for the capture and handling of NLEBs.

Outside the WNS zone (Figure 2), incidental take of NLEBs from otherwise lawful activities is not prohibited.

Inside the WNS zone, incidental take resulting from tree removal is prohibited if it:

- Occurs within 0.25 miles (0.4 km) of a known hibernaculum; or

- Cuts or destroys known, occupied maternity roost trees, or any other tree within a 150-foot (45m) buffer around known occupied maternity trees during the pup season (June 1 through July 31).

Inside known hibernacula, incidental take of NLEBs is prohibited if it results from:

- Disturbing or disrupting hibernating individuals when they are in the hibernacula; or

- Alteration of the hibernaculum's entrance or environment if the result of the activity impairs essential behavioral patterns, including sheltering NLEBs.

Any take resulting from otherwise lawful activities outside known hibernacula, other than tree removal within the established buffer, is not prohibited, as long as it does not change the bat's access to or quality of a known hibernaculum for the species.

In this proposed final 4(d) rule we also carried forward other prohibitions that are typically applied to threatened species and are currently applicable under the interim rule for the NLEB as well (Alternative 1). These prohibitions include the possession of and other acts with unlawfully taken NLEBs, as well as import and export. We have also included standard exemptions, including all the permitting provisions at 50 CFR 17.32, and the exemption for employees or agents of the Service, of the NMFS, or of a State conservation agency when acting in the course of their official duties to take NLEBs covered by an approved cooperative agreement to carry out conservation programs.

Activities that may cause incidental take of NLEBs may still occur in these areas during these times, but only after consultation with the Service. Incidental take may be authorized through other means provided in the ESA (i.e., section 7 consultation for Federal agencies; or an incidental take permit for non-Federal entities).

TABLE 1
SUMMARY AND COMPARISON OF ALTERNATIVES

Alternative 1	Alternative 2	Alternative 3
Under this alternative, the Service would issue a final 4(d) rule for the NLEB that reflects an "affirmation of the interim 4(d) rule." All of the prohibitions and exceptions in the Service's general ESA regulations at 50 CFR 17.31 and 50 CFR 17.32 would apply to the NLEB. All purposeful take of NLEBs is prohibited. Outside the WNS zone (Figure 2), incidental take of NLEBs from otherwise lawful activities would be excepted from the take prohibitions. Inside the WNS zone, incidental take is prohibited, except for incidental take that is attributable to certain land management and development activities that follow conservation measures. Incidental take of NLEBs attributable to wind energy development and other activities not specifically excepted would remain prohibited.	Under this alternative, the Service would withdraw the interim 4(d) rule for the NLEB and apply the general regulatory provisions for threatened wildlife provided under 50 CFR 17.31 and 17.32. The Service would not issue a special rule under section 4(d) of the ESA for the NLEB that provides prohibitions and exceptions tailored to the current conservation needs of the species. All purposeful and incidental take of NLEBs would be prohibited across the NLEB's U.S. range. With regard to land management and development activities and wind energy development, individuals and entities at-risk for unlawful incidental take of NLEBs would need to either avoid take by modifying their activities or seek an incidental take authorization from the Service under section 7 or 10 of the ESA. For this alternative, we assumed that future section 7 and section 10 processes would include conservation measures similar to those previously established under section 7 and section 10.	Under this alternative, the Service would issue a final rule through section 4(d) of the ESA for the NLEB that contains targeted prohibitions and exceptions tailored to the conservation needs of the species. Throughout the species range, all purposeful take of NLEBs would be prohibited, except for specific circumstances related to human structures and human life. Outside the WNS zone (Figure 2), incidental take of NLEBs from otherwise lawful activities is not prohibited. Inside the WNS zone, incidental take resulting from tree removal activities is prohibited under certain circumstances. Incidental take of NLEBs attributable to wind energy development and other activities not involving tree removal would not be prohibited.

TABLE 1
CONTINUED

Major Feature	Alternative 1	Alternative 2	Alternative 3
Removal NLEBs from Human Structures	Not prohibited	Prohibited, unless authorized under section 7 or 10 of the ESA.	Not prohibited
Hazardous Tree Removal	Not prohibited	Prohibited, unless authorized under section 7 or 10 of the ESA.	Not prohibited
Capture/Handling	Capture and handling of NLEBs by individuals permitted to conduct these same activities for other bats until May 3, 2016	Prohibited, unless authorized under section 7 or 10 of the ESA.	Capture and handling of NLEBs by individuals permitted to conduct these same activities for other bats until May 3, 2016.
Outside the WNS Zone	Incidental take outside the WNS zone is not prohibited.	All incidental take is prohibited, unless authorized through section 7 or 10 of the ESA.	Incidental take outside the WNS zone is not prohibited.
Inside the WNS Zone	Incidental take resulting from tree removal is prohibited if it:	All incidental take is prohibited unless authorized under section 7 or 10 of the ESA.	Incidental take resulting from tree removal is prohibited if it:
Protect Hibernacula	Occur within 0.25 mile (0.4 km) from a known occupied hibernacula	Avoid cutting or destroying roost trees within a .25-mile area around known hibernacula during the active season.	Occurs within 0.25 miles (0.4 km) of a known hibernaculum;
Protect Roost Trees	Cuts or destroys known occupied maternity roost trees during the pup season (June 1–July 31) Clear-cuts within 0.25 mile (0.4 km) of known occupied roost trees during the pup season (June 1–July 31)	Avoid cutting or destroying roost trees within a .25-mile area around known occupied maternity roost trees during the active season.	Cuts or destroys known occupied maternity roost trees, or any other tree within a 150 foot (45m) buffer around known occupied maternity roost trees during the pup season (June 1 - July 31).
ROW Management	Incidental take of NLEBs attributable to ROW management is not prohibited if it involves routine maintenance within an existing corridor or ROW, carried out in accordance with the previously described conservation measures.	Avoid aerial application of herbicides on existing ROWs that contain known spring staging and fall swarming habitat within 5 miles of known hibernacula during the active season. Avoid aerial application of herbicides on existing ROWs that contain known summer habitat within 1.5-miles of a known occupied maternity roost tree during the active season.	Incidental take attributable to ROW management is not prohibited if it is carried out in accordance with the previously described conservation measures.

ROW Management Continued	Incidental take of NLEBs attributable ROW management is not prohibited if it involves expansion of a corridor or ROW by up to 100 feet (30 m) from the edge of an existing cleared corridor or ROW, and carried out in accordance with the previously described conservation measures.	Avoid tree "side-trimming" along existing ROWs that contain known spring staging and fall swarming habitat within 5 miles of known hibernacula during the active season. Avoid tree "side-trimming" along existing ROWs that contains known summer habitat within 1.5 miles of a known occupied maternity roost tree during the active season.	
Forest Conversion	Incidental take attributable to forest conversion activities is not prohibited if **it i**nvolves an acre or less of contiguous habitat or one acre in total within a larger tract, whether that larger tract is entirely forested or a mixture of forested and non-forested cover types.	Avoid clearing more than 1 acre of contiguous known spring staging and fall swarming habitat within 5 miles of known hibernacula during the active season. Avoid clearing more than 1 acre of contiguous known summer habitat within 1.5 miles of a known occupied maternity roost tree during the active season.	Incidental take attributable to forest conversion activities is not prohibited if carried out in accordance with the previously described conservation measures.
Protect Hibernating Bats	Inside known hibernacula, incidental take of NLEBs is prohibited if it results from disturbing or disrupting hibernating individuals when they are in the hibernacula; or alteration of the hibernaculum's entrance or environment when bats are both present and not present, if the result of the activity impairs essential behavioral patterns, including sheltering NLEBs.	Avoid disturbing or disrupting hibernating NLEBs when they are in their hibernacula, or altering the hibernaculum's entrance or environment such that it impairs essential behavioral patterns, including sheltering NLEBs.	Inside known hibernacula, incidental take of NLEBs is prohibited if it results from disturbing or disrupting hibernating individuals when they are in the hibernacula; or alteration of the hibernaculum's entrance or environment when bats are both present and not present, if the result of the activity impairs essential behavioral patterns, including sheltering NLEBs.
Wind Energy Development	Incidental take attributable to wind energy development is prohibited.	Incidental take attributable to wind energy development is prohibited.	Incidental take attributable to wind energy development is not prohibited.

THE AFFECTED ENVIRONMENT

This chapter describes the existing resource conditions and trends potentially affected by the proposed action and alternatives. For the purpose of this EA, we considered resource impacts that were reasonably foreseeable and had a close causal relationship with the proposed action and action alternatives. These include impacts associated with:

- Forest resources,
- Water resources,
- NLEBs,
- Other cave-dwelling species associated with known NLEB hibernacula,
- Migratory birds and other wildlife,
- Wind energy development, and
- Land management and development activities.

3.1 The Physical Environment

The geographic range of the NLEB includes much of the eastern, southern, and north central United States and 13 Canadian provinces (Figure 1). The U.S. range of the NLEB which encompasses the physical environment, includes all or portions of the following 37 States and the District of Columbia: Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming. The Service categorizes the U.S. range of the NLEB in four parts, Eastern, Midwestern, Southern, and Western populations (USFWS 2013). These categories were developed solely for purposes of analysis and discussion; there is currently no indication that these are distinct populations.

The geographic range of the WNS zone[8] (Figure 2) currently includes all or most of the States within the species' range except North Dakota, South Dakota, Montana, and Wyoming

3.1.1 Forest Resources

Information on specific types and amounts of forest resources (e.g., forest cover, forest habitat, forest ownership) around known occupied maternity roost trees and known hibernacula was not available for this EA. In general, land cover across the U.S. portion of the NLEBs range varies widely, with forest land covering more than 406,502,260 acres in the States associated with the NLEBs range (Table 2)(web citation: Tuesday December 15th 10:13). More than half of the Southern portion of its range is forested, and nearly two thirds of the Eastern portion of its range is forested. In the Midwest portion of its range, there are several areas with substantial forests in

[8] http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSBufferZone.pdf.

the north and south, and trees cover nearly a third of the landscape overall. But the majority of land in the Midwest portion of its range is agriculture, with fragmented forest patches that support NLEB populations. In the Western portion of its range, there are few broadly forested areas with the main exception being the Black Hills area of South Dakota and Wyoming. Forest cover in the western portion of its range comprises less than 5 percent with over 90 percent of the landscape being herbaceous, cultivated crops, or pastures (Homer et.al. 2015). There are roughly 365,993,411 acres of forest land within the States associated with the WNS zone (web citation: Tuesday December 15th 10:13).

Range	State	Total Acres of Forest Land in State
Midwest	Iowa	3,013,759
Midwest	Illinois	4,847,480
Midwest	Indiana	4,830,395
Midwest	Michigan	20,127,048
Midwest	Minnesota	17,370,394
Midwest	Missouri	15,471,982
Midwest	Ohio	8,088,277
Midwest	Wisconsin	16,980,084
Eastern	Connecticut	1,711,749
Eastern	Delaware	339,520
Eastern	Maine	17,660,246
Eastern	Maryland	2,460,652
Eastern	Massachusetts	3,024,092
Eastern	New Hampshir	4,832,408
Eastern	New Jersey	1,963,561
Eastern	New York	18,966,416
Eastern	Pennsylvania	16,781,960
Eastern	Rhode Island	359,519
Eastern	Vermont	4,591,280
Eastern	Virginia	15,907,041
Eastern	West Virginia	12,154,471
Southern	Alabama	22,876,792
Southern	Arkansas	18,754,916
Southern	Georgia	24,768,236
Southern	Kentucky	12,471,762
Southern	Louisiana	14,540,135
Southern	Mississippi	19,541,284
Southern	North Carolina	18,587,540
Southern	Oklahoma	12,646,138
Southern	South Carolina	13,120,509
Southern	Tennessee	13,941,333
Western	Kansas	2,502,434
Western	Montana	25,573,200
Western	Nebraska	759,998
Western	North Dakota	1,576,174
Western	South Dakota	1,910,934
Western	Wyoming	11,448,541
	Total	406,502,260

Table 2 – Total Acres of Forest Land in States associated with the NLEB Range.

In portions of the northern Midwest and Eastern part of its range, there are white-red-jack pine forests, and maple-beech-birch forests, along with some areas of spruce-fir. The northern Midwest also has substantial aspen-birch forests, as well as some elm-ash-cottonwood areas. The southern Midwest and Eastern parts of the range have more oak-pine and oak-hickory forest. These oak forests also extend into the Southern part of the range, where there is also some oak-gum-cypress forests. The Southern part of the range also supports some loblolly-shortleaf-pine.

Foster and Kurta (1999) tracked radio-tagged NLEB in Eaton County, Michigan, during their mating period and observed that the trees used as roosts by NLEBs were located in wetlands and the base of each trunk was submerged in water at some point during both study years, leading to the death of most trees. The 32 roost trees that NLEBs chose belonged to three species: 56 percent were silver maple, 3 percent were red maple, and 41 percent were green ash. Of the roost trees, 17 were living and 15 were dead. In western Arkansas, Perry and Thill (2007) observed NLEB roosting in shortleaf pine (71 percent of all roosts) and 67 percent of roosts were observed in shortleaf pine snags. Both female and male NLEBs preferred to roost in or in close proximity to thinned mature (>50 years old) stands of mixed pine-hardwood. Menzel et. all. (2002) studied NLEB roosting behaviors in an industrial forest landscape located in the central Appalachians where the forest cover was primarily of an Allegheny hardwood-northern hardwood type (e.g., beech, yellow birch, sugar maple, red maple, black cherry, black locust, Fraser magnolia). The tree species they observed NLEBs using were red maple, northern red oak, sassafras, American basswood, Fraser magnolias, black cherries, and black locusts.

Forest land ownership across the NLEBs range varies widely. Forest land ownership within the States associated with the NLEBs range includes Federal (8 percent), State (3 percent), local government (1 percent), private (33 percent) and unknown (55 percent). Forest land ownership within the States that make up the WNS zone includes Federal (4 percent), State (3 percent), local government (1 percent), private (30 percent) and unknown (62 percent). Forest land ownership within non-WNS zone States includes Federal (28 percent), State (5 percent), local government (0.5 percent), private (44.5 percent) and unknown (22 percent) (web citation: Tuesday December 15th 10:13).

3.1.2 Water Resources

In general, groundwater in karst geology is particularly vulnerable to contamination, due in-part to the ease that water flows across the land surface where natural filtration is nearly non-existent. As water moves across the surface of the land, cracks, crevices, and "sinkholes" provide direct entry into the ground. While the depth of the groundwater is highly variable, underground streams and springs often originate in caves, or pass through them. Groundwater impacts to NLEB hibernacula can result from run-off due to construction and maintenance activities associated with roadways, ROWs, and developed land (e.g., clearing, grading, blasting, and excavation); hydraulic fracturing associated with oil and gas development; surface mining; and commercial timber harvest. Maintaining vegetative cover (including trees) in karst landscapes can reduce erosion and run-off, and protect groundwater quality in NLEB hibernacula. Conservation practices such as nutrient management plans, vegetative buffers, and storm water management practices can help safeguard groundwater quality in karst areas, including water quality in caves used by NLEBs as hibernacula.

Surface water resources (e.g., lakes, rivers, and wetlands) are a critical component of a maternity colony's home range. NLEBs eat terrestrial and aquatic insects while foraging over surface water. NLEBs tend to avoid open spaces, so connectivity among roost sites, foraging areas, and drinking water sources influence the quality of a roost site. Some land management and development activities can adversely affect surface water resources. Examples of such activities include clearing and grading of stream banks, blasting, backfilling, and hydrostatic testing. Impacts from these activities may arise due to reduced shading from tree clearing, which can increase water temperatures; temporary suspension of sediments from grading, trenching, and blasting, which can cause turbidity and affect dissolved oxygen concentrations, and potential release of fluids from operating machinery, which can contaminate receiving waters. Uncontrolled erosion from rights-of-way treated with herbicides, fertilizers or pesticides could introduce these substances into receiving waters. Similarly, leaks or spills of fuels and lubricants during right-of-way construction and maintenance could adversely affect surface water quality.

3.2 The Biological Environment

3.2.1 The Northern Long-eared Bat

The NLEB is a temperate, insectivorous, migratory bat that hibernates in mines and caves in the winter and spends summers in wooded areas. The key stages in its annual cycle are: hibernation, spring staging and migration, pregnancy, lactation, volancy/weaning, fall migration and

swarming. NLEB generally hibernate between mid-fall through mid-spring each year. The spring migration period likely runs from mid-March to mid-May each year, as females depart shortly after emerging from hibernation and are pregnant when they reach their summer area. Young are born between June and early July, with nursing continuing until weaning, which is shortly after young become volant (able to fly) in mid-to late-July. Fall migration likely occurs between mid-August and mid-October.

Status and Trend

The current range and distribution of NLEB must be described and understood within the context of the impacts of WNS. Prior to the onset of WNS, the best available information on NLEB came primarily from surveys (primarily focused on Indiana bat or other bat species) and some targeted research projects. In these efforts, NLEB was very frequently encountered and was considered the most common *Myotid* bat in many areas. Overall, the species was considered to be widespread and abundant throughout its historic range (Caceres and Barclay 2000). NLEBs continue to be distributed across much of the historical range, but there are many gaps within the range where bats are no longer detected or captured, and in other areas, their occurrence is sparse given local declines and extirpations. Historically, NLEBs were found in greater abundance in the Northeast and portions of the Midwest and Southeast, and were more rarely encountered along non forested habitat in the western parts of the range. While the species has been noted in typically small numbers in numerous hibernacula across its range, insufficient data are available at this time to estimate a range-wide population using hibernacula counts.

The Services draft Biological Opinion (BO) estimated NLEB numbers using the total forested acres in each State and a number of assumptions related to 1) State-specific occupancy rates[9]; 2) maternity colony home-range size; 3) number of adult females per colony; 4) overlap between adult male home range and maternity colony home range; 5) overlap between maternity colonies; and 6) landscape-scale adult sex ratio (we assume 1:1). We compiled the total forested acres for each State from the U.S. Forest Service's 2015 State and Private Forestry Fact sheets (available at http://stateforesters.org/regional-state). We assumed that all forested acres within each State are suitable for the NLEB. We recognize that this may be an overestimate; however, we consider this a reasonable assumption given the NLEB's ability to use very small trees (≥ 3 in diameter at breast height (dbh)). Also, not every State is wholly within the range of the NLEB, so we excluded those States with less than 50 percent of their land area within the NLEB range. This

[9] The occupancy data used in this analysis has many limitations and a substantial amount of uncertainty. Occupancy as used here is the proportion of suitable habitat that is likely to have NLEB present. This is sensitive to the accuracy of the suitable habitat data, the accuracy of the survey data used to estimate the occupancy, and biases in the survey data collection methodology. The definition of suitable habitat used for this analysis is necessarily very general (forested areas) to be applicable across the entire species range. The surveys used to generate the occupancy data were often very sparse and not designed for this purpose. Repurposing of the data may increase the effects of bias in distribution of sample points (in relation to both suitable habitat and bat distributions), sampling methodologies, and sampling timing. We believe that because much of the sampling was not targeted specifically at NLEB and often involves surveys for development or construction projects, survey locations are unlikely to be closely correlated to NLEB distributions, which may minimize the influence of some biases. However, the limitations of the available data and its biases are potentially significant to the occupancy estimates, and this creates uncertainty that we acknowledge. Given these factors, our estimates of population are meant as a tool for assessing potential relative impact by providing a scale for comparison, not as a precise estimate of the NLEB population. For more information about how occupancy rates and population estimates were derived, see the Service Biological Opinion.

excluded Montana, Wyoming, Oklahoma, Louisiana, Alabama, Georgia, and South Carolina. The inclusion of the full States of Nebraska, Kansas, Mississippi, and North Carolina should compensate for any individuals not included in the excluded States. The list of States included in this analysis, along with the total forested acres.

From this information we estimated the range-wide population for NLEBs to be approximately 6,546,718 adults. Arkansas supports the largest population 863,850 (13 percent), followed by Minnesota with (829,890 adults; 13 percent). Delaware and Rhode Island support the smallest populations with 640 and 1,240 adults, respectively. Based on these estimates, the Midwest supports 43percent of the total population followed by the Southern range (38 percent), the Eastern range (17 percent), and the Western range (2 percent) (Table 3).

Region	State	Forested Acres	Percent Occupancy	Occupied Acres	Maternity Colonies	Maternity Colony Size	Adult Females	Total Adults	Total Pups
Midwest	Iowa	3,013,759	41.7%	1,256,738	1,137	45	51,165	102,330	51,165
Midwest	Illinois	4,847,480	62.5%	3,029,675	2,740	39	106,860	213,720	106,860
Midwest	Indiana	4,830,395	37.5%	1,811,398	1,639	39	63,921	127,842	63,921
Midwest	Michigan	20,127,048	31.5%	6,340,020	5,734	39	223,626	447,252	223,626
Midwest	Minnesota	17,370,394	58.7%	10,196,421	9,221	45	414,945	829,890	414,945
Midwest	Missouri	15,471,982	26.2%	4,053,659	3,666	39	142,974	285,948	142,974
Midwest	Ohio	8,088,277	42.1%	3,405,165	3,080	39	120,120	240,240	120,120
Midwest	Wisconsin	16,980,084	44.9%	7,624,058	6,895	39	268,905	537,810	268,905
Eastern	Connecticut	1,711,749	9.4%	160,904	146	20	2,920	5,840	2,920
Eastern	Delaware	339,520	5.0%	16,976	16	20	320	640	320
Eastern	Maine	17,660,246	9.4%	1,660,063	1,502	39	58,578	117,156	58,578
Eastern	Maryland	2,460,652	5.0%	123,033	112	20	2,240	4,480	2,240
Eastern	Massachusetts	3,024,092	6.8%	205,638	186	20	3,720	7,440	3,720
Eastern	New Hampshire	4,832,408	9.8%	473,576	429	20	8,580	17,160	8,580
Eastern	New Jersey	1,963,561	32.0%	628,340	569	20	11,380	22,760	11,380
Eastern	New York	18,966,416	33.3%	6,315,817	5,712	20	114,240	228,480	114,240
Eastern	Pennsylvania	16,781,960	33.8%	5,672,302	5,130	20	102,600	205,200	102,600
Eastern	Rhode Island	359,519	9.4%	33,795	31	20	620	1,240	620
Eastern	Vermont	4,591,280	9.8%	449,945	407	20	8,140	16,280	8,140
Eastern	Virginia	15,907,041	48.3%	7,683,101	6,948	20	138,960	277,920	138,960
Eastern	West Virginia	12,154,471	53.6%	6,514,796	5,892	20	117,840	235,680	117,840
Southern	Arkansas	18,754,916	65.3%	12,246,960	11,075	39	431,925	863,850	431,925
Southern	Kentucky	12,471,762	40.7%	5,076,007	4,591	39	179,049	358,098	179,049
Southern	Mississippi	19,541,284	34.2%	6,683,119	6,044	45	271,980	543,960	271,980
Southern	North Carolina	18,587,540	40.0%	7,435,016	6,724	39	262,236	524,472	262,236
Southern	Tennessee	13,941,333	41.1%	5,729,888	5,182	20	103,640	207,280	103,640
Western	Kansas	2,502,434	22.5%	563,048	510	45	22,950	45,900	22,950
Western	Nebraska	1,576,174	22.5%	354,639	321	45	14,445	28,890	14,445
Western	North Dakota	759,998	22.5%	171,000	155	45	6,975	13,950	6,975
Western	South Dakota	1,910,934	22.5%	429,960	389	45	17,505	35,010	17,505
	Total	281,528,709	37.8%	106,345,057	96,183		3,273,359	6,546,718	3,273,359

Table 3 - NLEB Summer Population Estimates for the 30 States included in the Analysis.

Conservation Needs

Hibernacula and surrounding forest habitats play important roles in the life cycle of the NLEB beyond the time when the bats are overwintering. In both the early spring and fall, the hibernacula and surrounding forested habitats are the focus of bat activity in two separate periods referred to as “spring staging” and “fall swarming. ”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 1,000 feet from the next nearest suitable roost tree, woodlot, or wooded fencerow. For additional details about NLEB hibernacula, see the final listing determination (80 FR 17974).

There are approximately 1,508 known hibernacula across 31 States in the NLEB's U.S. range (Table 4). These include underground caves and cave-like structures (e.g. abandoned or active mines and railroad tunnels). There may be other landscape features being used by NLEB during the winter that have yet to be documented. In general, bats select hibernacula because they have characteristics that allow the bats to meet specific life-cycle requirements. Factors influencing a hibernaculum's suitability include its physical structure (e.g., openings, interior space, and depth), air circulation, temperature profile, and location relative to foraging sites (Tuttle and Stevenson 1978). Known hibernacula typically have cracks and crevices for roosting; relatively constant, cool temperatures (0-9 degrees Celsius) with high humidity and minimal air currents. Specific areas where NLEBs 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. Hibernating population sizes range from a few individuals to around 1,000 (USFWS unpublished data). Overwinter survival can be a particularly challenging period in the NLEBs life cycle. Hibernating bats appear to balance their physical condition (e.g., fat reserves upon entering hibernation), hibernacula characteristics (e.g., temperature variation and humidity), social resources (e.g., roosting singly or in groups), and metabolic condition (i.e., degree of torpor, which is the state of mental or physical inactivity) to meet overwinter survival needs. The overwinter physiological needs of the species include maintaining body temperature above freezing, minimizing water loss, meeting energetic needs until prey again become available, and responding to disturbance or disease. Because of this complex interplay of hibernaculum characteristics and bat physiology, changes to hibernacula can significantly impact their suitability as well as the survival of any

Range	State	Known Occupied Maternity Roost Trees	Number of Known Hibernacula
Midwest	Iowa	14	2
Midwest	Illinois	39	44
Midwest	Indiana	193	69
Midwest	Michigan	25	77
Midwest	Minnesota	102	15
Midwest	Missouri	58	269
Midwest	Ohio	4	32
Midwest	Wisconsin	84	67
Eastern	Connecticut	0	8
Eastern	Delaware	0	2
Eastern	Maine	0	3
Eastern	Maryland	0	8
Eastern	Massachusetts	16	7
Eastern	New Hampshir	0	11
Eastern	New Jersey	47	9
Eastern	New York	27	90
Eastern	Pennsylvania	157	322
Eastern	Rhode Island	0	0
Eastern	Vermont	0	16
Eastern	Virginia	12	11
Eastern	West Virginia	231	104
Southern	Alabama	0	11
Southern	Arkansas	310	77
Southern	Georgia	20	6
Southern	Kentucky	254	122
Southern	Louisiana	0	0
Southern	Mississippi	0	0
Southern	North Carolina	101	29
Southern	Oklahoma	0	9
Southern	South Carolina	0	3
Southern	Tennessee	50	61
Western	Kansas	0	1
Western	Montana	0	0
Western	Nebraska	0	2
Western	North Dakota	0	0
Western	South Dakota	0	21
Western	Wyoming	0	0
	Total	1,744	1,508

Table 4 – Known Hibernacula and Known Occupied Maternity Roost Trees in the States within the NLEB Range.

hibernating bats. Suitable hibernacula are so significant to the NLEB that they are considered a primary driver in the species distribution (Kurta 1982).

After hibernation ends in late March or early April (as late as May in some northern areas), most NLEBs migrate to summer roosts. Female NLEBs emerge from hibernation prior to males. Reproductively active females store sperm from autumn copulations through winter. Ovulation takes place after the bats emerge from hibernation in spring. The period after hibernation and just before spring migration is also referred to as "staging," a time when bats forage and a limited amount of mating occurs. This period can be as short as a day for an individual NLEB but not all bats emerge on the same day.

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 in 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 1,000 feet of other forested/wooded habitat. NLEBs have 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. Average foraging distance around summer roosts has been calculated as 1.5 miles (Sasse and Pekins 1996; Jackson 2004).

There are 1,744 known maternity roost trees in 19 of 37 states, with 42 percent occurring in the Southern range, 30 percent in the Midwest, and 28 percent in the Eastern range (Table 4). There are no known maternity roost trees in the Western range. Suitable maternity roost trees are trees (live, dying, dead, or snag) with a 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. Maternity colonies (females and pups) are generally small, numbering from 30 to 60 individuals (Whitaker and Mumford 2009; Caceres and Barclay 2000).Young are born in late-May or early June to July with females giving birth to a single offspring. Young bats start flying by 18 to 21 days after birth. Adult NLEBs can live up to 19 years.

Primary Threats

White-nose Syndrome

WNS is an emerging infectious wildlife disease caused by a fungus of European origin, *Pd*, which poses a considerable threat to hibernating bat species throughout North America, including the NLEB (Service 2011). WNS is responsible for unprecedented mortality of insectivorous bats in eastern North America (Blehert et al. 2009; Turner et al. 2011). No other threat is as severe and immediate for the NLEB as the disease WNS. NLEB populations would not declining so dramatically without the impact of WNS. Since the disease was first observed in

New York in 2007, WNS has spread rapidly in bat populations from the East to the Midwest and the South. As of December 2015, WNS or *Pd* was confirmed in 30 of the 37 States within the species' range. Data support substantial declines in the Eastern range and portions of the Midwest range. In addition, there are apparent population declines at most hibernacula with WNS in the Southern range. We expect further declines as the disease continues to spread across the species' range.

Post-WNS hibernacula counts available from the northeast U.S. show the most substantial population declines for the NLEB. Turner et al. (2011) compared the most recent pre-WNS count to the most recent post-WNS count for six cave bat species and reported a 98 percent total decline in the number of hibernating NLEB at 30 hibernacula in New York, Pennsylvania, Vermont, Virginia, and West Virginia through 2011. For the final listing rule, the Service conducted an analysis of additional survey information at 103 sites across 12 U.S. States and Canadian provinces (New York, Pennsylvania, Vermont, West Virginia, Virginia, New Hampshire, Maryland, Connecticut, Massachusetts, North Carolina, New Jersey, and Quebec) and found comparable declines in winter colony size. At these sites, total NLEB counts declined by an average of 96 percent after the arrival of WNS; 68 percent of the sites declined to zero NLEB, and 92 percent of sites declined by more than 50 percent. Frick et al. (2015) consider the NLEB now extirpated from 69 percent of the hibernacula in Vermont, New York, Pennsylvania, Maryland, Virginia, and West Virginia that had colonies of NLEB prior to WNS. Langwig et al. (2012) reported that 14 populations of NLEB in New York, Vermont, and Connecticut became locally extinct within 2 years due to WNS.

Long-term summer survey data (including pre- and post-WNS) for the NLEB, where available, corroborate the population decline evident in hibernacula survey data. For example, summer surveys from 2005 – 2011 near Surry Mountain Lake in New Hampshire showed a 98 percent decline in capture success of NLEB post-WNS, which is similar to the hibernacula data for the State (a 95 percent decline) (Moosman et al. 2013). Mist-netting data from Pennsylvania indicate that NLEB captures declined by 46 percent in 2011, 63 percent in 2012, 76 percent in 2013, and 94 percent in 2014, compared to the average pre-WNS capture rate between 2001 to 2007 (Butchkoski 2014; Pennsylvania Game Commission, unpublished data). The NLEB is more commonly encountered in summer mist-net surveys in the Midwest; however, similar rates of population decline are already occurring in Ohio and Illinois. Early reports also indicate declines in Missouri and Indiana (final listing rule 80 FR 17979-17980). Other data, much of it received as comments on the proposed listing rule from State wildlife agencies, demonstrate that various measures of summer NLEB abundance and relative abundance (mist net surveys, acoustic surveys) have declined following detection of WNS in the State.

The dispersal rate of *Pd* across the landscape and the onset of WNS after the fungus arrives at a new site are variable, but it appears that any site within the range of the NLEB is susceptible to WNS. Some evidence suggests that certain microclimatic conditions may hinder disease progression at some sites, but given sufficient exposure time, WNS has had similar impacts on NLEB everywhere the disease is documented. Absent direct evidence that some NLEB exposed to the fungus do not contract WNS, available information suggests that the disease will eventually spread throughout the species' range.

Forest Management

Forest management activities can positively and negatively affect NLEBs at multiple spatial scales and during all stages of its life history, from foraging habitat to maternity and day roosts to hibernacula and fall swarming and spring staging habitat. For example, bat activity and foraging may be greatly influenced by forest clutter. Studies suggest that most bats avoid highly cluttered areas and prefer to forage and travel in areas with less clutter (Brigham and et al. 1997a, Erickson and West 2003, Hayes and Loeb 2007, Humes et al.1999). Thinning through selective tree removal can reduce clutter and lead to increased bat activity (Erickson and West 2003, Lacki et al. 2007), although some studies suggest no response by bats to thinning (Tibbels and Kurta 2003). Forest management can also be used to maximize insect availability (prey) for bats during spring emergence; the availability of such food resources in the general vicinity of hibernacula can be critically important to bats affected by WNS as they emerge in spring and attempt to restore body fat and repair tissue damage from WNS infection. In addition, forest management can provide edge habitat that is frequently used by bats for commuting and foraging, and can strongly influence both short- and long-term prey availability in a given area (Hayes and Loeb 2007).

Impacts from timber harvest, which can range from the removal of individual trees to clearcutting broad expanses of forests, can range from positive (e.g., maintaining or increasing suitable roosting and foraging habitat within NLEB home ranges) to neutral (e.g., minor amounts of forest removal, areas outside NLEB summer home ranges, away from hibernacula) to negative (e.g., death of adult females and/or pups resulting from the destruction of maternity roost trees).

To estimate the potential impacts of timber harvest on NLEBs, the Service draft BO calculated the average annual amount of timber harvest in States within the NLEB's range using data available through the USDA Forest Service's Forest Inventory Analysis (available only on internet: http://apps.fs.fed.us/Evalidator/evalidator.jsp; accessed November 2015). This database reports the total harvest (acres) of Federal, State, local, and private entities by State for various combinations of years. We used the most recent combination of years available and calculated the mean annual harvest. We anticipate that 3,669,077 acres will be harvested annually, which is 1.3 percent of the available forested habitat. Timber harvest is expected to occur in similar proportions in the Midwest, Eastern, and Southern ranges (29 percent, 35 percent, and 34 percent, respectively), but only 2 percent of the total harvest will occur in the Western range.

The draft BO further analyzed these data by partitioning the average annual acreage expected during the NLEB active season and the pup season. Lacking a breakdown of the acres harvested during the active and non-volant seasons, we assume that timber harvest will occur with equal frequency throughout the year. The NLEB active season (April 1 – October 31) is 214 days, or 58.6 percent of the year. The NLEB non-volant season (June 1 – July 31) is 61 days, or 16.7 percent of the year. Therefore, the average annual acres of timber harvest during the active season are 58.6 percent of the total average annual acres, and 16.7 percent of the total timber harvest is estimated to occur in the non-volant season.

Prescribed fire is another forest-management tool. However, there are potential negative effects from prescribed burning, including direct mortality to NLEBs. The potential for death or injury resulting from prescribed burning depends largely on site-specific circumstances, e.g., fire intensity near the maternity roost tree and the height above ground of pups in the maternity roost tree. However, the use of prescribed fire in any given year will impact only a small proportion of the NLEBs range during the bats active period. For example, the U.S. Forest Service's Southern Region manages approximately 10.9 million acres of land, and the maximum estimate of acres where prescribed fire is employed annually during the active period of NLEBs (April –October) was 320,577 acres, which is less than 3 percent of the National Forest regional lands. Similarly, the Forest Service's Eastern Region manages 15 Forests in 13 States that include about 12.2 million acres, of which 11.3 million acres are forested habitat. The Forest Service anticipates applying prescribed burning to 107,684 acres annually or about 1 percent of the forested habitat across the eastern region. In addition, only 17,342 acres of prescribed burning annually is anticipated to occur during the non-volant period on the eastern forests (i.e., 0.15 percent of the forested habitat).

There are also substantial benefits of prescribed fire for maintaining forest ecosystems, such as providing the successional and disturbance processes that renew the supply of suitable roost trees (Silvis et. al. 2012), as well as helping to ensure a varied and reliable prey base (Dodd et. al. 2012). Little is known of the effects of fire on adjacent cave and mine habitats used by bats. Fire could alter vegetation surrounding entrances, which could potentially modify airflow (Carter et al. 2002, Richter et al. 1993). Smoke and noxious gases could enter caves, depending on air-flow characteristics of individual caves or mines and weather conditions such as temperature (Carter et al. 2002). Fire may not cause levels of gases high enough to be toxic to bats in caves or mines, but gases could potentially cause arousals during hibernation (Dickinson et al. 2009). Caviness (2003) noted smoke intrusion into hibernacula during winter burning in Missouri, but no arousal of hibernating bats was observed. There is no evidence that prescribed fire has led to population-level declines in this species nor is there evidence that regulating the incidental take that might occur would meaningfully change the conservation status or recovery potential of the species in the face of WNS.

Forest Conversion

Forest conversion is the loss of forest to another land cover type (e.g., grassland, cropland, development) and may result in loss of suitable roosting or foraging habitat; fragmentation of remaining forest patches, leading to longer flights between suitable roosting and foraging habitat; removal of (fragmenting colonies/networks) travel corridors; and direct injury or mortality (during active season clearing). It can occur from a variety of land management and development activities, including surface mining, energy extraction and transmission, and infrastructure development, just to name a few. Within the U.S. range of the NLEB, some of the highest rates of development are occurring (Brown et al. 2005), and contribute to the loss of forest habitat. The 2010 Resources Planning Act (RPA) Assessment (USFS 2012) summarized findings about the status, trends, and projected future of U.S. forests. This assessment was influenced by a set of scenarios with varying assumptions with regard to global and U.S. population, economic growth, climate change, wood energy consumption, and land use change from 2010 to 2060. It projects forest losses of 16–34 million (or 4–8 percent of 2007 forest area) across the conterminous

United States, and forest loss is expected to be concentrated in the southern United States, with losses of 9–21 million acres (USFS 2012). Throughout the range of NLEB, forest conversion is expected to increase due to commercial and urban development, energy production and transmission, and natural changes.

To estimate the potential impacts of forest conversion to NLEBs, The Services draft BO examined the total forested acres in each State from 2001 to 2011 using the National Land Cover Datasets. We calculated the approximate acres of forest lost per State per year by subtracting the acres of total forest in 2011 from the forested acres in 2001, and calculating the annual loss over the 10 year period. From this analysis we anticipate an annual forest conversion rate of 914,237 acres, which is 0.3 percent of the available forested habitat per year. The majority of the expected forest conversion will occur in the Southern range (53 percent), followed by the Eastern range (26 percent), Midwest (19 percent). Only about 2 percent of the total conversion will occur in the Western range. However, similar to timber harvest, we lack a breakdown of forest conversion during the active and non-volant seasons, and we assume that it will occur with equal frequency throughout the year. Therefore, the average annual acres of forest conversion during the active season are 58.6 percent of the total average annual acres, and 16.7 percent of the total is estimated to occur in the non-volant season.

Wind Energy Development

Wind energy development continues to increase throughout the NLEBs range. Iowa, Illinois, Oklahoma, Minnesota, Kansas, and New York are among the top 10 States for wind energy capacity (installed projects) in the U.S. (AWEA 2013). Wind energy facilities are known to cause mortality of NLEB. The Service reviewed post-construction mortality monitoring studies at 62 unique operating wind energy facilities in the range of the NLEB in the United States and Canada. In these studies, 41 NLEB mortalities were documented, comprising less than 1 percent of all bat mortalities. NLEB mortalities were detected throughout the study range at 29 percent of the facilities, including: Illinois, Indiana, Maryland, Michigan, Missouri, New York, Pennsylvania, West Virginia, and Ontario. There is a great deal of uncertainty related to extrapolating these numbers to generate an estimate of total NLEB mortality at wind energy facilities due to variability in post-construction survey effort and methodology (Huso and Dalthorp 2014). Bat mortality can vary between years and between sites, and detected carcasses are only a small percentage of total bat mortalities. Despite these limitations, Arnett and Baerwald (2013) estimated that wind energy facilities in the U.S. and Canada killed between 1,175 and 2,433 NLEBs from 2000 to 2011, or approximately 106-221 per year.

To estimate the potential impact that wind energy development could have on the NLEB, the Service used data from a draft EIS prepared for the Midwest Wind Energy HCP (see draft BO). While the studies used to estimate bat fatality rates for that draft EIS were limited to studies conducted in six Midwestern states, the estimates represent the best available information that we had for this EA. We estimated a mean fatality rate for NLEBs due to wind energy development at approximately 0.0158 bats per megawatt of wind energy capacity per year (ms/yr.). At the current level of wind energy development which is approximately 28,284 megawatts, we estimate wind energy development are incidentally taking roughly 489 NLEBs each year (2014 estimate). This NLEB fatality rate was then applied to the projected build-out for 2020 and 2030

to determine an estimated number of NLEB fatalities that could occur during those years, assuming no avoidance and minimization measures would be in place. Based on these assumptions, we estimated that 697 NLEB fatalities could occur annually by 2020 and 1,566 by 2030. We acknowledge the uncertainty of these estimates for the Eastern, Southern, and Western portions of the species' range, and recognize that these estimates over-estimate fatalities because they do not account for avoidance and minimization measures that are currently applied at many wind facilities across the range of the Indiana bat, nor do they account for recent declines in NLEB numbers due to WNS.

Evironmental Contaminants

Environmental contaminants, in particular insecticides, pesticides, and inorganic contaminants, such as mercury and lead, may also have detrimental effects on individual NLEBs. However, across the wide-range of the species, it is unclear whether environmental contaminants, regardless of the source (e.g., pesticide applications, industrial waste-water), would be expected to cause population-level impacts to the northern long-eared bat either independently or in concert with WNS. Historically, the most intensively-studied contaminants in bats have been the organochlorine insecticides (OCs; O'Shea and Clark 2002). During wide-spread use of OCs in the 1960s and 1970s, lethal pesticide poisoning was demonstrated in gray bats (*Myotis grisescens*), Mexican free-tailed bats (*Tadarida brasiliensis*), and Indiana bats (*Myotis sodalis*) (O'Shea and Clark 2002). Since the phasing out of OCs in the United States, the effects of chemical contaminants on bats have been less well studied (O'Shea and Johnston 2009); however, a few recent studies have demonstrated the accumulation of potentially toxic elements and chemicals in North American bats. For instance, Yates et al. (2014) quantified total mercury (Hg) levels in 1,481 fur samples and 681 blood samples from 10 bat species captured across 8 northeastern U.S. States and detected the highest Hg levels in tri-colored bats (*Perimyotis subflavus*), little brown bats (*Myotis lucifugus*) and northern long-eared bats. More recently, Secord et al. (2015) analyzed tissue samples from 48 northeastern bat carcasses of four species, including northern long-eared bats, and detected accumulations of several contaminants of emerging concern (CECs), including most commonly polybrominated diphenyl ethers (PDBEs; 100 percent of samples), salicylic acid (81 percent), thiabendazole (50 percent), and caffeine (23 percent). Digoxigenin, ibuprofen, warfarin, penicillin V, testosterone, and N,N-diethyl-meta-toluamide (DEET) were also present in at least 15 percent of samples. Compounds with the highest concentrations were bisphenol A (397 ng/g), PDBE congeners 28, 47, 99, 100, 153, and 154 (83.5 ng/g), triclosan (71.3 n/g), caffeine (68.3 ng/g), salicylic acid (66.4 ng/g), warfarin (57.6 ng/g), sulfathiazole (55.8 ng/g), tris(1-chloro-2-propyl) phosphate (53.8 ng/g), and DEET (37.2 ng/g).

Although there is the potential for direct and indirect contaminant-related effects, mortality or other population-level impacts have not been reported for NLEBs. Long-term sub-lethal effects of environmental contaminants on bats are largely unknown; however, environmentally relevant exposure levels of various contaminants have been shown to impair nervous system, endocrine, and reproductive functioning in other wildlife (Yates et al. 2014; Köhler and Triebskorn 2013; Colborn et al. 1993). Moreover, bats' high metabolic rates, longevity, insectivorous diet, migration-hibernation patterns of fat deposition and depletion, and immune impairment during hibernation, along with potentially exacerbating effects of WNS, likely increase their risk of

exposure to and accumulation of environmental toxins (Secord et al. 2015, Yates et al. 2014, Geluso et al. 1976, Quarles 2013, O'Shea and Clark 2002). Following WNS-caused population declines in northeastern little brown bats, Kannan et al. (2010) investigated whether exposure to toxic contaminants could be a contributing factor in WNS-related mortality. Although high concentrations of polychlorinated biphenyls (PCBs), PBDEs, polybrominated biphenyls (PBBs), and chlordanes were found in the fat tissues of WNS-infected bats in New York, relative concentrations in bats from an uninfected population in Kentucky were also high (Kannan et al. 2010). The authors concluded that the study's sample sizes were too small to accurately associate contaminant exposure with the effects of WNS in bats (Kannan et al. 2010), but argued that additional research is needed. Despite the lack of knowledge on the effects of various contaminants on northern long-eared bats, we recognize the potential for direct and indirect consequences. However, contaminant-related mortality has not been reported for NLEBs. Additionally, Ingersoll (2013) suggested it was unclear what other threats or combination of threats other than WNS (e.g., changes to critical roosting or foraging habitat, collisions, effects from chemicals) may be responsible for recent bat declines.

Climate Change

Climate change may also be affecting NLEB. Climate change is expected to alter seasonal ambient temperatures and precipitation patterns across regions (Adams and Hayes 2008), which could lead to shifts in the range of some bat species (Loeb and Winters 2013; Razgour et al. 2013). Suitable roost temperatures and water availability are directly related to successful reproduction in female insectivorous bats (Adams and Hayes 2008). Adams (2010) reported decreased reproductive success in female insectivorous bats in response to decreased precipitation. In contrast, Burles et al. (2009) and Lucan et al. (2013) reported decreased reproductive success in response to increased precipitation in little brown bats and Daubenton's bats (*Myotis daubentonii*), respectively. NLEB are particularly sensitive to changes in temperature, humidity, and precipitation. Climate influences food availability, timing of hibernation, frequency and duration of torpor, rate of energy expenditure, reproduction, and rates of juvenile bat development (Sherwin et al. 2013). Climate change may indirectly affect the NLEB through changes in food availability and the timing of hibernation and reproductive cycles.

Human Disturbance

Human disturbance of hibernating bats has long been considered a threat to cave-hibernating bat species like the NLEB. Modifications to bat hibernacula can affect the microclimate (e.g., temperature, humidity) of the subterranean habitat, and thus the ability of the cave or mine to support hibernating bats, including the NLEB. Anthropogenic modifications to cave and mine entrances may not only alter flight characteristics and access (Spanjer and Fenton 2005), but may change airflow and alter internal microclimates of the caves and mines, eliminating their utility as hibernacula (Service 2007). For example, Richter et al. (1993) attributed the decline in the number of Indiana bats at Wyandotte Cave, Indiana (which harbors one of the largest known population of hibernating Indiana bats (*Myotis sodalis*), to an increase in the cave's temperature resulting from restricted airflow caused by a stone wall erected at the cave's entrance. In addition to the direct access modifications to caves discussed above, debris buildup at entrances

or on cave gates can also significantly modify the cave or mine site characteristics by restricting airflow and the course of natural water flow. Water-flow restriction could lead to flooding, thus drowning hibernating bats (Amelon and Burhans 2006). Boyles and Brack's (2009) predicted that the survival rate of hibernating little brown bats drops from 96 percent to 73 percent with human visitations to hibernacula. Prior to the outbreak of WNS, Amelon and Burhans (2006) indicated that "the widespread recreational use of caves and indirect or direct disturbance by humans during the hibernation period pose the greatest known threat to this species (NLEB)."

3.2.2 Other Cave-dwelling Species associated with Known Hibernacula

Many of the 1,508 known NLEB hibernacula are cave-like structures that provide unique habitats to fish and wildlife. Species that live in these areas are often highly specialized and sensitive species. Troglobites are animals that live in the dark areas of caves. They include both troglofauna (land-dwelling species) and stygofauna (water-dwelling species). Troglobites are typically identified by evolutionary traits that suit them for cave life, such as loss of sight and skin pigment or slow metabolism and therefore are mostly incapable of surviving outside of their unique cave environments. Cave-dwelling bat and birds (e.g., swallows) are not considered troglobites because they leave the caves in order to feed, reproduce, etc. These animals are called trogloxenes (i.e., animals associated with caves but do not live exclusively in caves). Many cave ecosystems are highly dependent upon these trogloxenes for bringing in energy and nutrients from the outside. Many other native animals use caves as well, including birds (e.g., falcons and hawks), small and large mammals (e.g., mice, raccoons, deer, bear), fish, and invertebrates. In fact, some of our Nations most imperiled species depend on cave habitats, including the Grotto sculpin *(Cottus specus),* tumbling creek cave snail *(Antrobia culveri),* Ozark cavefish (*Amblyopsis rosae*), and cave crayfish (*Cambarus aculabrum*). Several species of Federally listed cave-dwelling bats have been observed with or adjacent to NLEBs in their hibernacula, including the endangered gray bat (*Myotis grisescens*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), and Indiana bat (*Myotis sodalis*)(Service 1999).

Caves and cave environments are highly vulnerable to changes made on the land's surface, especially areas that drain into them. Activities such as road construction, urban development, surface mining, logging, and other activities that convert forests to other land uses, may cause increased storm-water runoff and siltation to enter a cave and increase the likelihood of flooding, or otherwise adversely change temperature and humidity regimes. Establishing and maintaining forested buffers around caves may indirectly reduce threats associated with filling, excavation, blasting, and human disturbance. Conservation and management of areas above caves is needed where there is a risk of contaminants flowing into or being accidentally spilled into them (e.g., chemical runoff from agricultural fields). In 1988, the United States passed the Federal Cave Resource Protection Act, which preserves and protects all significant caves found on Federal land for future generations of Americans. However, the majority of caves on private land remain unprotected.

3.2.3 Migratory Birds and other Wildlife

Migratory birds are those species that migrate to north of the Tropic of Cancer (the United States and Canada) during the summer months to breed, but spend winter months south of that latitude in such areas as Mexico, Central America, South America, or the Caribbean. Within the areas around known occupied NLEB maternity roosts and occupied NLEB hibernacula, we would expect to find a diverse mix of migratory birds using these areas for nesting, resting, and feeding. They include: waterbirds, shorebirds, land birds, and forest-dwelling birds (e.g., waterfowl, herons, warblers, woodpeckers, eagles, hawks and owls).

Migratory birds may experience disturbance, injury, and mortality as a result of forest management, forest conversion, and wind energy development. Forest management activities such as site preparation, herbicide use, and thinning affect forest stand structure and bird fauna. Clearcutting forests can result in a complete removal of some bird species; while partial removal can result in decreases for some and increases for others. Many forest interior migratory birds are absent from small forest fragments, most likely due to edge-related declines in their reproductive success. Wind energy development has been shown to impact birds through direct mortality from collisions with turbines, and indirectly through avoidance of areas around facilities. The Service estimates that wind turbines across the U.S. kill roughly a half million birds a year.

We would also expect to see a large assortment of small, medium, and large-sized mammals (mice and moles, squirrels and mink, deer and fox, and bears); as well as a variety of reptiles and amphibians (snakes, frogs, and turtles). Several other bat species are also found in areas occupied by NLEBs, including the tri-colored bat (*Perimyotis subflavus*), little brown bats (*Myotis lucifugus*) the big brown bat (*Eptesicus fuscus*) the Indiana bat (*Myotis sodalis*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), eastern pipistrelle (*Perimyotis subflavus*) (now tricolored bat), Virginia big-eared bat (*Plecotus townsendii*) and the Ozark big-eared bat *(Plecotus townsendii ingens)*. Several of these bats are particularly vulnerable to collisions with wind turbines, including the hoary bat (*Lasiurus cinereus*), eastern red bat (*L. borealis*), and the silver-haired bat *Lasionycteris noctivagans*). For these three species, the number being killed at wind energy facilities far exceeds any other documented natural or human-caused source of mortality (Cyran, P.B. 2011). At some wind energy facilities little brown bats (*Myotis lucifugus*) and tri-colored bats (*Perimyotis subflavus*) are also frequently killed. Bats are long-lived animals, and have low reproductive rates, making populations susceptible to localized extinction (Barclay and Harder 2003; Jones et al. 2003). Population sizes for migratory tree bat species are largely unknown, and we do not know whether current or future collision fatality levels represent a significant threat to these species (NAS 2007; Kunz et al. 2007; Arnett et al. 2008; Arnett and Baerwald 2013). Further, the lack of reliable monitoring data from existing wind energy facilities makes it difficult to derive reliable fatality estimates for these species. Bats provide valuable ecosystem services. A paper published in Science estimates that bats typically save farmers $74 per acre, and that the value of bats to agriculture in the continental U.S is roughly $22.9 billion annually (Boyles et.al., 2011). The little brown bat can alone eat up to 600 mosquitoes an hour, thus performing the work of a "natural insecticide," helping control crop pests and other insects.

Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are found in many parts of the NLEBs range. Both species have generalist diets consisting primarily of small mammals, fish, and carrion, and are variably migratory based on breeding location and year-round habitat suitability. Both species are also prone to disturbance during the nesting period, making those areas a principal area of concern for protection. Nests are located in mature or old-growth trees, snags, cliffs, or rock promontories. Bald eagle nests are most commonly associated with coastlines, rivers, or large lakes and streams while golden eagle nests are most commonly associated with cliffs in hilly or mountainous areas. Migrating and wintering bald eagles often congregate at specific roosting sites for purposes of feeding and sheltering. Human activities near or within communal roost sites may prevent eagles from feeding or taking shelter, especially if there are no other undisturbed and productive feeding and roosting sites available. Activities that permanently alter communal roost sites and important foraging areas can altogether eliminate the elements that are essential for feeding and sheltering eagles. Bald and golden eagle are also vulnerable to wind turbines. Large numbers of golden eagles have been killed by wind turbines in the western States. Bald eagles have also been killed by wind turbines, although not nearly to the extent as golden eagles in the West. Although neither bald or golden eagles are afforded protection under the ESA, they are still protected under the Bald and Golden Eagle Protection Act (BGEPA), MBTA, Lacey Act, and by most States.

3.3 The Socioeconomic Environment

3.3.1 Wind Energy Development

Wind-energy facilities are found scattered throughout the range of the NLEB and many new facilities are anticipated to be constructed over the next 15 years (United States Department of Energy 2008). By 2020, 20 percent of our nation's energy could come from wind energy. Wind energy development is rapidly increasing throughout the NLEB's range. In the State of Illinois, the target for renewable energy is 25 percent (75 percent of that from wind) by 2025. These targets for renewable energy were established to promote energy independence, environmental stewardship, and economic development. Wind energy generation is emissions free, requires little to no water, changes only a minimal portion of existing land use, and reduces the need for other traditional energy sources like coal, thereby reducing associated emissions. As an example, current installed capacity in Illinois will avoid emission of over 4.7 million metric tons of carbon dioxide annually. In 2012 wind energy became the number one source of new electricity generating capacity in the U.S., providing 42 percent of all new capacity.

In addition to environmental benefits from wind, direct and indirect economic benefits are realized in areas where wind energy projects are developed. Construction jobs are created during construction as well as a long term operations and maintenance and environmental monitoring jobs. There are direct payments made to participating landowners which can increase local spending and make its way through the wider economic community. Another direct benefit is the increased tax revenue associated with wind energy projects, which can benefit local schools, fire, water and other municipal services. Beyond the local project area, wind energy development also supports a growing supply chain and manufacturing base. There are now more than 550 wind energy-related manufacturing facilities across the United States.

3.3.2 Land Management and Development Activities involving Tree Removal

A number of land management and development activities applied to natural and built environments could be affected by the proposed action and alternatives, primarily by the incidental take prohibitions related to tree removal within the buffer areas around known occupied maternity roost trees and known hibernacula. These could impact certain forest management activities, ROW development and maintenance activities, and development activities.

Forest management is the practical application of biological, physical, quantitative, managerial, economic, social, and policy principles to the regeneration, management, utilization and conservation of forests to meet specific goals and objectives (Society of American Foresters (SAF)(a), http:// dictionaryofforestry.org/dict/term/ forest_management). Forest management activities are the tools used to achieve a forestry objectives. These include timber harvest, tree plantings, prescribed burning, and the use of specific chemicals such as herbicides and fertilizers. Forest management is vital to the conservation and recovery of the NLEB. According to Boggess et al. (2014) approximately 2 percent of forest acreage in the States within the range of the NLEBs will undergo forest management activities in 2015. For purposes of this EA, we assume that approximately 2 percent of forests within the 37 State NLEB range (8,130,045 acres) will experience some form of forest management activities in any given year (see section 3.1.2). For individuals and entities planning and executing forest management activities, environmental compliance obligations can be challenging, time-consuming, and expensive, especially when their projects involve multiple Federal and State jurisdictions. Economic and financial considerations usually determine which land management and development activities are feasible for the landowner.

Forest conversion is activities that remove forested habitat from a landscape. This includes, but is not limited to, tree removal from commercial or residential development, energy production and transmission (oil, gas, solar, wind), mining, agriculture, transportation, and military training. Natural gas extraction is expanding across the U.S., particularly throughout the Eastern range of the NLEB. Natural gas extraction involves fracturing rock formations using highly pressurized water and other various chemicals (Hein 2012). Natural gas extraction and transmission, particularly across the Marcellus Shale region, which includes large portions of New York, Pennsylvania, Ohio, and West Virginia, is expected to expand over the coming years. In Pennsylvania, for example, nearly 2,000 Marcellus natural gas wells have already been drilled or permitted, and if development trends continue, as many as 60,000 more could be built by 2030 (Johnson 2010). The Services draft BO estimates that within the 37 State NLEB range, approximately 0.3 percent of the forest land (914,237 acres) could experience forest conversion activities in any given year.

Rights-of-way (ROW) and other corridors are found throughout the range of the NLEB. They exist to facilitate transportation (highways, railways), utility transmission lines, and energy delivery (pipelines), just to name a few. ROW maintenance activities limit vegetation growth, within an existing footprint, so that operations can continue smoothly, and in some cases, legally. These activities may include tree trimming or removal, mowing, and herbicide spraying. Depending on the purpose of the corridor or ROW, maintenance may be performed frequently,

or infrequently, depending on the vegetation and the laws and regulation governing its use. ROW expansion occurs when there is a need to increase the capacity if the infrastructure within the ROW (e.g., road widening).

Prairie management activities involve maintaining existing prairies and grasslands, or activities used to reestablish grasslands that had previously been converted to some other land cover type. In some areas of the NLEBs range, tree and shrub species are overtaking the prairies and grasslands. Landowners and agencies working to establish or conserve prairies often need to constantly manage trees and brush in order to establish and maintain prairies and grasslands. Management activities on prairies usually involve tree cutting, mowing, burning, grazing, or using herbicides which could conflict with some of the conservation measures in the alternatives.

ENVIRONMENTAL CONSEQUENCES

This chapter describes the environmental effects of each of the three alternatives retained for detailed analysis. The chapter is organized by resource and corresponds to the organization of Chapter 3. The Service acknowledges that due to the geographic extent of the proposed action and the temporal and spatial uncertainty about future impact-producing projects, the EA process did not allow for any site specific analyses of impacts. Rather, potentially affected resources were evaluated using reasonable worst-case scenario assumptions to predict the manner and extent of anticipated impacts, which we believe captures the range of possible impacts into the future. The conclusions reached in this EA (summarized in Table 8 on pg. 40) are based on our analysis of the alternatives and the following assumptions:

- Project proponents will comply with applicable laws and regulations,
- Section 7 and section 10 processes would be completed in unison with demand, and may include the conservation measures described for alternative 2 (see section 2.4.2), and
- Alternative 1, "affirmation of the interim 4(d) rule," is the status quo/no action alternative.

4.1 Impacts to the Physical Environment

Analysis of impacts to the physical environment includes forest resources within the WNS zone and the proposed buffer areas, and groundwater resources associated with known NLEB hibernacula. Impacts to these resources are those that substantially affect the resources status and trend.

4.1.1 Forest Resources

Each alternative has the potential to impact forest resources around known occupied maternity roost trees and known hibernacula, where incidental take of NLEBs due to tree removal activities would be prohibited during the timeframes and areas established for each alternative. For the purpose of this assessment, we assume that all of the land within the proposed buffer areas is forested, and forest resource "impacts" are forest resources that would be "conserved as a result of the proposed conservation measures in the alternatives", or in other words, forest resources that could have been subject to land management and development activities (e.g., forest management and forest conversion) but-for the proposed conservation measures. As discussed in section 3.2.1, within the U.S. range of the NLEB, we expect 2 percent of the forest land to experience forest management activities and 0.3 percent (i.e., .3247 percent) of the forest land to experience forest conversion activities in any given year over the short-term.

Forest Resources around Known Hibernacula

There are 1,508 known NLEB hibernacula documented across 31 States. The majority of the known hibernacula occur within the Eastern (39 percent) and the Midwest range (38 percent), followed by 21 percent in the Southern range, and 2 percent in the Western range. Within the 31 States with known hibernacula, there are approximately 333,463,407 acres of forest land (Table 6).

Under alternatives 1 and 3, the hibernacula conservation measures would consist of a 0.25-mile area (125.7 acres) around known hibernacula, which could encompass up to 189,556 acres of forest land, or roughly 0.06 percent of the total forest land acreage across these 31 States. We assume that in any given year, forest management activities could affect approximately 3,791 of those 189,556 acres, while forest conversion activities could affect 615 of those 189,556 acres annually.

Under alternative 2, buffer areas potentially established through section 7 or 10 of the ESA for hibernacula could consist of a 5-mile area (50,265 acres) around known hibernacula, which could encompass up to 75,799,620 acres of forest land around known hibernacula, or 22.7 percent of the total forest land acreage in these 31 States. In any given year, forest management activities could affect 1,515,992 of those acres annually, while forest conversion activities could affect 246,121 of those acres annually.

Each of the alternatives would potentially conserve forest resources around known hibernacula, as the incidental take prohibitions for NLEBs due to tree removal activities are in effect year-round. However, this does not mean that the forest resources in those areas will not be impacted by land management and development activities. Forests can and will be managed and developed in these areas as long as tree removal activities do not result in the incidental take of NLEBs. Individuals and entities may also choose to obtain authorization to take NLEBs in the buffer areas through section 7 or 10 of the ESA. Or, as indicated above, tree removal activities could occur in these buffer areas in a way that does not result in the incidental taking of NLEBs and would, therefore, not be prohibited.

We do not expect any of the alternatives to significantly change the current status or trend of forest resources around NLEB hibernacula because as indicated above, forest managers and developers will choose to adapt their forest management techniques to either avoid take of NLEBs or will get an authorization to take NLEBs through sections 7 or 10 of the ESA. However, alternative 2 would likely have the greatest impact on forest resources around known hibernacula as it could include larger buffer areas (5-mile buffers around hibernacula vs 0.25-mile buffers for alternatives 1 and 3) and thus more forest land acreage could be potentially impacted by the NLEB conservation measures.

Forest Resources around Known Occupied Maternity Roost Trees

There are 1,744 known occupied maternity roost trees documented across 19 States. The majority of known occupied maternity roost tress occur in the Midwest range (30 percent), followed by the Southern range (42 percent) and Eastern range (28 percent). There are no known

maternity roost trees in the Western range. Within these 19 States, there are approximately 248,050,747acres of forest land (Table 7).

Range	State	Number of Known Hibernacula	Acres of Forest Land in State	Acres Covered by Hibernacula Buffers (Alternative 1)	Percent of Forest Land in State	Acres Covered by Hibernacula Buffers (Alternative 2)	Percent of Forest Land in State	Acres Covered by Hibernacula Buffers (Alternative 3)	Percent of Forest Land in State
Midwest	Iowa	2	3,013,759	251	0.01%	100,530	3.34%	251	0.01%
Midwest	Illinois	44	4,847,480	5,531	0.11%	2,211,660	45.62%	5,531	0.11%
Midwest	Indiana	69	4,830,395	8,673	0.18%	3,468,285	71.80%	8,673	0.18%
Midwest	Michigan	77	20,127,048	9,679	0.05%	3,870,405	19.23%	9,679	0.05%
Midwest	Minnesota	15	17,370,394	1,886	0.01%	753,975	4.34%	1,886	0.01%
Midwest	Missouri	269	15,471,982	33,813	0.22%	13,521,285	87.39%	33,813	0.22%
Midwest	Ohio	32	8,088,277	4,022	0.05%	1,608,480	19.89%	4,022	0.05%
Midwest	Wisconsin	67	16,980,084	8,422	0.05%	3,367,755	19.83%	8,422	0.05%
Eastern	Connecticut	8	1,711,749	1,006	0.06%	402,120	23.49%	1,006	0.06%
Eastern	Delaware	2	339,520	251	0.07%	100,530	29.61%	251	0.07%
Eastern	Maine	3	17,660,246	377	0.00%	150,795	0.85%	377	0.00%
Eastern	Maryland	8	2,460,652	1,006	0.04%	402,120	16.34%	1,006	0.04%
Eastern	Massachusetts	7	3,024,092	880	0.03%	351,855	11.64%	880	0.03%
Eastern	New Hampshir	11	4,832,408	1,383	0.03%	552,915	11.44%	1,383	0.03%
Eastern	New Jersey	9	1,963,561	1,131	0.06%	452,385	23.04%	1,131	0.06%
Eastern	New York	90	18,966,416	11,313	0.06%	4,523,850	23.85%	11,313	0.06%
Eastern	Pennsylvania	322	16,781,960	40,475	0.24%	16,185,330	96.44%	40,475	0.24%
Eastern	Rhode Island	0	359,519	0	0.00%	0	0.00%	0	0.00%
Eastern	Vermont	16	4,591,280	2,011	0.04%	804,240	17.52%	2,011	0.04%
Eastern	Virginia	11	15,907,041	1,383	0.01%	552,915	3.48%	1,383	0.01%
Eastern	West Virginia	104	12,154,471	13,073	0.11%	5,227,560	43.01%	13,073	0.11%
Southern	Alabama	11	22,876,792	1,383	0.01%	552,915	2.42%	1,383	0.01%
Southern	Arkansas	77	18,754,916	9,679	0.05%	3,870,405	20.64%	9,679	0.05%
Southern	Georgia	6	24,768,236	754	0.00%	301,590	1.22%	754	0.00%
Southern	Kentucky	122	12,471,762	15,335	0.12%	6,132,330	49.17%	15,335	0.12%
Southern	Louisiana	0	14,540,135	0	0.00%	0	0.00%	0	0.00%
Southern	Mississippi	0	19,541,284	0	0.00%	0	0.00%	0	0.00%
Southern	North Carolina	29	18,587,540	3,645	0.02%	1,457,685	7.84%	3,645	0.02%
Southern	Oklahoma	9	12,646,138	1,131	0.01%	452,385	3.58%	1,131	0.01%
Southern	South Carolina	3	13,120,509	377	0.00%	150,795	1.15%	377	0.00%
Southern	Tennessee	61	13,941,333	7,668	0.05%	3,066,165	21.99%	7,668	0.05%
Western	Kansas	1	2,502,434	126	0.01%	50,265	2.01%	126	0.01%
Western	Montana	0	25,573,200	0	0.00%	0	0.00%	0	0.00%
Western	Nebraska	2	759,998	251	0.03%	100,530	13.23%	251	0.03%
Western	North Dakota	0	1,576,174	0	0.00%	0	0.00%	0	0.00%
Western	South Dakota	21	1,910,934	2,640	0.14%	1,055,565	55.24%	2,640	0.14%
Western	Wyoming	0	11,448,541	0	0.00%	0	0.00%	0	0.00%
	Total	1,508	406,502,260	189,556		75,799,620		189,556	

Table 5 – Forest Resources potentially impacted by Hibernacula Buffer Areas.

Under alternative 1, known occupied maternity roost tree conservation measures would consist of a 0.25-mile area (125.7 acres) around known occupied maternity roost trees, which could encompass up to 219,221 acres of forest land, or 0.09 percent of the total acres of forest land in these 19 States. In any given year, forest management activities could affect 4,384 of those acres annually, while forest conversion activities could affect 712 of those acres annually.

Under alternative 2, conservation measures potentially established through section 7 or 10 of the ESA for known occupied maternity roost trees would likely consist of a 1.5-mile radius (4,524 acres) around known occupied maternity roost trees, which could encompass up to 7,889,856 acres of forest land, or 3.18 percent of the total acres of forest land in these 19 States. In any given year, forest management activities could affect 157,797 of those acres annually, while forest conversion could affect 25,618 of those acres annually.

Under alternative 3, known occupied maternity roost tree conservation measures would consist of a 150-foot area (1.6 acres of land) around known occupied maternity roost trees, which could encompass up to 2,790 acres of forest land, or 0.001 percent of the total forest land acres in these 19 States. In any given year, forest management activities could affect 56 of those acres annually, while forest conversion activities could affect 9 of those acres annually.

Each of the alternatives will indirectly conserve forest resources around known occupied maternity roost trees, although in varying degrees. Both alternatives 1 and 3 would prohibit incidental take of NLEBs associated with tree removal activities around known occupied maternity roost trees during the pup season (June 1 through July 31). The conservation measures in alternative 1 could potentially impact up to 5,096 acres of forest resources each year, while the conservation measures in alternative 3 could impact roughly 65 acres each year. Outside of this timeframe, incidental take of NLEBs would not be prohibited, and we would expect tree removal activities to occur in these areas during those times. For this reason, we expect alternatives 1 and 3 to have minor positive impacts on forest resources. Alternative 2 would likely have the greatest impact on forest resources around known occupied maternity roost trees as it would likely include larger buffers (1.5-mile buffer) and a longer timeframe when the incidental take prohibitions for NLEB would be in effect (March 15 – October 15). However, as discussed above, this does not mean that the forest resources in those areas will not be impacted by land management and development activities. Forests can and will be managed and developed in these areas as long as tree removal activities do not result in incidental take of NLEBs. Further, individuals and entities may choose to obtain authorization to take NLEBs through section 7 or 10 of the ESA. In those cases, incidental take of NLEBs due to tree removal activities would not be prohibited.

Range	State	Known Occupied Maternity Roost Trees	Acres of Forest Land in State	Acres Covered by Roost Tree Buffers (Alternative 1)	Percent of Forest Land in State	Acres Covered by Roost Tree Buffers (Alternative 2)	Percent of Forest Land in State	Acres Covered by Roost Tree Buffers (Alternative 3)	Percent of Forest Land in State
Midwest	Iowa	14	3,013,759	1,760	0.06%	63,336	2.10%	22	0.001%
Midwest	Illinois	39	4,847,480	4,902	0.10%	176,436	3.64%	62	0.001%
Midwest	Indiana	193	4,830,395	24,260	0.50%	873,132	18.08%	309	0.006%
Midwest	Michigan	25	20,127,048	3,143	0.02%	113,100	0.56%	40	0.000%
Midwest	Minnesota	102	17,370,394	12,821	0.07%	461,448	2.66%	163	0.001%
Midwest	Missouri	58	15,471,982	7,291	0.05%	262,392	1.70%	93	0.001%
Midwest	Ohio	4	8,088,277	503	0.01%	18,096	0.22%	6	0.000%
Midwest	Wisconsin	84	16,980,084	10,559	0.06%	380,016	2.24%	134	0.001%
Eastern	Connecticut	0	1,711,749	0	0.00%	0	0.00%	0	0.000%
Eastern	Delaware	0	339,520	0	0.00%	0	0.00%	0	0.000%
Eastern	Maine	0	17,660,246	0	0.00%	0	0.00%	0	0.000%
Eastern	Maryland	0	2,460,652	0	0.00%	0	0.00%	0	0.000%
Eastern	Massachusetts	16	3,024,092	2,011	0.07%	72,384	2.39%	26	0.001%
Eastern	New Hampshir	0	4,832,408	0	0.00%	0	0.00%	0	0.000%
Eastern	New Jersey	47	1,963,561	5,908	0.30%	212,628	10.83%	75	0.004%
Eastern	New York	27	18,966,416	3,394	0.02%	122,148	0.64%	43	0.000%
Eastern	Pennsylvania	157	16,781,960	19,735	0.12%	710,268	4.23%	251	0.001%
Eastern	Rhode Island	0	359,519	0	0.00%	0	0.00%	0	0.000%
Eastern	Vermont	0	4,591,280	0	0.00%	0	0.00%	0	0.000%
Eastern	Virginia	12	15,907,041	1,508	0.01%	54,288	0.34%	19	0.000%
Eastern	West Virginia	231	12,154,471	29,037	0.24%	1,045,044	8.60%	370	0.003%
Southern	Alabama	0	22,876,792	0	0.00%	0	0.00%	0	0.000%
Southern	Arkansas	310	18,754,916	38,967	0.21%	1,402,440	7.48%	496	0.003%
Southern	Georgia	20	24,768,236	2,514	0.01%	90,480	0.37%	32	0.000%
Southern	Kentucky	254	12,471,762	31,928	0.26%	1,149,096	9.21%	406	0.003%
Southern	Louisiana	0	14,540,135	0	0.00%	0	0.00%	0	0.000%
Southern	Mississippi	0	19,541,284	0	0.00%	0	0.00%	0	0.000%
Southern	North Carolina	101	18,587,540	12,696	0.07%	456,924	2.46%	162	0.001%
Southern	Oklahoma	0	12,646,138	0	0.00%	0	0.00%	0	0.000%
Southern	South Carolina	0	13,120,509	0	0.00%	0	0.00%	0	0.000%
Southern	Tennessee	50	13,941,333	6,285	0.05%	226,200	1.62%	80	0.001%
Western	Kansas	0	2,502,434	0	0.00%	0	0.00%	0	0.000%
Western	Montana	0	25,573,200	0	0.00%	0	0.00%	0	0.000%
Western	Nebraska	0	759,998	0	0.00%	0	0.00%	0	0.000%
Western	North Dakota	0	1,576,174	0	0.00%	0	0.00%	0	0.000%
Western	South Dakota	0	1,910,934	0	0.00%	0	0.00%	0	0.000%
Western	Wyoming	0	11,448,541	0	0.00%	0	0.00%	0	0.000%
	Total	1,744	406,502,260	219,221		7,889,856		2,790	

Table 6 – Forest Resources potentially impacted by Roost Tree Buffer Areas.

Forest Conversion in the WNS zone

Unless authorized under section 7 or 10 of the ESA, incidental take attributable to certain forest conversion activities under alternative 1 would remain prohibited throughout the WNS zone. These prohibitions would include 1) tree removal activities involving an acre or more of contiguous NLEB habitat, or an acre or more in total within a larger tract, whether that larger tract is entirely forested or a mixture of forested and non-forested cover types, and 2) the conversion of mature hardwood, or mixed, forest into intensively managed monoculture pine plantation stands, or non-forested landscapes. There are approximately 365,993,411 acres of

forest land within the States associated with the WNS zone (web citation: Tuesday December 15th 10:13). In any given year, forest conversion activities could impact approximately 1,188,381 of those acres annually.

Under alternative 2, incidental take of NLEBs attributable to forest conversion activities would be prohibited unless authorized by sections 7 or 10 of the ESA. However, as indicated above, we have authorized take pursuant to sections 7 and 10 if it involved: 1) tree removal activities involving an acre or less of contiguous NLEB habitat within 1.5 miles of a known occupied maternity roost tree, or 2) tree removal activities involving an acre or less of contiguous NLEB habitat within 5 miles of a known hibernacula. There are roughly 83,689,476 acres of forest land associated with the hibernacula and roost tree buffer areas in alternative 2. In any given year, forest conversion activities could impact 271,740 of those acres annually.

Under alternative 3, incidental take of NLEBs attributable to forest conversion activities would only be prohibited within the 0.25-mile buffer areas established for known hibernacula, and the 150-foot buffer areas established for known occupied maternity roost trees (during the pup season). There are roughly 192,342 acres of forest land associated with the hibernacula and roost tree buffers in alternative 3. In any given year, forest conversion activities could impact approximately 625 of those acres annually.

Alternatives 1 and 2 would likely have the greatest potential impact on forest resources in the WNS zone, as incidental take of NLEBs attributable to certain forest conversion activities would be prohibited across a much larger area than alternative 3, unless authorized by sections 7 or 10 of the ESA. Using a reasonable worst-case scenario assumption that in any given year all of the forest resources that could potentially be converted to another use were both known NLEB habitat and located within the WNS and the buffer areas, alternative 1 (status quo) could potentially impact the most, roughly 1,188,381 acres; alternative 2 could potentially impact 271,740 acres, and alternative 3 could potentially impact 625 acres. In reality, each alternative would probably impact roughly the same amount of forest resource acreage because as WNS spreads across the WNS zone and reduces populations numbers, known NLEB habitat will decrease as well, thus decreasing the possibility that any given forest conversion activity would incidentally take NLEBs.

4.1.2 Water Resources

Analysis of water resources includes groundwater resources associated with known hibernacula and surface water resources associated with known occupied maternity roost trees. Species dependent on groundwater quantity and quality in NLEB hibernacula include a diverse array highly specialized and highly sensitive cave-dwelling species. Surface water resources are a critical component of NLEB maternity colony home ranges.

None of the alternatives in this EA would cause significant adverse impacts to groundwater or surface water resources. All of the alternatives would contribute toward safeguarding groundwater and surface water quantity and quality associated with known hibernacula and known occupied maternity roost trees, primarily by directly and indirectly conserving forest resources around these areas, although in varying degrees. The buffer areas and associated

conservation measures in alternatives 1 and 3 would likely have minor direct and indirect positive impacts on groundwater and surface water resources associated with known hibernacula and known occupied maternity roost trees. The buffer areas and associated conservation measures potentially established through future section 7 and 10 processes under alternative 2 would likely have a greater positive impact on both groundwater and surface water resources as they could be larger in size and "prescriptively applied" on a project-by-project basis (e.g., restrict aerial application of herbicides and pesticides on certain ROWs, if appropriate). The forest conversion provisions in both alternative 1 and 2 could have substantial indirect positive impacts to both groundwater and surface water resources. While we acknowledge that we cannot predict precisely what effect any alternative will have on groundwater resources associated with known hibernacula, or surface water associated with known occupied maternity roost trees, we would expect alternative 2 to have the greatest impact, followed by alternatives 1 and 3. As a result of listing the NLEB as a threatened species under the ESA, we expect a heightened awareness and appreciation of the species and its habitat.

4.2 Impacts to the Biological Environment

Analysis of impacts to the biological environment includes the NLEB, other cave-dwelling species associated with NLEB hibernacula, migratory birds and other wildlife. Impacts to these resources are those that substantially affect a species' population or reduce its habitat quality or quantity.

None of the alternatives in this EA will cause significant impacts to any other listed, proposed, or candidate species, or designated or proposed critical habitat. None of the alternatives exempt any of the take prohibitions established for other listed species, nor do they alter in any way the consultation requirements under section 7(a)(2) of the ESA for Federal agencies. For threatened and endangered species that share hibernacula and roosting areas with NLEBs, implementation of all alternatives may have net long-term beneficial impacts. However, quantifying the potential benefit to these species is not possible without knowing specific locations, baseline population densities, and factors limiting populations.

4.2.1 The Northern Long-eared Bat

Analysis of potential impacts to NLEBs and their habitat includes an evaluation of land management activities involving tree removal (e.g., forest management and conversion), wind energy development, and other activities that are either known or perceived to be threats to NLEBs.

In our listing determination for the NLEB, we noted that current and future forest conversion may have negative additive impacts where the species has been impacted by WNS (80 FR 17991). Our assessment was based largely on the species' summer-home-range fidelity and the potential for increased energetic demands for individuals where the loss of summer habitat had been removed or degraded (e.g., fragmentation). We noted that forest conversion "can result in a myriad of effects to the species, including direct loss of habitat, fragmentation of remaining habitat, and direct injury or mortality" (80 FR 17993). Many of the comments we received on the listing determination argued that habitat is not limiting for the NLEB, and that NLEBs have been

documented using a wide variety of forest types across its range. Tree removal associated with forest management and conversion, ROW management and expansion, and prairie management does have the potential to impact NLEBs and their habitat, particularly through localized temporary or permanent reductions in suitable roosting and/or foraging habitat (e.g., clear-cuts) and to individuals directly killed or injured from the activities themselves (e.g., tree felling). However we expect the impacts to be very minor.

With regard to forest management and conversion, we expect approximately 2 percent and .3 percent respectively of forest acreage in States within the range of the NLEBs will undergo forest management and forest conversion activities in any given year. Put another way, we expect roughly 98 percent of potential NLEB habitat to be completely unaffected by forest management and conversion activities in any particular year. Only timber harvest and prescribed burning are expected to potentially impact large numbers of bats. Of that forest subjected to management and conversion annually, we would expect only a smaller fraction of the forested habitat to be harvested or burned during the NLEBs active season (April–October), and an even smaller portion harvested or burned during the pup season. When known occupied maternity roost trees are cut outside of the pup season, or if unknown occupied maternity roost trees are cut, some portion of the individuals in that tree (particularly males) will flee the roost and survive. Further, most forest management activities in the range of NLEB leave some forested habitat remaining after the action is completed, and this habitat continues to be used by NLEBs. Thus, we anticipate only a small percentage of NLEBs will be annually impacted by forest management and conversion activities.

The Services draft Biological Opinion for the final 4(d) rule (alternative 3) estimates that approximately 120,882 NLEBs will be impacted by forest management and forest conversion activities annually. Of that total, approximately 117,267 of those individuals would experience some form of harassment, while 3,615 of them would experience some form of harm (Table 5). Out of an estimated NLEB population of over 10 million, we do not believe any of the alternatives will cause significant adverse impacts to NLEB populations. All of the alternatives and their associated conservation measures will directly and indirectly protect essential roosting and foraging habitat around known occupied maternity roost trees and known hibernacula. All of the alternatives will protect NLEBs when they are in and around their hibernacula. All of the alternatives will protect NLEBs from activities that alter a hibernaculum's environment or impair an essential NLEB behavioral pattern, such as filling, excavation, human disturbance, and water quality degradation. While some of the buffers may differ in size compared to one another, we do not think the size difference will meaningfully change the potential impact forest management and forest conversion activities will have on NLEB populations. However, under alternative 2, the Service could develop conservation measures specifically tailored to the conservation needs of local NLEB populations. For this reason, we believe alternative 2 would likely reduce potential impacts from forest management and forest conversion activities the most, while alternative 3 would reduce impacts to NLEBs the least.

The Services draft Biological Opinion (BO) for the final 4(d) rule (alternative 3) estimates the mean annual take from wind energy over the short-term to be approximately 650 adult bats (Table 5). Both alternative 1 and 2 would prohibit incidental take attributable to wind energy development. Under these alternatives, facilities at-risk for NLEB take in these areas would

presumably avoid and minimize NLEB take through section 10 of the ESA. To avoid take of NLEBs, facilities will curtail operation of their turbines at wind speeds of 6.9 m/s (15.4 mph) or less, from sunset to sunrise, when the ambient temperatures are above 10°C (50°F), during spring and fall migration. To minimize incidental take to Indiana bats (*Myotis sodalis*), facilities will curtail operation of their turbines at wind speeds of 5.0 m/s (11.2 mph) or less, from sunset to sunrise, when the ambient temperature is above 10°C (50°F), during spring and fall migrations, which we believe can reduce incidental take of NLEBs by more than 50 percent. Bat activity is negatively correlated with wind speed. When wind speed increases, bat activity is reduced (Fiedler 2004). At the Fowler Ridge Wind Farm (Fowler Ridge) in Indiana, Good et al. (2011, 2012) found approximately 73% of all bat activity at the height of the turbine nacelles occurred when wind speeds were below 5.5 m/s (12.3 mph). Good et al. (2012) found most bat activity and bat fatalities occurred when mean nightly temperatures were above 15°C (59°F). Studies at both proposed and operating wind facilities have documented reduced bat activity during periods of high wind speeds (usually > 6.0m/s) (Arnett et al. 2005, Reynolds 2006). Studies with experimentally raiseed cut-in speeds of 5.0m/s to 6.5m/s during the fall bat migratory period resulted in a minimum of 44 percent and maximum of 93 percent reduction in overall mortality (Baerwald et al. 2009, Arnett et al. 2011). Under alternative 3, incidental take of NLEBs attributable to wind energy development would not be prohibited, thus impacts to NLEBs due to wind energy development would be greatest under alternative 3 (est. 650 NLEBs/years for alternative 3 compared to est. 325 NLEBs/year for alternatives 1 and 2).

However, as discussed in section 3.2.1, we acknowledge the uncertainty of these estimates for the Eastern, Southern, and Western portions of the species' range. We recognize that these estimates likely over-estimate fatalities because they do not account for avoidance and minimization measures that are currently applied at many wind facilities across the range of the Indiana bat, nor do they account for recent declines in NLEB numbers due to WNS. Under all alternatives, facilities operating in the 20 States where NLEBs and Indiana bats (*Myotis sodalis*) overlap (Figure 3), and who are at-risk for take of Indiana bats, must either 1) implement measures to avoid incidental take of Indiana bats (*Myotis sodalis*), or 2) implement measures that minimizes and mitigates the impact of take through an HCP and incidental take permit. Avoidance and minimization measures for Indiana bats (*Myotis sodalis*)(e.g., curtailment at low wind speeds, timing restrictions, feathering of blades) are also effective for NLEBs.

Cut-in speeds of 6.5m/s have been demonstrated to be the uppermost wind speed at which the majority of bat activity occurs. Without question, wind energy facilities that are implementing measures to avoid and minimize take of Indiana bats (*Myotis sodalis*) are also benefiting many other bat species, including the NLEB. AWEA's voluntary protocols for bat take avoidance and minimization (through feathering and curtailment of wind turbines at low wind speeds) if implemented, could also reduce impacts to bats by as much as 30 percent (AWEA 2015). This is especially important for facilities operating in those 17 States where Indiana bats (*Myotis sodalis*) are not present.

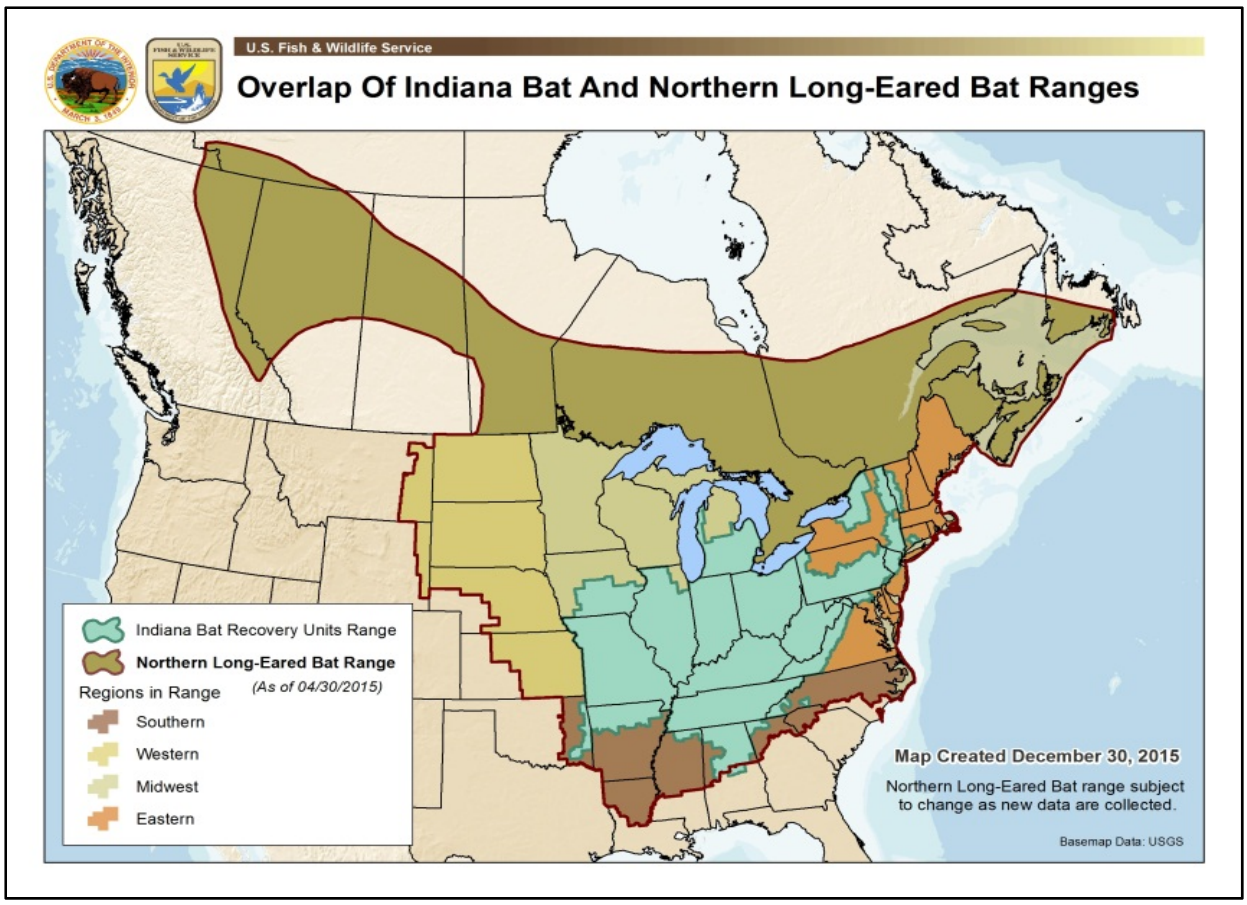

Figure 3 – Overlap of Indiana Bat (*Myotis sodalis*) and NLEB Ranges

Further, we reviewed post-construction mortality monitoring studies conducted at various times from 1998 through 2014 at 81 unique operating wind-energy facilities in the range of the NLEB in the U.S. and Canada (Service 2015, unpublished data). NLEBs were rarely detected as mortalities, even when they were known to be common on the landscape around the wind-energy facility. Where incidental take does occur, there are not currently any mitigation strategies that are certain to improve the conservation potential of the NLEB. There are no forest management techniques available that have been documented to increase the reproductive rates or survival rates of NLEB in maternity colonies. Most migration routes for NLEB are not known, so they cannot be protected. Opportunities to provide additional protection to hibernacula are limited, and would only protect against non-WNS threats. None of these actions can be shown to provide a meaningful benefit to the species.

With regard to the other threats discussed in section 3.2.1, besides WNS, there is currently no evidence that any of those activities (i.e., environmental contaminants, climate change, and human disturbance) were separately or cumulatively contributing to range-wide population effects to NLEBs prior to the onset of WNS. As noted in our decision to list the NLEB as a threatened species, WNS is the primary cause of the species decline, and we would not have listed the NLEB if not for the impact of WNS. In addition, the primary vector for transmission of WNS appears to be bats themselves when surviving bats carry the disease to new areas. In most cases these bats will originate within the WNS zone, and the number of bats in the populations

they move to is unlikely to have any impact on whether the disease takes hold in a particular hibernaculum. We conclude that regulating incidental take in areas not affected by WNS is not expected to change the rate at which WNS progresses across the range of the species. In other words, regulating incidental take outside the WNS zone will influence neither the future impact of the disease throughout the species' range nor the status of the species.

We acknowledge that prior to WNS, the most significant risk identified for NLEB conservation was direct human disturbance while bats are hibernating (Olson et al. 2011, Bilecki 2003; Service 2012). Impacts to hibernacula openings can restrict bat movement. It can also change the air flow and microclimate, reducing suitability of the hibernaculum for NLEBs or even decreasing survivorship. All of the alternatives would prohibit incidental take of NLEBs if it results from:

- Disturbing or disrupting hibernating individuals when they are in the hibernacula; or

- Alteration of the hibernaculum's entrance or environment if the result of the activity impairs essential behavioral patterns, including sheltering NLEBs.

Region	State	Harass Timber Harvest	Harass Prescribed Fire	Harass Forest Conversion	Harm (pups) Timber Harvest	Harm (pups) Prescribed Fire	Harm (pups) Forest Conversion	Harm (adults) Timber Harvest	Harm (adults) Forest Conversion	Harm (adults) Average Wind	Total Annual Harassment	Total Annual Harm (pups)	Total Annual Harm (adults)
Midwest	Iowa	619	310	76	9	30	2	2	1	102	1,005	41	105
Midwest	Illinois	1,469	314	239	21	30	4	5	1	70	2,022	55	76
Midwest	Indiana	1,207	149	94	18	15	2	4	1	43	1,450	35	48
Midwest	Michigan	5,240	183	874	75	18	13	16	3	24	6,297	106	43
Midwest	Minnesota	6,706	4,306	2,190	96	409	32	21	7	53	13,202	537	81
Midwest	Missouri	2,831	576	276	41	55	4	9	1	18	3,683	100	28
Midwest	Ohio	2,111	73	354	31	7	6	7	2	36	2,538	44	45
Midwest	Wisconsin	7,493	441	841	107	42	12	23	3	18	8,775	161	44
Eastern	Connecticut	30	1	9	1	1	1	1	1	1	40	3	3
Eastern	Delaware	5	1	3	1	1	1	1	1	0	9	3	2
Eastern	Maine	2,767	1	305	40	1	5	9	1	13	3,073	46	23
Eastern	Maryland	24	5	11	1	1	1	1	1	10	40	3	12
Eastern	Massachusetts	30	1	16	1	1	1	1	1	3	47	3	5
Eastern	New Hampshire	215	1	38	4	1	1	1	1	6	254	6	8
Eastern	New Jersey	37	73	62	1	7	1	1	1	0	172	9	2
Eastern	New York	1,880	2	150	27	1	3	6	1	28	2,032	31	35
Eastern	Pennsylvania	2,104	20	244	30	2	4	7	1	67	2,368	36	75
Eastern	Rhode Island	0	1	3	0	1	1	0	1	0	4	2	1
Eastern	Vermont	163	2	13	3	1	1	1	1	5	178	5	7
Eastern	Virginia	2,963	209	1,463	43	20	21	9	5	2	4,635	84	16
Eastern	West Virginia	1,316	13	217	19	2	4	4	1	10	1,546	25	15
Southern	Arkansas	17,961	6,221	4,672	256	591	67	55	15	2	28,854	914	72
Southern	Kentucky	2,772	208	585	40	20	9	9	2	1	3,565	69	12
Southern	Mississippi	9,309	3,091	3,983	133	294	57	29	13	0	16,383	484	42
Southern	North Carolina	4,892	2,711	3,245	70	258	47	15	10	8	10,848	375	33
Southern	Tennessee	1,695	196	706	25	19	11	6	3	1	2,597	55	10
Western	Kansas	172	2	69	3	1	1	1	1	52	243	5	54
Western	Nebraska	250	120	66	4	12	1	1	1	18	436	17	20
Western	North Dakota	0	102	30	0	10	1	0	1	42	132	11	43
Western	South Dakota	585	84	170	9	8	3	2	1	18	839	20	21
	Total	76,846	19,417	21,004	1,109	1,859	317	247	83	650	117,267	3,285	980

Table 5 - Summary of annual disturbance and harm estimates from timber harvest, prescribed fire, forest conversion, and wind[10] (Table 4.15 in the draft BO)

[10] Wind is the mean annual estimate from 2015 to 2022 reported in Table 4.13.

In summary, the Service's draft Biological Opinion (BO) for the proposed final 4(d) rule (Service 2015, unpublished data) estimates the number of NLEBs potential impacted per year by forest management, forest conversion, and wind energy development under alternative 3 to be approximately 121,532 from an estimated total population of nearly 10 million bats (1.2 percent of the total population)(Table 5). Impacts from disturbance are expected to be temporary, but may result in harm to some bats. These impacts may be distributed unevenly across the range, but disturbance is not expected to exceed 2.2 percent in any State. Further, the number of bats potentially harmed is expected to be much lower than those disturbed. We estimate 3,285 NLEB pups and 980 NLEB adults could be harmed per year, which is approximately 0.1 percent of the estimated pup population, and 0.01 percent of the estimated adult population. Harm to pups is expected to come from forest management and conversion, while harm to adults includes both forest management and conversion and wind turbines. As with disturbance, harm will not be evenly distributed. However, harm to pups in any State is not expected to exceed 0.2 percent except in States where 3 or fewer pups will be harmed. Distribution of harm to adults will likely be even less concentrated. Nearly 2/3 of the harm to adults is expected to come from wind turbines, which are distributed differently across the NLEB range than forests. Loss of adults from local populations may diminish their capacity to withstand other stressors, and loss of females could inhibit reproductive rates in local populations. Loss of pups may reduce the numbers of juveniles in local populations, and to some extent the number of adults in subsequent years. This is not expected to have a significant impact on statewide populations, as the total harm to adults is not expected to exceed 0.3 percent in any State, and in most States is expected to be less that 0.1 percent.

Throughout this process we have searched for ways to fully protect the NLEB while providing flexibility to the regulated public so they will seek to conserve the species and help foster its recovery. We believe recovery of this species will require many partnerships across the species range, and minimizing regulatory impacts on activities that have minor direct and indirect impacts to NLEB populations provides an important step in building these partnerships. Both alternatives 1 and 3 would allow the regulated public to manage their land in a manner that is lawful and compatible with the NLEBs conservation needs, and allows for protection of the species in a manner that the Service deems necessary and advisable for the conservation of the species. Both alternatives 1 and 3 would allow the Service to determine what prohibitions and exceptions to incidental take are necessary for the long-term survival of the species. Nothing in alternative 1 or 3 would affect other provisions of the ESA, such as designation of critical habitat under section 4, recovery planning under section 4(f), consultation requirements under section 7, and permitting requirements under section 10. The default provisions under 50 CFR 17.31 and 17.32, unmodified by a species-specific 4(d) rule, does not provide the regulated public with flexibility, nor does it provide the Service the opportunity to develop necessary and advisable regulations for the conservation of the NLEB. Rather, alternative 2 would require the Service to establish protections and exceptions through other means, mainly on a project-by-project basis through section 7 and 10 of the ESA and technical assistance. In addition, as discussed in the listing rule and interim 4(d) rule, applying the default provisions would not provide any significant conservation benefit to the species.

4.2.2 Other Cave-dwelling Species associated with Known Hibernacula

Analysis of impacts to other cave-dwelling species includes those which could substantially affect a species' population or reduce its habitat quality or quantity.

As discussed in Chapter 3, many of the caves used by NLEBs as hibernacula provide highly specialized habitats to a number of fish and wildlife species, including Federally listed species like the Grotto sculpin *(Cottus specus),* tumbling creek cave snail *(Antrobia culveri),* Ozark cavefish (*Amblyopsis rosae*), and cave crayfish (*Cambarus aculabrum*). Several species of Federally listed cave-dwelling bats have also been observed with or adjacent to NLEBs in their hibernacula, including gray bats (*Myotis grisescens*), Virginia big-eared bats (*Corynorhinus townsendii virginianus*), and Indiana bats (*Myotis sodalis*)(Service 1999). Many native animals also use these caves, including birds (e.g., swallows, falcons and hawks), small and large mammals (e.g., mice, raccoons, deer, bear), certain fish, and invertebrates.

Significant beneficial or adverse impacts to other cave-dwelling species using known NLEB hibernacula are not expected under any of the three alternatives. Quantifying the benefits to these species as a result of the conservation measures in the alternatives is very difficult, without first having an understanding of the species in those caves, their population status, and their unique threats. All of the alternatives would prohibit activities inside known hibernacula in the WNS zone, which we believe will provide the greatest conservation benefits to other cave-dwelling fish and wildlife species. Maintaining tree cover directly around known NLEB hibernacula will help safeguard surface and ground water quality associated with these cave hibernacula, which should have a positive long-term effect on the unique species that depend on these cave environments.

4.2.3 Migratory Birds and other Wildlife

Analysis of impacts to migratory birds and other wildlife include those can substantially affect a species' population or reduce its habitat quality or quantity. As per NEPA and CEQ guidelines, the human environment includes avian resources. Under Executive Order 13186, Federal agencies are expected to carry out, among other things, the following: 1) ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern; and, 2) identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors.

Based on the above criteria, significant beneficial or adverse impacts to migratory birds are not expected under any of the three alternatives. No alternative would significantly impact a species' population (locally, regionally, or range-wide) or reduce its habitat quality or quantity. However, indirectly conserving forested habitat around 1,744 known occupied maternity roost trees and 1,508 known hibernacula should benefit migratory birds using those areas. Further, both alternatives 1 and 2 would prohibit incidental take of NLEBs associated with forest conversion activities in known NLEB habitat, although to varying degrees. If the net effect of the

take prohibition on NLEBs as a result of forest conversion were to result in additional conservation of forested landscapes, the impact to some migratory birds could be substantial. For instance, bottomland hardwood forests in the southeastern U.S., in addition to providing habitat for many bat species, it also provides habitat for at least 70 species of breeding birds, including several declining species of regional and national concern, like the swallow-tailed kite, prothonotary warbler, and Swainson's warbler.

Wind energy development negatively impacts migratory tree bats. Some of the most negatively impacted bat species are the hoary bat *(Lasiurus cinereus)*, eastern red bat *(Lasiurus borealis)*, and silver-haired bat *(Lasionycteris noctivagans)* which account for approximately 70 percent of those killed at wind energy facilities. To estimate the potential impact that wind energy development could have on migratory tree bat species, we used data from a draft EIS prepared for the Midwest Wind Energy HCP. While the studies used to estimate bat fatality rates for that draft EIS were limited to studies conducted in six Midwestern states, the estimates represent the best available information that we had for this EA. We acknowledge the uncertainty of these estimates for the Eastern, Southern, and Western portions of the species' range. Seventeen fatality monitoring studies were used to estimate fatality rates: two were conducted in Minnesota, three in Wisconsin, three in Iowa, four in Illinois, two in Indiana, and three in Ohio. Reported bat fatality rates were variable across projects and ranged from a low of 1.42 bats/MW/study period at the Big Blue project in Minnesota (Fagen Engineering, LLC 2014), to 38.25 bats/MW/study period at the Cedar Ridge project in Wisconsin (BHE Environmental 2010). The mean bat fatality rate derived from those studies was 17.55 bats/MW/year. This estimate is similar to pre-WNS surveys in Maryland (15.61 bats/MW; Young et al. 2011) and Pennsylvania (14.4 bats/MW; Taucher et al. 2012), which addresses some of the uncertainty of using Midwest estimates for the entire range.

In terms of the composition of bat species being killed; the draft EIS looked at 71 studies across the Midwest. From these 71 studies, three species of long-distance migrants made up the highest percentage of fatalities, totaling 88 percent of the 8,934 bat carcasses documented across all studies. Eastern red bats had the highest number of fatalities (3,893 bat carcasses or 44 percent), followed by hoary bats (2,328 bat carcasses or 26 percent), and silver-haired bats (1,621 bat carcasses or 18 percent). The next most common species found among fatalities were big brown bats (519 bat carcasses or 6 percent), followed by little brown bats (339 bat carcasses or 4 percent). NLEBs made up 0.09 percent (8 bat carcasses out of 8,934) of the fatality pool.

Currently, there is approximately 28,284 MW of installed capacity across the 37 State range of the NLEB. To estimate the potential future impact of wind energy development on bats, we used the Department of Energy's 2020 and 2030 build-out projections from the interactive map developed using data from with their 2015 Wind Vision Report (http://energy.gov/maps/map-projected-growth-wind-industry-now-until-2050; USDOE 2015). According to this data, the total amount of installed wind capacity for states with more than 50 percent of their area within the NLEB range is projected to be 44,100 MW by 2020, and 100,380 MW by 2030 (Table 7). Based on these projections and the mean bat fatality rate derived from the 17 studies discussed above (17.55 bats/MW/year), we estimate that approximately 496,884 bats were killed by wind energy facilities in 2014. By 2020, that number could rise to 773,955 bats, and by 2030, it could reach 1,761,669 bats per year. Again, we recognize that these are over-estimates because they do not

account for avoidance and minimization measures applied at wind energy facilities to reduce take of Indiana bats, which have been proven effective for avoiding and minimizing take of other bat species, including those most negatively impacted by wind energy development in the WNS zone (i.e., hoary bat, eastern red bat, and silver-haired bat*).* AWEA's voluntary protocols for bat take avoidance and minimization (through feathering of wind turbines at low wind speeds) if implemented by facilities, could reduce impacts to migratory tree bats by as much as 30 percent (AWEA 2015). Again, this is especially important for facilities operating in those 17 States where Indiana bats are not present.

Under alternatives 1, incidental take of NLEBs due to wind energy development would remain prohibited within the WNS zone, unless the incidental take is authorized through another means (e.g., section 7 and 10 of the ESA). Under alternative 2, incidental take of NLEBs due to wind energy development would be prohibited range-wide, unless the incidental take is authorized through another means (e.g., section 7 and 10 of the ESA). Facilities at-risk for NLEB take in these areas would presumably avoid and minimize NLEB take through section 10 of the ESA, which could also reduce fatalities of migratory tree bats by up to 50 percent. Under alternative 3, incidental take of NLEBs attributable to wind energy development would not be prohibited, thus impacts to migratory tree bats would be greatest under this alternative. Since alternative 2 would prohibit incidental take of NLEBs due to wind energy development range-wide, we would expect this alternative to reduce potential adverse impacts to migratory tree bats the most.

All of the alternatives would contribute toward protecting NLEB habitat around known occupied maternity roost trees and known hibernacula, which will also benefit other bat species using these areas. NLEBs are often found among tri-colored bats (*Perimyotis subflavus*), little brown bats (*Myotis lucifugus*), big brown bats (*Eptesicus fuscus*), Indiana bats (*Myotis sodalis*), eastern red bats (*Lasiurus borealis*), hoary bats (*Lasiurus cinereus*), silver-haired bats (*Lasionycteris noctivagans*), eastern pipistrelles (*Perimyotis subflavus*) (now tricolored bat), Virginia big-eared bats (*Plecotus townsendii*) and Ozark big-eared bats *(Plecotus townsendii ingens)*. Alternative 2 could have the greatest positive effect on these species as it could potentially conserve the greatest amount of habitat in these areas, and would prohibit incidental take of NLEBs as a result of wind energy development range-wide. Alternative 3 would have the least beneficial effect on bat species, as it involves the smallest buffers of any alternative. Alternative 3 would also have the greatest adverse impact on bat species as it would not prohibit incidental take of NLEBs due to wind energy development.

Neither alternative 1 or 2 will likely cause significant adverse impacts to bat populations, as neither is expected to cause a reduction of any species population below a level needed for maintaining viability at regional levels, or cause any substantial loss or degradation of their habitat. Both alternatives 1 and 2 would prohibit incidental take of NLEBs attributable to wind energy development (unless authorized through section 7 or section 10), which in effect, could reduce overall wind energy-related bat fatalities across the WNS zone. All alternatives would indirectly conserve forest resources around known hibernacula and around known occupied maternity roost trees, which in effect could benefit other bat species using these areas as well. Under alternative 3, incidental take of NLEBs attributable to wind energy development would no longer be prohibited. Absent any conservation measures to reduce the estimated future take of migratory tree bats due to wind energy development in the WNS zone (e.g., conservation

measures for the Indiana bat), impacts to migratory tree bat populations could be significant. However, to the best of our knowledge, migratory tree bats are common and widely distributed, but population sizes and structures are unknown. Without reliable information on population sizes for migratory tree bat species, it is difficult to ascertain whether current or future collision fatality levels represent a significant threat to these species (NAS 2007; Kunz et al. 2007; Arnett et al. 2008; Arnett and Baerwald 2013). Nonetheless, if wind energy facilities operating in the 20-states where Indiana bats and NLEBs overlap (Figure 3) were to avoid, minimize, and mitigate incidental take of Indiana bats, and if facilities operating in the 17 NLEB States where Indiana bats are absent were to incorporate AWEA's voluntary bat avoidance and minimization BMPs (AWEA 2015), take of migratory tree bats due to wind energy development would be greatly reduced.

Significant impacts to bald and golden eagles are not expected under any of the three alternatives. No alternative would substantially affect a species' population (locally, regionally, or range-wide) or reduce its habitat quality or quantity. As discussed in Chapter 3, both species are found within the WNS zone, and both species are prone to disturbance during their nesting periods. Each of the alternatives involve indirectly protecting forest habitat around known hibernacula and known occupied maternity roost trees, which could possibly provide minor direct conservation benefits to bald and golden eagles using those areas. However, both species are already afforded protections under the Bald and Golden Eagle Protection Act (BGEPA), MBTA, Lacey Act, and by most States. Therefore, the additive conservation benefit from the protective buffers around NLEB hibernacula and roost trees is expected to be minor at best.

4.3 Impacts to the Socioeconomic Environment

Analysis of impacts to the socioeconomic environment includes a general impact analysis and a discussion of potential impacts to wind energy development and land management and development activities involving tree removal in the WNS zone.

4.3.1 General Impact Analysis

Implementation of the alternatives is not expected to have any significant direct, indirect, or cumulative impacts on socioeconomic resources, including regional or local employment and income, local or regional property values, community services, local or regional population (including low income/minority populations), housing, or public services. None of the alternatives would be incompatible with local land use, zoning, and future planned development; results in indirect effects to surrounding lands; and/or result in substantial degradation in a designated recreational use on surrounding land. Alternative 3 would have the least impact to any of these resources as in addition to being necessary and advisable for the conservation of the species, it would also greatly reduce the potential regulatory burden associated with ESA compliance for many individuals and entities. Alternative 2 would have the greatest potential for impacts to socioeconomic resources, as the need for ESA compliance would cover the greatest amount of activities and the greatest amount of area.

4.3.2 Wind Energy Development

Wind-energy facilities are found scattered throughout the range of the NLEB and many new facilities are anticipated to be constructed over the next 15 years (United States Department of Energy 2008). Wind energy facilities have been found to take NLEBs during operation of their turbines, particularly at low wind speeds. Many wind energy companies are interested in obtaining an exception to the take provisions in 50 CFR 17.31 through a final 4(d) rule, while others are actively taking steps to obtain a permit under section 10 of the ESA that would authorize incidental take of NLEBs at their facilities.

Under both alternative 1 and alternative 2, incidental take of NLEBs from wind energy development would be prohibited. Under alternative 1, the incidental take prohibitions would apply to facilities operating in the WNS zone. Under alternative 2, incidental take of NLEBs from wind energy development would apply range-wide. Wind energy facilities in these areas at-risk for take of NLEBs would need to either apply operational modifications to their turbines to avoid take of NLEBs (e.g., curtail operation of their turbines at low wind speeds), or seek an incidental take permit from the Service under section 10 of the ESA that would authorize take of NLEBs at their facilities. Operational modifications of wind turbines (e.g., curtailment, feathering, BMPs) can result in both lost power generation and lost revenues to a facility. Developing an HCP can be both expensive and time-consuming. In some cases, the operational modifications or requirements to get an incidental take permit might exceed expectations for a prospective project, and those projects may not be built. Landowners associated with these projects may forego revenue from leasing land to wind energy companies. Taxing districts may forgo tax revenues.

Under alternative 3, incidental take of NLEBs at wind energy facilities would not be prohibited. Therefore, there should not be any major adverse impacts to any socioeconomic aspect of wind energy development.

4.3.3 Land Management and Development Activities involving Tree Removal

As discussed in Chapter 3, a number of land management and development activities involving tree removal and applied to natural and built environments could be impacted by the proposed action and alternatives. These include individuals and entities involved with forest management activities; development activities such as commercial and residential development, energy production and transmission, infrastructure development, mining, and commercial timber harvest; prairie management; and ROW establishment and maintenance. NLEB conservation measures involving tree removal timing restrictions, tree removal acreage restrictions, timber harvest restrictions, and ROW expansion and maintenance restrictions could impact individuals and entities carrying out these activities, which could range from minor inconveniences to potential economic consequences. For each of the alternatives we characterize impacts to the socioeconomic environment as potential “conflicts” between land management and development objectives involving tree removal activities and the NLEB incidental take prohibitions associated with tree removal for each alternative.

Forest Management

As discussed above, we expect approximately 2 percent of forests in States within the 37 State range of the NLEB to experience forest management activities this year (Boggess et al., 2014). Assuming that 2 percent reflects an approximation of the average annual amount of forest land potentially affected by forest management activities in each State, including forest land within the proposed buffer areas around known hibernacula and known occupied maternity roost trees, we calculated the average annual amount of forest land within the proposed buffer areas that could potentially conflict with forest management activities under each alternative.

Within the 31 States with known hibernacula there are approximately 333,463,407 acres of forest land. Assuming the acreage totals in section 4.1.1 represent a close approximation of the forest land in hibernacula buffer areas, the total acreage of forest land that could potentially conflict with annual forest management activities in those proposed hibernacula buffer areas is as follows. Under alternative 1, there are approximately 189,556 acres in the known hibernacula buffer areas across 31 States. Forest management activities could conflict with NLEB conservation measures on 3,791 of those acres annually. Under alternative 2, there are approximately 75,799,620 acres in the known hibernacula buffer areas across 31 States. Forest management activities could conflict with NLEB conservation measures on 1,515,992 of those acres annually. Under alternative 3, there are approximately 189,556 acres in the known hibernacula buffer areas across 31 States. Forest management activities could conflict with NLEB conservation measures on 3,791 of those acres annually.

Within the 19 States with known occupied maternity roost trees there are approximately 248,050,747acres of forest land. Again, assuming the acreage totals in section 4.1.1 represent a close approximation of the forest land in these buffer areas, the total acreage of forest land that could potentially conflict with annual forest management activities in the proposed known occupied maternity roost tree buffer areas is as follows. Under alternative 1, there are approximately 219,221 acres in the known occupied maternity roost tree buffer areas across 19 States. Forest management activities could conflict with NLEB conservation measures on 4,384 of those acres annually. However, because conservation measures around maternity colonies under alternative 1 only apply for 16.7% of the year (during the non-volant season), activities would only conflict seasonally with NLEB conservation measures on 732 acres. Under alternative 2, there are approximately 7,889,856 acres in the known occupied maternity roost tree buffer areas across 19 States. Forest management activities could conflict with NLEB conservation measures on 157,797 of those acres annually. Under alternative 3, there are approximately 2,790 acres in the known occupied maternity roost tree buffer areas across 19 States. Forest management activities could conflict with NLEB conservation measures on 56 of those acres annually. Because conservation measures around maternity colonies under alternative 3 only apply for 16.7% of the year, activities would only conflict seasonally with NLEB conservation measures on 9 acres.

Forest Conversion

Over the short-term, we anticipate that roughly 914,237 acres of forest land in the NLEBs U.S. range will be converted annually to other uses, which is about 0.3 percent of the total acres of

forest land within the 30 States used to estimate NLEB population. Assuming that 0.3 percent reflects an approximation of the average annual amount of forest land potentially affected by forest conversion activities in each State, including forest land within the buffer areas established for known hibernacula and known occupied maternity roost trees, the average annual amount of forest land in the buffer areas that could potentially conflict with forest conversion activities would be as follows:

Within the 31 States with known hibernacula there are approximately 333,463,407 acres of forest land. Assuming the acreage totals in section 4.1.1 represent a close approximation of the total forest land in the hibernacula buffer areas, the total acreage of forest land that could potentially conflict with annual forest management activities in those proposed buffer areas is as follows. Under alternative 1, there are approximately 189,556 acres in the known hibernacula buffer areas across 31 States. Forest conversion activities could conflict with NLEB conservation measures on 615 of those acres annually. Under alternative 2, there are approximately 75,799,620 acres in the known hibernacula buffer areas across 31 States. Forest conversion activities could conflict with NLEB conservation measures on 246,121 of those acres annually. Under alternative 3, there are approximately 189,556 acres in the known hibernacula buffer areas across 31 States. Forest conversion activities could conflict with NLEB conservation measures on 615 of those acres annually.

Within the 19 States with known occupied maternity roost trees there are approximately 248,050,747 acres of forest land. Assuming the acreage totals in section 4.1.1 represent a close approximation of the forest land in the roost tree buffer areas, the total acreage of forest land that could potentially conflict with annual forest conversion activities is as follows. Under alternative 1, there are approximately 219,221 acres in the known occupied maternity roost tree buffer areas across 19 States. Forest conversion activities could conflict with NLEB conservation measures on 712 of those acres annually. However, because conservation measures around maternity colonies under alternative 1 only apply for 16.7% of the year (during the non-volant season) activities would only conflict seasonally with NLEB conservation measures on 119 acres. Under alternative 2, there are approximately 7,889,856 acres in the known occupied maternity roost tree buffer areas across 19 States. Forest conversion activities could conflict with NLEB conservation measures on 25,618 acres annually across 19 States. Under alternative 3, there are approximately 2,790 acres in the known occupied maternity roost tree buffer areas across 19 States. Forest conversion activities could conflict with NLEB conservation measures on 9 of those acres annually. Because conservation measures around maternity colonies under alternative 3 only apply for 16.7% of the year activities would only conflict seasonally with NLEB conservation measures on 2 acres.

All of the alternatives establish incidental take prohibitions for certain types of otherwise lawful activities. Land management and development activities (i.e., forest management and forest conversion) may occur on 2 percent and 0.3 percent respectively of available forest land in any given year. Put another way, roughly 98 percent of potential forest land will be unaffected by forest management and conversion activities in any particular year. Under any alternative, individuals and entities at-risk for unlawful incidental take of NLEBs would need to either avoid take by modifying their activities (e.g., when the activity occurs, how the activity is implemented) or seek an incidental take authorization from the Service under section 7 or 10 of

the ESA. For some, modifying their activities to avoid take could cause project delays and/or increased costs. Similarly, obtaining an incidental take permit under section 10 of the ESA can be expensive and time consuming. For these reasons, some projects may not get implemented, which could cause economic hardship to some individuals. Further, many of the individuals and entities conducting land management and development activities across the WNS zone already require various Federal authorizations to conduct their projects, including transportation-related projects, energy extraction and transmission projects, timber harvest projects on Federal land, certain mining projects, and projects that involve wetlands, depending on the activity. Under alternative 2 this would remain largely the status quo. Under alternatives 1 and 3, individuals and entities would be afforded both a reduced geographic extent of the NLEB take prohibitions, and a streamlined process for Federal agencies to receive incidental take authorizations through section 7 of the ESA. Thus, the potential regulatory burden associated with ESA compliance for both Federal and non-Federal entities would be substantially less under alternatives 1 and 3, compared to alternative 2.

TABLE 8
SUMMARY AND COMPARISON OF ENVIRONMENTAL CONSEQUENCES

Resources	Potential Environmental Consequences		
	Alternative 1	**Alternative 2**	**Alternative 3**
Forest Resources	A buffer area limiting tree removal within 0.25 miles around known hibernacula A seasonal buffer area limiting tree removal within 0.25 miles around known occupied maternity roost trees Additional consultation requirements for incidental take related to: --Removal of trees within buffers --Tree removal of more than one acre of NLEB habitat --Conversion of hardwood or mixed forest into monoculture pine plantations or non-forest	Tree removal could be limited up to 5 miles around known hibernacula Tree removal could be limited up to 1.5 miles around known occupied maternity roost trees Additional consultation requirements for incidental take related to: --Tree removal of more than one acre of NLEB habitat within 1.5 miles of known occupied maternity roost trees --Tree removal of more than one acre of NLEB habitat within 5 miles of known hibernacula	A buffer area limiting tree removal 0.25 within miles around known hibernacula A seasonal buffer area limiting tree removal within 150 feet around known occupied maternity roost trees Additional consultation requirements for incidental take related to: --Removal of trees within buffers
Water Resources	Minor direct and indirect positive effects for groundwater quality	Positive effect on ground water quality, including reduced use of herbicides	Minor direct and indirect positive effects for groundwater quality
Northern Long-eared Bats	No significant impacts to NLEB populations expected; harassment and a small amount of harm may have local impacts	No significant impacts to NLEB populations expected; harassment and a small amount of harm may have local impacts	No significant impacts to NLEB populations expected; harassment and a small amount of harm may have local impacts

Northern Long-eared Bats Cont.	Incidental take from disturbing individuals in a hibernacula or altering a hibernaculum's environment prohibited A buffer protects roosting and foraging habitat within 0.25 miles around known hibernacula from tree removal, and bats using these trees A buffer protects pups and adult bats in known occupied maternity roost trees, as well as roosting and foraging habitat within 0.25 miles around known occupied maternity roost trees Incidental take of NLEB associated with tree removal of one acre or more of NLEB habitat in the WNS zone prohibited Incidental take of NLEB associated with conversion of hardwood or mixed forest to monoculture pine plantations or non-forest prohibited	Incidental take from disturbing individuals in a hibernacula or altering a hibernaculum's environment prohibited No specific buffer designated to protect hibernacula, but protections likely up to 5 miles around known hibernacula No specific buffer designated to protect maternity roost trees, but protections likely up to 1.5 miles around known occupied maternity roost trees. Incidental take of NLEB associated with tree removal of one acre or more of NLEB habitat in the WNS zone prohibited	Incidental take from disturbing individuals in a hibernacula or altering a hibernaculum's environment prohibited A buffer protects roosting and foraging habitat within 0.25 miles around known hibernacula from tree removal, and bats using these trees A buffer protects pups and adult bats in known occupied maternity roost trees, as well as roosting and foraging habitat within 150 feet around known occupied maternity roost trees
Other Cave-Dwelling Species associated with Known Hibernacula	Internal cave environments protected in the WNS zone Cave water quality may be improved	Internal cave environments protected in the WNS zone Cave water quality may be improved	Internal cave environments protected in the WNS zone Cave water quality may be improved
Migratory Birds and Other Wildlife	Significant impacts to migratory birds, and bald and golden eagles are not expected Benefit to other bat species through habitat protection near known hibernacula and roost trees	Significant impacts to migratory birds, and bald and golden eagles are not expected Benefit to other bat species through habitat protection near known hibernacula and roost trees—this alternative expected to have the largest benefit from habitat protection	Significant impacts to migratory birds, and bald and golden eagles are not expected Benefit to other bat species through habitat protection near known hibernacula and roost trees

Migratory Birds and Other Wildlife Cont.	Reduced impacts to other bat species provided by wind energy permit requirements in areas outside of Indiana bat habitat	Reduced impacts to other bat species provided by wind energy permit requirements in areas outside of Indiana bat habitat	No reductions in impacts to other bat species provided by wind energy permit requirements in areas outside of Indiana bat habitat
General Socioeconomic Impacts	No significant impacts are expected	No significant impacts are expected, but this alternative has the greatest potential for impacts through additional regulatory burdens	No significant impacts are expected, but this alternative has the least potential for impacts
Wind Energy Development	Incidental take of NLEB from wind energy prohibited within WNS zone—operational modifications or Section 10 permit required	Incidental take of NLEB from wind energy prohibited throughout NLEB range—operational modifications or Section 10 permit required	No impact to wind energy development
Land Management and Development Activities involving Tree Removal	Activities at risk of incidental take of NLEB will need to modify projects to avoid take or acquire incidental take authorization Estimated annual acreage where authorization could be required for: --Forest management near hibernacula—3,791 acres --Forest management near known occupied maternity roost trees—4,384 acres --Forest conversion near hibernacula—615 acres --Forest conversion near known occupied maternity roost trees—712 acres	Activities at risk of incidental take of NLEB will need to modify projects to avoid take or acquire incidental take authorization Estimated annual acreage where authorization could be required for: --Forest management near hibernacula—1,515,992 acres --Forest management near known occupied maternity roost trees—157,797 acres --Forest conversion near hibernacula—246,121 acres --Forest conversion near known occupied maternity roost trees—25,618 acres	Activities at risk of incidental take of NLEB will need to modify projects to avoid take or acquire incidental take authorization Estimated annual acreage where authorization could be required for: --Forest management near hibernacula—3,791 acres --Forest management near known occupied maternity roost trees—56 acres --Forest conversion near hibernacula—615 acres --Forest conversion near known occupied maternity roost trees—9 acres
Environmental Justice	No disproportionate effects expected	No disproportionate effects expected	No disproportionate effects expected

4.4 Environmental Justice

Executive Order 12898 requires Federal agencies to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations. There are minority and low-income populations across the range of the NLEB and within the WNS zone where the conservation measures would apply. However, none of those measures or anything else related to the proposed action or alternatives will have a disproportionate adverse environmental impact on minority and low income populations requiring additional consideration under environmental

justice requirements. Specifically, minority and low income groups or individuals are not expected be impacted at a rate that appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group. Therefore, further consideration of the environmental justice policy under NEPA is not required. If environmental impacts occur to minority or low-income individuals and rise to the level of significance under NEPA, it is highly improbable that there will be a disproportionate impact. Hence the impacts, positive or negative, that will occur under the proposed action or any alternative will be neither disproportionately gained nor borne by minority or low income populations.

4.5 Cumulative Effects

The combined, incremental effects of human activities, commonly referred to as cumulative effects, pose a serious threat to the environment. Cumulative effects are defined in 40 CFR 1508.7 to mean "the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-federal) or person undertakes such other actions." Cumulative effects result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. Cumulative effects within the context of the NEPA arise when a relationship exists between a proposed action and other actions that have occurred or are expected to occur in a similar location or period of time. It is the combination of these effects, and any resulting environmental degradation, that is the focus of a cumulative effects analysis. As stated earlier, the proposed Federal action in this EA is to establish regulations through a final 4(d) rule for the NLEB that are both necessary and advisable, and specifically tailored to the conservation needs of the species. Those regulations include prohibitions and exceptions for take of NLEBs under the ESA. A basic tenet of the proposed regulations is the Service does not authorize or prohibit the activities that cause the take of NLEBs, but rather the take that results from the activities. CEQ guidelines acknowledge that while "in a broad sense all the impacts on affected resources are probably cumulative," it is important to "count what counts" and narrow the focus of the analysis to important national, regional, and local issues (CEQ 1997).

4.5.1 Physical Environment

None of the alternatives, including the no action alternative, will result in cumulative adverse effects to physical resources (i.e., forest resources, groundwater resources). All of the alternatives propose conservation measures to protect NLEBs from known threats and stressors (e.g., habitat loss and alternation, human disturbance) while they are in and around known hibernacula and known occupied maternity roost trees. As a result, some forest resources in these areas may not experience on-going or planned management, conversion, or development activities involving tree removal, at least within the timeframes established for each alternative. As noted above, as a result of listing the NLEB as a threatened species under the ESA, we might see a heightened awareness and appreciation of the NLEB and its habitat. As a result, individuals and entities who own or control the land around within the proposed buffer areas may voluntarily implement actions that conserve forest resources for NLEBs.

4.5.2 Biological Environment

Impacts to migratory tree bats due to wind energy development have and will continue to contribute to overall bat mortality. For some bat species, wind energy development has the potential to adversely impact their populations at both local and regional scales, as fatalities will likely increase as wind energy development continues to expand (see section 4.2.3). Under alternative 1, incidental take from wind energy facilities would be prohibited within the WNS zone. Under alternative 2, the same incidental take prohibition would apply except range-wide. Under these alternative, wind energy facilities at-risk for take of NLEBs would either need to avoid take through operational modifications or minimize take through an HCP. Terms of these HCPs might include measures to reduce incidental take of NLEBs and measures to off-set impacts through mitigation. Minimization and mitigation measures applied for NLEBs through an HCP also benefit many migratory tree bats. Under alternative 3, incidental take from wind energy facilities would not be prohibited, therefore wind energy facilities would not need an incidental take permit for NLEBs.

Voluntary operational measures to minimize incidental take of all bats at wind facilities are expected to reduce bat mortality rates by up to 30 percent (AWEA 2015), although not necessarily as much as an HCP might require. Incidental take minimization and mitigation measures applied at wind energy facilities for the Indiana bat are also effective at reducing the mortality of migratory tree bats. In 20 of the 37 States where NLEBs occur, Indiana bats also occur. Therefore, we assume facilities in these States who are at-risk for take of Indiana bats are already implementing avoidance, minimization and mitigation measure for Indiana bats, which also benefit other bat species. All three alternatives will contribute cumulatively to effects associated with bat mortality. Among the three alternatives, Alternatives 1 and 2 would contribute the least to cumulative bat mortality, and Alternative 3 would contribute the most. However, with regard to NLEBs, as discussed in Chapter 3 NLEB mortality from wind energy development is minor when compared to take of other bat species, and as discussed in the final listing decision, we do not anticipate that NLEB mortality caused by wind energy facilities will meaningfully change the species status in the foreseeable future. Further, it is highly probable that as the population of NLEBs is reduced by WNS, the numbers of bats taken at wind energy facilities will also be reduced.

As noted above, the Service estimates that roughly 500,000 birds are killed each year as a result of wind energy development, which is substantially lower than bird mortality from other anthropogenic factors, including vehicles, buildings and windows, transmission lines, communication towers, pesticides, and feral and domestic cats. None of the alternatives, including the no action alternative, will result in significant cumulative effects to migratory birds from wind energy development.

Cumulative impacts from past, present and future land management activities involving tree removal has resulted in additive habitat loss and mortality for migratory birds. Millions of acres of forested landscapes were cleared over the past 100 years to make way for row-crop agricultural fields and other forms of development. None of the alternatives will either reverse this trend or significantly change the status of habitat for migratory birds at any scale.

We have no evidence that land management and development activities separately or cumulatively are contributing to range-wide population effects to NLEBs. In fact, we believe the level of take associated with on-going land management actions and wind energy development do not individually or cumulatively affect NLEBs at the broader population level. There is currently no evidence that any of the threats discussed in Chapter 3 (i.e., human disturbance, forest conversion, forest management, wind energy, climate change, and environmental contaminants) have separately or cumulatively contributed to significant range-wide population effects on the NLEB prior to the onset of WNS. However, declines due to WNS have significantly reduced the number and size of NLEB populations in some areas of its range. This has reduced these populations to the extent that they may be increasingly vulnerable to other stressors that they may have previously had the ability to withstand. These impacts could potentially be seen on two levels. First, individual NLEB sickened or struggling with infection by WNS may be less able to survive other stressors. Second, NLEB populations impacted by WNS, with smaller numbers and reduced fitness among individuals, may be less able to recover making them more prone to extirpation.

All of the conservation measures proposed in the alternatives are necessary and advisable for the conservation of the NLEB because they provide some level of protection to known occupied maternity roost trees and known hibernacula within the WNS zone. Under alternative 1, there would not be any change from the interim rule, so there would be no additional impacts to the NLEB from land management, development, and wind energy activities. Under alternative 2, the buffer areas around known hibernacula and known occupied maternity roost trees could be substantially larger than those in alternative 1 therefore, we expect potential impacts to NLEBs from land management and development activities to be less, at least at these local scales. Under alternative 3, as a result of the reduced buffer size around known occupied maternity roost trees, we expect local populations of NLEB to occasionally experience reductions in foraging areas and travel corridors, and removal of unknown roost trees. However, we expect these reductions in habitat to be minor and infrequent, and only result in short-term impacts to local NLEB populations.

4.5.3 Socioeconomic Environment

Neither the proposed action nor the alternatives are expected to significantly contribute to loss or adverse impacts to socioeconomic resources, including land use, transportation and utilities, and recreation, nor are they expected to create a separate, additive cumulative effect to any social and/or economic resource beyond that which already exists under alternative 1.

Land use within the NLEBs range has drastically changed due to past and present development, and this trend would be expected to continue. Urban development is expanding with population, generally occurring on the periphery of already developed areas, and there is no evidence of any shift in this trend. Land will continue to be converted from rural to developed uses, and urban uses will continue to be intensified within already developed areas. We do not expect the proposed action or alternatives to affect this, or the ability for developers to meet these development demands. Potential cumulative impacts to commercial, industrial, or residential development are not expected. Future urbanization within the WNS zone, as well as industrial development and associated transportation and infrastructure development, could translate into

an increase in population within the general vicinity of that development, along with potential changes to employment, tax revenues, and personal income. Employment created by land management, development, and wind energy activities should not be negatively impacted by the proposed action and alternatives.

Incidental take prohibitions associated with tree removal activities could have a potential indirect effect on local property values. For example, if it were perceived that the incidental take prohibition for NLEBs due to forest conversion activities in alternatives 1 and 2 were actually "land-use restrictions" it could have a potential negative impact on those individuals or entities who own the land.

CONSULTATION AND COORDINATION

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5.3 Agencies, Organizations and Persons Contacted

As discussed in Chapter 1, in response to the proposed and interim 4(d) rules, the Service received approximately 40,500 comments, reflecting a variety of issues and concerns. A summary of and response to these comments can be found in the Summary of Comments and Recommendations on the Proposed and Interim 4(d) Rules section of the final rule. All of the issues and concerns expressed through these processes were acknowledged and addressed in our administrative record. All of the comments received, including information on the individuals and entities who provided those comments, are available for viewing at *http://www.regulations.gov*.

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination With Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge

our responsibilities to work directly with tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to tribes.

In October 2013, Tribes and multi-tribal organizations were sent letters inviting them to begin consultation and coordination with the service on the proposal to list the northern long-eared bat. In August 2014, several Tribes and multi-tribal organizations were sent an additional letter regarding the Service's intent to extend the deadline for making a final listing determination by 6 months. A conference call was also held with Tribes to explain the listing process and discuss any concerns. Following publication of the proposed rule, the Service established three interagency teams (biology of the northern long-eared bat, non-WNS threats, and conservation measures) to ensure that States, Tribes, and other Federal agencies were able to provide input into various aspects of the listing rule and potential conservation measures for the species. Invitations for inclusion in these teams were sent to Tribes within the range of the northern long-eared bat and a few tribal representatives participated on those teams. Two additional conference calls (in January and March 2015) were held with Tribes to outline the proposed species-specific 4(d) rule and to answer questions. Through this coordination, some Tribal representatives expressed concern about how listing the northern long-eared bat may impact forestry practices, housing development programs, and other activities on Tribal lands.

REQUIRED DETERMINATIONS

The following are required determinations for issuance of a special rule under section 4(d) of the ESA.

6.1 Regulatory Planning and Review (Executive Orders 12866 and 13563)

Executive Order 12866 provides that the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget will review all significant rules. OIRA has determined that this rule is not significant. Executive Order 13563 reaffirms the principles of E.O. 12866 while calling for improvements in the nation's regulatory system to promote predictability, to reduce uncertainty, and to use the best, most innovative, and least burdensome tools for achieving regulatory ends. The executive order directs agencies to consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public where these approaches are relevant, feasible, and consistent with regulatory objectives. E.O. 13563 emphasizes further that regulations must be based on the best available science and that the rulemaking process must allow for public participation and an open exchange of ideas. We have developed this final 4(d) rule in a manner consistent with these requirements.

6.2 Regulatory Flexibility Act (5 U.S.C.601 et seq.)

Listing and status determinations under the Endangered Species Act of 1973, as amended (Act; 16 U.S.C. 1531 et seq.), and any prohibitions or protective measures afforded the species under the Act are exempt from the Regulatory Flexibility Act (RFA; 5 U.S.C. 601 et seq., as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996). However, as this final 4(d) rule is being promulgated following the final listing of the northern long-eared bat, we evaluate whether the Regulatory Flexibility Act applies to this rulemaking.

Under the Regulatory Flexibility Act, whenever an agency must publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small entities (small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. SBREFA amended the RFA to require Federal agencies to provide a statement of the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities. Thus, for a regulatory flexibility analysis to be required, impacts must exceed a threshold for "significant impact" and a threshold for a "substantial number of small entities." See 5 U.S.C. 605(b). Based on the information that is available to us at this time, we certify that this rule will not have a significant economic impact on a substantial number of small entities. The following discussion explains our rationale.

On April 2, 2015 (80 FR 17974), we published the final determination to list the northern long-eared bat as a threatened species and an interim 4(d) rule. That rule became effective on May 4, 2015, and the interim 4(d) rule will remain in effect until this final rule becomes effective (see DATES, above). The interim 4(d) rule generally applies the prohibitions of 50 CFR 17.31 and

17.32 to the northern long-eared bat, which means that the interim rule, among other things, prohibits the purposeful take of northern long-eared bats throughout the species' range, but the interim rule includes exceptions to the purposeful take prohibition. The exceptions for purposeful take are: (1) In instances of removal of northern long-eared bats from human structures (if actions comply with all applicable State regulations); and (2) for authorized capture, handling, and related activities of northern long-eared bats by individuals permitted to conduct these same activities for other bat species until May 3, 2016. Under the interim rule, incidental take is not prohibited outside the WNS zone if the incidental take results from otherwise lawful activities. Inside the WNS zone, there are exceptions for incidental take for the following activities, subject to certain conditions: Implementation of forest management; maintenance and expansion of existing rights-of-way and transmission corridors; prairie management; minimal tree removal; and removal of hazardous trees for the protection of human life and property.

This final 4(d) rule does not generally apply the prohibitions of 50 CFR 17.31 to the northern long-eared bat. This rule continues to prohibit purposeful take of northern long-eared bats throughout the species' range, except in certain cases, including in instances of removal of northern long-eared bats from human structures and for authorized capture, handling, and related activities of northern long-eared bats by individuals permitted to conduct these same activities for other bat species until May 3, 2016. After May 3, 2016, a permit pursuant to section 10(a)(1)(A) of the Act is required for the capture and handling of northern long-eared bats. Under this rule, incidental take is still not prohibited outside the WNS zone. Within the WNS zone, incidental take is prohibited only if: (1) Actions result in the incidental take of northern long-eared bats in hibernacula; (2) actions result in the incidental take of northern long-eared bats by altering a known hibernaculum's entrance or interior environment if the alteration impairs an essential behavioral pattern, including sheltering northern long-eared bats; or (3) tree-removal activities result in the incidental take of northern long-eared bats when the activity either occurs within 0.25 mile (0.4 kilometer) of a known hibernaculum, or cuts or destroys known, occupied maternity roost trees or any other trees within a 150-foot (45-meter) radius from the maternity roost tree during the pup season (June 1 through July 31). This approach allows more flexibility to affected entities and individuals in conducting activities within the WNS zone. Under this rule, we individually set forth prohibitions on possession and other acts with unlawfully taken northern long-eared bats, and on import and export of northern long-eared bats. These prohibitions were included in the interim 4(d) through the general application of the prohibitions of 50 CFR 17.31 to the northern long-eared bat. Under this rule, take of the northern long-eared bat is also not prohibited for the following: Removal of hazardous trees for protection of human life and property; take in defense of life; and take by an employee or agent of the Service, of the National Marine Fisheries Service, or of a State conservation agency that is operating a conservation program pursuant to the terms of a cooperative agreement with the Service. Regarding these three exceptions, take in defense of life was not included in the interim 4(d) rule, but the other two exceptions were, either through the general application of 50 CFR 17.31 or through a specific exception included in the interim 4(d) rule. Therefore, this final 4(d) rule will result in less restrictive regulations under the Act than those set forth in the interim 4(d) rule.

We completed an analysis of the forested land area that may be impacted by this rulemaking. There are approximately 400,000,000 acres (161,874,256 ha) of forested land across the range of

the NLEB, which includes 37 States and the District of Columbia. This rule may restrict land use activities on approximately 200,000 acres (80,937 ha). This area constitutes less than 0.05 percent of all forested habitat across the extensive range of the northern long-eared bat. Any impact in this very small portion of forested habitat is not expected to affect a substantial number of entities in any given sector, nor result in a significant economic impact on any given entity. For the above reasons, we certify that the final rule will not have a significant economic impact on a substantial number of small entities. Therefore, a final regulatory flexibility analysis is not required.

6.3 Energy Supply, Distribution, or Use (Executive Order 13211)

Executive Order 13211 (Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use) requires agencies to prepare Statements of Energy Effects when undertaking certain actions. For reasons discussed within this final rule, we believe that the rule will not have any effect on energy supplies, distribution, or use. Therefore, this action is not a significant energy action, and no Statement of Energy Effects is required.

6.4 Unfunded Mandates Reform Act

In accordance with the Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.), we make the following findings:

(1) This final rule will not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, or Tribal governments, or the private sector, and includes both ''Federal intergovernmental mandates'' and ''Federal private sector mandates.'' These terms are defined in 2 U.S.C. 658(5)–(7). ''Federal intergovernmental mandate'' includes a regulation that ''would impose an enforceable duty upon State, local, or [T]ribal governments'' with two exceptions. It excludes ''a condition of Federal assistance.'' It also excludes ''a duty arising from participation in a voluntary Federal program,'' unless the regulation ''relates to a then-existing Federal program under which $500,000,000 or more is provided annually to State, local, and [T]ribal governments under entitlement authority,'' if the provision would ''increase the stringency of conditions of assistance'' or ''place caps upon, or otherwise decrease, the Federal Government's responsibility to provide funding,'' and the State, local, or Tribal governments ''lack authority'' to adjust accordingly. At the time of enactment, these entitlement programs were: Medicaid; AFDC work programs; Child Nutrition; Food Stamps; Social Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement. ''Federal private sector mandate'' includes a regulation that ''would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance or (ii) a duty arising from participation in a voluntary Federal program.''

(2) This final 4(d) rule will result in less restrictive regulations under the Act, as it pertains to the northern long-eared bat, than would otherwise exist without a 4(d) rule or under the interim 4(d) rule. As a result, we do not believe that this rule will significantly or uniquely affect small government entities. Therefore, a Small Government Agency Plan is not required.

6.5 Takings

In accordance with Executive Order 12630, this final rule will not have significant takings implications. We have determined that the rule has no potential takings of private property implications as defined by this Executive Order because this 4(d) rule will result in less-restrictive regulations under the Act than would otherwise exist. A takings implication assessment is not required.

6.6 Federalism

In accordance with Executive Order 13132, this final 4(d) rule does not have significant Federalism effects. A federalism summary impact statement is not required. This rule will not have substantial direct effects on the State, on the relationship between the Federal Government and the State, or on the distribution of power and responsibilities among the various levels of government.

6.7 Civil Justice Reform

In accordance with Executive Order 12988, the Office of the Solicitor has determined that this final rule does not unduly burden the judicial system and meets the requirements of sections 3(a) and 3(b)(2) of the Order.

6.8 Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This rule does not contain collections of information that require approval by the Office of Management and Budget (OMB) under the Paperwork Reduction Act. This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number.

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