United States Department of the Interior

FISH AND WILDLIFE SERVICE

West Virginia Field Office
694 Beverly Pike
Elkins, West Virginia 26241

Memorandum

Date: December 3, 2013

To: Assistant Regional Director, Ecological Services, Hadley, Massachusetts

From: Field Supervisor, West Virginia Field Office, Elkins, West Virginia

Subject: Biological Opinion on an Application for an Incidental Take Permit Submitted by Beech Ridge Energy LLC and Beech Ridge Energy II LLC for the Beech Ridge Wind Energy Project, in Greenbrier and Nicholas Counties, West Virginia

I. INTRODUCTION

This document constitutes the U.S. Fish and Wildlife Service's (Service or USFWS) Biological Opinion (BO) on the proposed Federal action of issuing an Endangered Species Act Section 10(a)(1)(B) Incidental Take Permit (ITP) contingent upon implementation of the Beech Ridge Wind Energy Project Habitat Conservation Plan (HCP). Beech Ridge Energy LLC and Beech Ridge Energy II LLC have applied as co-permittees for a single ITP for the Beech Ridge Wind Energy Project (hereafter referred to as the Project).

Beech Ridge Energy LLC owns and operates the existing phase I of the Project. A separate business entity, Beech Ridge Energy II LLC, will construct, own, and operate phase II of the Project. The companies are jointly referred to in this BO as "BRE" or the Applicants (unless specifically named). Both companies are wholly-owned subsidiaries of Invenergy Wind LLC, and are separate companies with management control over their respective phases of the Project.

The Applicants jointly submitted an HCP as part of an application for a permit to authorize incidental take of endangered Indiana bats (*Myotis sodalis*) and endangered Virginia big-eared bats (*Corynorhinus townsendii virginianus*) that may result from implementation of the project in Greenbrier and Nicholas Counties, West Virginia. The Applicants will be jointly responsible for implementing the terms and conditions of the HCP, ITP, and the implementing agreement. The companies will coordinate over administrative and operational issues relating to the HCP to ensure efficient operation of the project.

This BO is prepared in accordance with section 7 of the Endangered Species Act (Act or ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). Section 7(b)(3)(A) of the Act requires that the

Secretary of the Interior issue biological opinions on Federal agency actions which may affect listed species or critical habitat. The Service uses biological opinions to determine if the action proposed by the action agency is likely to jeopardize the continued existence of listed species or destroy or modify critical habitat. Section 7(b)(3)(A) of the Act also requires the Secretary to suggest reasonable and prudent alternatives to any action that is found likely to jeopardize the continued existence of listed species or result in an adverse modification of critical habitat, if any has been designated.

In this BO we evaluate the Service's issuance of an ITP pursuant to section 10 of the Act because the proposed permit is considered a Federal action requiring consultation under section 7 of the Act. In this opinion we evaluate the potential direct and indirect effects to Indiana and Virginia big-eared bats which may occur as a result of implementing the Project as described in the associated HCP. The purpose of this formal section 7 consultation is to ensure that any action authorized, funded, or carried out by the Federal government is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat.

The jeopardy analysis in this BO assesses whether the proposed action would be reasonably expected to reduce appreciably the likelihood of both survival and recovery of the Indiana bat and Virginia big-eared bat by reducing their reproduction, population, and distribution in the wild. The principal components of this analysis are, in brief: identifying the likelihood of individual Indiana bat and Virginia big-eared bat exposure to action related stressors and their responses to that exposure, integrating those individual risks (exposure risk and subsequent response) to discern the consequences to the populations to which those individuals belong, and determining the consequences of any population-level risks to the species rangewide.

Jeopardy determinations ultimately are made for listed entities, which in this case are the rangewide population of the Indiana bat and the rangewide population of the Virginia big-eared bat. However, as described in the Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects (USFWS 2013a), the jeopardy analysis is best conducted in the context of an analytical framework which addresses effects at various scales, beginning with the smaller, local population level. In this BO we follow this analytical approach. If, at any point, we demonstrate that the risks are unlikely at the smaller, local population level, then risks also are unlikely at larger population scales, and we conclude that the action is not likely to jeopardize the continued existence of the species rangewide.

This BO is based upon information from many sources, including but not limited to: 1) the Applicants' final HCP (BRE 2013a) and errata (BRE 2013b); 2) the Service's Final Environmental Impact Statement (FEIS) for Proposed Issuance of an Incidental Take Permit for the Beech Ridge Wind Energy Project (USFWS 2013a); 3) Indiana and Virginia big-eared bat surveys conducted at the project site (BHE Environmental 2005, 2006; Young and Gruver 2011; Young et al. 2012a; 4) information from scientific literature and unpublished reports; 5) meetings, phone calls, and written correspondence with the Applicants and their consultants; and 6) multiple runs of an Indiana bat demographic model developed by Thogmartin et al. (2013). Our model runs reflect: a) Indiana bat specific assumptions described in the model; b) an assumption that White Nose Syndrome has and will continue to affect the population; and c)

Service choices of appropriate scenarios, with and without the project, as described in Appendix A of this BO.

II. CONSULTATION HISTORY

The Service first began coordinating with BRE and its consultants on the proposed project in 2005. Appendix B provides a detailed chronology of formal letters, exchange of informal comments on drafts of the HCP, site visits, meetings, and major milestones that occurred as part of the consultation process. In addition to the events listed in Appendix A, the consultation history includes numerous phone calls, e-mails, and teleconferences over the past 4 years, including periods during which weekly teleconferences occurred between the Applicants and the Service regarding development of the HCP and related documents.

Because this HCP, in part, is a by-product of litigation, some background explanation concerning the history of the project is required. Although the Service was not a party to the litigation, the litigation was a factor in the Applicants' decisions to pursue an ITP, and has influenced the number and location of turbines, and the operation of the project while the ITP process was underway. Thus for context, a summary of the litigation history follows.

In June 2009, the Animal Welfare Institute, Mountain Communities for Responsible Energy, and David Cowan (plaintiffs) filed a lawsuit against Beech Ridge Energy LLC, alleging that the Project would take endangered Indiana bats in violation of section 9 of the Act. In December 2009, the U.S. District Court of Maryland ruled in favor of plaintiffs that Beech Ridge Energy LLC was in violation of the Act for its potential to take Indiana bats and its failure to file an application for an ITP related to this project (case no. RWT 09cv 1519). The Court ruled that Beech Ridge Energy LLC's construction and operation of wind turbines (40 in construction at the time, with a total of 124 hoped for by the end of 2010) would violate section 9 of the Act "unless and until [Beech Ridge Energy LLC] obtains an ITP" for the Indiana bat. The Court enjoined Beech Ridge Energy LLC from building additional turbines beyond the 40 already under construction, and restricted operation to the bat hibernation season (November 15 to March 31) until the company obtained an ITP. The Court also invited the parties to confer on whether they could agree on terms for further turbine operation while Beech Ridge Energy LLC pursued an ITP.

Under the terms of a court approved settlement agreement reached between Beech Ridge Energy LLC and the plaintiffs in January 2010, the company agreed not to build 24 of the original 124 turbines that are closest to known bat hibernacula. While the HCP was under development, plaintiffs agreed that Beech Ridge Energy LLC could construct an additional 27 turbines (in addition to the 40 already under construction), for a total of 67 turbines in phase I. However, pursuant to this settlement agreement, Beech Ridge Energy LLC could only operate these 67 turbines during specified times of day and season when bats are not flying, and thus, would not be at risk of mortality or injury from turbine operation.

The settlement agreement also included a map of the general location where the 33 additional (as yet not constructed) turbines in the phase II expansion area could be built. BRE subsequently received court approval on November 15, 2011 of a revision to the settlement agreement to include new areas proposed by BRE for the phase II turbines. This allowed BRE to locate many phase II turbines further away from known bat hibernacula.

In January 2012 Beech Ridge Energy LLC sought permission from the Service for interim extended turbine operations at night from April 1 through November 15, 2012 (BRE 2012b). After further discussion with the Service, Beech Ridge Energy LLC agreed to: 1) feathering blades at night (beginning one-half hour before sunset and ending one-quarter hour after sunrise) when bats are active so that the blades rotate less than 2 revolutions per minute (rpm) at or below wind speeds of 6.9 meters per second (mps); 2) monitoring the effectiveness of the operating regime in minimizing the risk of take of listed bats by searching the ground for bats (and birds) at the 67 existing turbines every two days; and 3) ceasing night-time operations if take of a listed bat occurs. Based on consideration of best available scientific and commercial information, the Service independently concluded this interim operating strategy was not likely to adversely affect either species of listed bat (USFWS 2012b). The Court subsequently approved a modified stipulation for the interim operating strategy on February 17, 2012 (Appendix L to the FEIS).

In February 2013, Beech Ridge Energy LLC again sought and received permission from the Service to implement in 2013 the same interim operating strategy and monitoring regime conducted during 2012 until an ITP is issued (BRE 2013c, USFWS 2013b). Court approval followed on March 13, 2013 (Appendix L to the FEIS). Based on submittal of monthly and annual reports, no take of a listed bat, or *Myotis* bat species, has been documented to date and the strategy has reduced fatality of all unlisted bats by approximately 73% compared to other projects (Tidhar et al. 2013, Young et al. 2013a).

III. DESCRIPTION OF THE PROPOSED ACTION

The Federal action being evaluated in this BO is the Service's issuance of a Section 10(a)(1)(B) ITP for the Indiana bat and Virginia big-eared bat. The ITP would authorize cumulative take of 53 Indiana bats and 14 Virginia big-eared bats over the next 25 years associated with implementation of HCP covered activities.

Activities described in the HCP that will be further evaluated in this BO include:

1) Operation of the existing 67 turbines (phase 1);
2) Construction of up to 33 additional turbines (phase II) and associated infrastructure, including construction of turbine assembly pads, construction of new access roads and improvement of existing access roads, use of an existing staging area and concrete batch plant, construction of underground electrical and communication cables, construction of 2 self-supporting unguyed meteorological towers, and construction of a supplemental 1.6-mile-long overhead transmission line;
3) Operation of the 33 (phase II) turbines;
4) Maintenance of each phase of the Project , including turbine maintenance, maintenance of underground cable and communication lines, mowing of turbine plots and use of herbicides to control noxious weeds near turbines, and cutting of hazard trees in the transmission line and other project areas for safety reasons; and

5) Decommissioning of the entire 100-turbine Project and associated facilities including, but not limited to, dismantling and removal of the turbines, foundations, and transformers; substation and transmission line; four meteorological towers; and an operation and maintenance (O&M) building, followed by site grading and restoration. Disturbed areas and access roads will be left in place or graded and returned to the original contour per the request of the landowner.

As will be discussed, of these activities, only turbine operations are anticipated to cause take. The permit duration is 25 years from the effective date of the permit. Therefore, the authorized incidental take stemming from turbine operations will be for a maximum duration of 25 years. But the two phases may operate for fewer years depending on how long it takes to construct phase II, and the permitees' decisions regarding decommissioning and its timing. The minimum functional life of the turbines is 20 years, but the useful life of a particular turbine may vary. After 20 years of operation, BRE will evaluate whether to continue turbine operations, decommission the Project, or retrofit the Project with new turbines. The latter would require permit amendment and renewal.

As part of the requirements for obtaining an ITP, the BRE has prepared an HCP in coordination with the Service. The HCP details measures BRE will implement to avoid, minimize, mitigate, and monitor the impacts of the take of Indiana and Virginia big-eared bats. BRE has requested that impacts associated with implementation of any aspect of the HCP be covered by the take authorization of the ITP.

There are no other species currently listed as threatened or endangered species likely to be affected by this Project. In our FEIS we considered that there are three federally listed plants with records of occurrence in Greenbrier and Nicholas counties: the endangered shale barren rock cress (*Arabis serotina*), the threatened Virginia spiraea (*Spiraea virginiana*), and the threatened small whorled pogonia (*Isotria medeoloides*). As further explained in our FEIS, these plants are not likely to be adversely affected by the Project because there is no suitable habitat on the project area, available models do not predict habitat for these plants in the project area, and rare plant surveys (Michael 1994) did not detect these species in the phase I project area (see section 4.5.2.3 of the FEIS).

In our FEIS we also considered the potential occurrence of the threatened Cheat Mountain salamander (*Plethodon netting*i) in the project area due to the availability of potential habitat (moist coniferous and mixed coniferous and deciduous forest at elevations above 3500 feet). As further explained in our FEIS, the Project is not likely to adversely affect this salamander given that: (1) there are no few to no conifers on the Project site; (2) the closest known occurrence of the species is 40 miles away from the Project area and known populations are isolated and discontinuous; and (3) past land uses on the Project area (i.e. surface mining and timber harvest , including clear-cutting) make occurrence of the species on the project area unlikely (FEIS section 4.6.2.1).

In addition, the Service informally consulted with BRE on the West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) when it was listed as an endangered species. In our March 7, 2006, letter we concluded the Project was not likely to adversely affect this species due to lack of its spruce habitat component in the predominantly hardwood forest on the project site, lack of old growth forest characteristics on site, and 3 years of nest box surveys which failed to capture a West Virginia northern flying squirrel on site (USFWS 2006). Since then this species has been delisted due to recovery and the ESA protections no longer apply (78 Federal Register 14022, published March 4, 2013.

There are no other currently listed species with potential to occur in the Project area. Thus the only currently listed species likely to be adversely affected by the Project are the Indiana bat and Virginia big-ear bat.

Action Area

For purposes of consultation under Section 7 of the Act, the action area is defined as all areas to be affected directly or indirectly[1] by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). Thus the action area is not necessarily limited to the project footprint and should consider the effects to the environment resulting from the action. Within the action area, all activities that can cause measurable or detectable changes in land, air, and water or to other measurable factors that may elicit a response in the species or critical habitat are considered. Consequently the action area should extend to include all areas affected by the action, which may include areas beyond the Project footprint.

In establishing the action area for the purposes of this BO, we considered the anticipated geographic extent of the effects of activities which may elicit a response in the species. We considered that the primary effect from turbine operations (death or injury from collision or barotrauma) will occur in the rotor-swept area extending approximately 126 to 164 feet (38 to 50 meters) from the base of the phase I and phase II towers, respectively (see Figure 2.1 in HCP). Thus the action area incorporates the geographic area equivalent to the distance of the rotor-swept area away from all of the tower locations.

We also considered the geographic extent of the effects of other stressors, such as habitat alteration (tree cutting), vehicle traffic, light, and noise during construction, operation, and decommissioning of the Project. Some of these effects may extend beyond the ground disturbance footprint of the Project. We evaluated all of the potential stressors and determined that construction related noise (such as chainsaws and jackhammers) would likely extend the farthest distance and would incorporate the area of effect for any of the other potential stressors. Therefore the geographic extent of the action area extends to include a 1-mile buffer, which incorporates this area of construction related noise disturbance. We believe this is a reasonable approach that errs on the side of species in considering the geographic extent of effects from all of the potential stressors.

The 1-mile buffer is based on the attenuation distance of the loudest noises expected during the duration of the ITP. The loudest noise levels anticipated during the 25-year duration of the ITP would involve chainsaws and jackhammers which can generate sound levels of 89 decibels (dB) at 50 feet (Federal Highway Administration 2006), a level of noise which is significantly greater

---

[1] Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

than background noise measured in the project area (50 dB, Acentech 2006, 2011). Although noise attenuation can vary, based on many site-specific factors such as vegetation, topography and wind, as a general rule of thumb noise decreases by approximately 5 dB per doubling of distance between the source and the receptor over soft ground with heavy vegetative cover (USFWS 2005). Based on noise modeling studies conducted for the Project, the noise of a chainsaw, jackhammer, and other construction equipment would attenuate to below background noise levels at a distance of approximately 1 mile from the source (see discussion in FEIS section 5.2).

The action area includes the geographic area where all direct and indirect effects of the Project will occur. While the individual bats that may be impacted by the Project may originate from a broader source population (such as a migratory population or an unknown maternity population), we do not anticipate that the Project related effects (e.g., collision/barotrauma, habitat alteration, noise, lighting, etc.) will extend outside of the action area. Impacts of take of individual bats originating from broader source populations are examined in the section of this BO that assesses the impacts of take.

In conclusion, the action area for this BO incorporates the 521-acre disturbance footprint of the Project which is distributed linearly over 30 miles of ridgeline, the 283-acre area equivalent to the distance of the rotor-swept area away from all of the tower locations, and the 1-mile construction related noise buffer) (Figure 1). The total area encompassed by these overlapping zones is 51,147[2] acres (80 square miles). Thus the 51,147-acre action area is larger than the disturbance area for the Project, and it is larger than the 30,600-acre area leased [3] by BRE for the facility, much of which will not be affected by the Project.

Project Description

The proposed Project associated with the Federal action of ITP issuance is described in detail in section 2.1 of the HCP (BRE 2013a) and sections 1.2 and 1.3 of the FEIS (USFWS 2013a). A summary of the Project as described in these two documents follows.

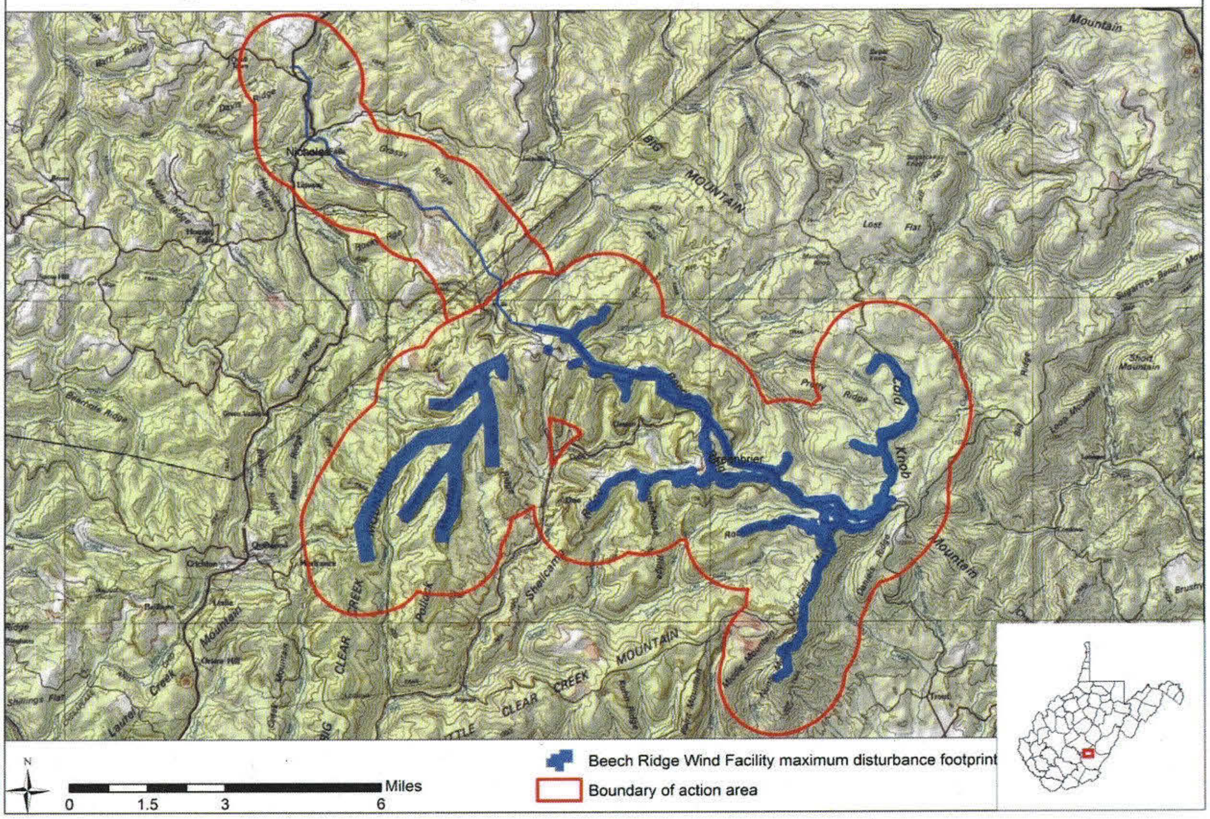
The Project is a wind energy facility not to exceed 100 turbines with a nameplate capacity of up to 186 megawatts (MW) of energy. The Project consists of two phases, of which phase I is complete (67 turbines and associated infrastructure). The existing 67 phase I turbines each have a nameplate capacity of 1.5 MW (the hypothetical maximum possible energy production), whereas the proposed addition of up to 33 additional phase II turbines are anticipated to each have a nameplate capacity of 1.62 MW (but not to exceed 2.5 MW). Based on an analysis of the wind resources data at the site, the Project is expected to operate at an average annual capacity factor of about 39.5%, the ratio of actual energy produced in a given period of time, to the

---

[2] The 51,147 acres includes a 174-acre area inside the red triangle in Figure 1. Technically the area inside this triangle is located just outside of the 1 mile-buffer (red line) drawn around the outer edge of the blue shaded area (the maximum disturbance footprint of the project). We included this 174-acre area so that the outer boundary of the action area would be contiguous.

[3] BRE leased approximately 27,600 acres for phase I and 3,000 acres for phase II in order to have sufficient land to plan and develop the wind energy facility (K. Coppinger, BRE, personal communication, 2013). BRE also has an access agreement to the 85-acre permanent right-of-way of the existing 14-mile transmission line.

Figure 1. Beech Ridge Wind Energy Project action area.

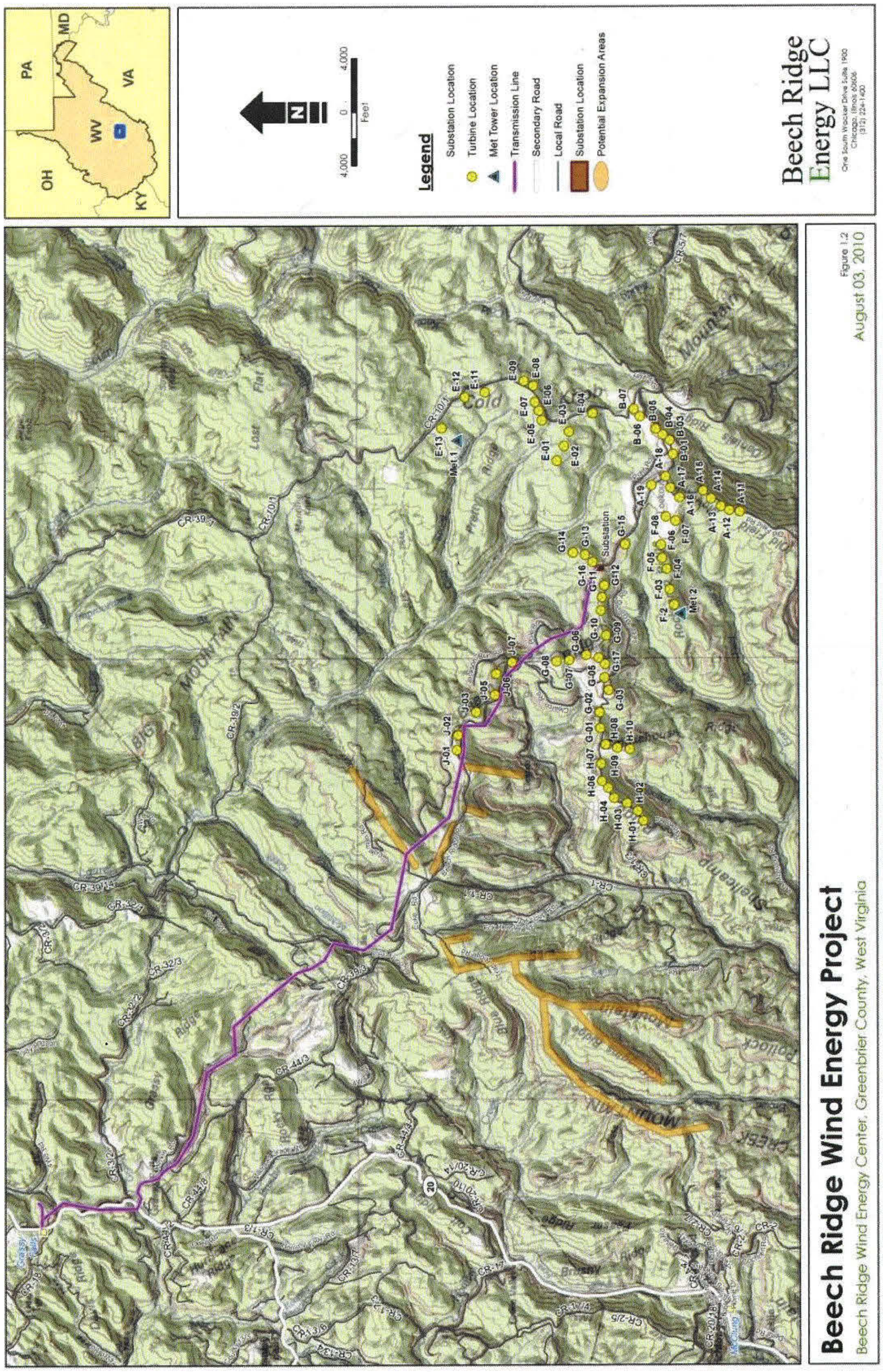


hypothetical maximum possible. After accounting for the capacity factor, and HCP operating constraints, the Project potentially could generate approximately 615,000 megawatt hours (MWh) of electricity per year.

The 67-existing wind turbine generators are the GE-1.5-MW sle model, each composed of a pad-mounted transformer, power distribution panel, turbine tower, and gravel pad with an initial disturbance footprint of approximately 1.8 acres for each turbine. The turbine towers are 262 feet (80 m) in height with a nacelle and a three-bladed rotor that is 253 feet (77 m) maximum in diameter mounted at the top of each tower. The total height of the turbines from the tower base to the blade tip at its highest point is 366 feet (118 m). Within the phase I area, the existing turbines are arranged in 7 multidirectional strings, with 28 turbines at the east end arranged in 3 strings (A, B, and E) generally running north to south; 23 turbines in the center of the project area in two strings (F and G) generally running east to west; and 16 turbines at the west end of the project area in two strings (the H string generally running north to south and the J string running northwest to southeast (Figure 2).

The model for the 33-additional turbines has not yet been determined but these turbines will be larger than the existing 67 turbines. Each of the 33 additional turbines is anticipated to require

Figure 2. Location of the existing phase I turbines, proposed phase II turbines, and infrastructure associated with the Beech Ridge Wind Energy Project in Greenbrier and Nicholas Counties, West Virginia.



an initial ground disturbance of approximately 2.1 acres per turbine. The HCP (Figure 2.1) indicates the maximum dimensions of these towers will be 328 feet (100 m) in height, with a rotor diameter also up to 328 feet (100 m). The maximum height of these turbines from the tower base to the highest point is not to exceed 492 feet (150 m).

Project Schedule

Beech Ridge Energy II LLC proposes to begin construction of phase II as soon as practicable pending issuance of an ITP. Construction of the 33 phase II turbines and associated infrastructure is anticipated to be completed within approximately 1.5 to 2 years following ITP issuance.

Conservation Measures

The HCP incorporates measures designed to avoid, minimize, mitigate, monitor, and report the impacts of taking of the proposed Project on Indiana bats and Virginia big-eared bats. The HCP's conservation goals and objectives emphasize turbine operational adjustments anticipated to reduce annual *Myotis* fatality (and hence Indiana bat fatality) by 60%, annual Virginia big-eared bat fatality by 50%, and annual all bat fatality by 50%. The HCP's mitigation goal is designed to compensate for the remaining anticipated take of up to 53 Indiana bats and 14 Virginia big-eared bats by protecting an equal number of bats in perpetuity off-site in key occupied Indiana bat habitats within the Appalachian Mountain Recovery Unit (AMRU), and by gating key occupied Virginia big-eared bat caves or mine portals within the same genetically isolated population where the impact occurred.

The Service has analyzed the effects of the proposed ITP based on the assumption that all conservation measures in the HCP will be implemented. A more detailed description of the Project's conservation measures, pertaining to Project construction, operation, maintenance, and decommissioning, can be found in Section 5.0 of the HCP (BRE 2013a). These measures are summarized here briefly:

1) Avoidance and Minimization Measures:

- BRE reduced the number of turbines from 124 to 100, and turbine sites within the eastern portion of the phase I area (which are closest to known and historical Indiana bat hibernacula) were eliminated from the project. These project design changes reduced the risk of bat fatality by reducing the project size (i.e., number of turbines) and by increasing the distance between known bat locations and the project site.

- Portions of the proposed phase II expansion area were moved farther away from known caves.

- BRE committed to work with the Service during micro-siting of phase II turbines to adjust, where feasible, the location of turbines to minimize impacts to covered species and their habitat.

- BRE will minimize land use disturbance associated with upgrading and constructing new access roads for the phase II expansion area, where possible, by using previously disturbed timber/mining haul roads, as well as historic timber skid trails that were used for previous timbering operations.

- To avoid direct mortality of Indiana bats during clearing of 148 acres of trees in the phase II expansion area, BRE will limit tree clearing to the period between November 15 and March 31 when bats are in hibernation, with one exception. Should weather (e.g., deep snow or ice) prevent clearing or create safety issues for construction workers, BRE may clear up to 15 acres between April 1 and May 15 or between October 15 and November 14. If tree clearing is necessary during either of these periods, BRE will retain a qualified wildlife biologist to conduct a survey for potential roost trees prior to clearing and confirm that potential roost are not occupied by roosting Indiana bats. If trees are found to be occupied, BRE will mark the occupied trees and delay removal until such time as the trees are unoccupied.

- In the event that hazard trees have to be trimmed or removed during maintenance of approximately 15.6 total miles of transmission line, or in other portions of the facility, BRE will trim or cut the hazard trees between November 15 and March 31, except in an emergency where there is risk to public safety and/or the transmission line.

- As an incidental benefit to bats of compliance with the Clean Water Act, BRE avoided impacts to regulatory wetlands during phase I construction, and plans to do the same during phase II construction, thus minimizing potential impacts to water sources that could be used by listed bats.

- To minimize impacts to streams and ponds that may be used for drinking by listed bats, BRE will use water from an existing well to serve the requirements of the existing batch plant that will be used to make concrete during phase II construction. In addition, water used for dust suppression during phase II construction and during decommissioning of the entire project will be withdrawn from local perennial creeks/ponds within the project area, thus minimizing impacts to intermittent and ephemeral headwater streams. To avoid dewatering streams, BRE also will follow West Virginia Department of Environmental Protection (WVDEP) water withdrawal guidance, and use an on-line mapping tool and standard practices to judge when it is appropriate to remove water from streams (see HCP errata sheet).

- To minimize soil erosion and stream siltation during and after construction of the phase II expansion area, BRE will prepare and implement a Storm Water Pollution Prevention Plan (SWPP), including standard measures such as silt fences, straw bales, netting, soil stabilizers, and check dams. Areas disturbed during construction of the phase II expansion area will be stabilized and reclaimed using appropriate erosion control measures including site-specific contouring and reseeding, designed and implemented in compliance with the SWPP.

- To minimize toxic substance release, BRE will implement a Hazardous Spill Prevention

Plan, Control, and Countermeasure Plan. Diesel fuel, gasoline, coolant, and lubricants will not be stored within 100 feet of any stream, nor will vehicle refueling or routine maintenance occur within 100 feet of streams.

- To minimize the potential for animal/vehicle collisions on the project site, BRE will post 25 mile-per-hour speed limit signs along roads, as necessary, identifying speed limits, and will advise project personnel regarding the speed limits.

- To minimize wildlife harvest[4], BRE will prohibit hunting, fishing, dogs, and possession of firearms in the project area by its employees and contractors during construction, operation, and maintenance, and will conduct employee/contractor education regarding wildlife laws. Violations will be referred to the West Virginia Division of Natural Resources (WVDNR) for prosecution and offending employees or contractors may be disciplined and dismissed by BRE.

- BRE will reduce annual *Myotis* bat fatality (including Indiana bat fatality) from turbine operations by 60% and annual Virginia big-ear bat and other bat fatality by 50%. Subject to provisions of the Research, Monitoring, and Adaptive Management Plan (RMAMP) described below, BRE proposes to meet this goal by testing and implementing a turbine operation curtailment plan which initially specifies feathering all turbines to make less than 2 rpm below the 4.8 mps m/s cut-in speed beginning at sunset for a period of 5 hours from July 15 through October 15. This is the period during which the largest peak in bat mortality occurs.

2) Mitigation Measures

- Within 2 years of ITP issuance, BRE will complete off-site conservation projects that meet specific criteria that are more fully outlined in section 5.3 of the HCP (BRE 2013a). For Indiana bats, BRE will purchase priority winter hibernacula that support at least 53 Indiana bats or summer maternity areas through fee simple acquisition, lease, or conservation easement, and will transfer ownership rights to a Service-approved land manager who agrees to protect and manage the site in perpetuity. For Virginia big-eared bat, BRE will fund implementation of a gating Project at a known hibernaculum supporting at least 14 Virginia big-eared bats that is threatened by human activity.

3) Monitoring, Adaptive Management, Changed Circumstances, and Reporting

- BRE will implement an RMAMP which uses post-construction monitoring to assess whether the curtailment plan is effective in achieving 60% annual reduction in *Myotis* bat fatalities and 50% annual reduction in fatalities of all other bats. The RMAMP also includes researching the potential for additional reductions in bat fatality through several modifications to the curtailment plan (e.g., increased cut-in speeds, full-night curtailment, and longer seasons of curtailment). If the minimization measures prove to be ineffective in achieving 60% annual reduction in *Myotis* fatality and 50% annual reduction in all

[4] Historically, recreational shooting of bats was common in West Virginia, although less so today.

other bat fatality, BRE has committed through the RMAMP process to increase the cut-in speed levels, the nightly duration of applying the cut-in speeds, and/or extending the season of applying the curtailment measures until such point as the biological goals and objectives are achieved (BRE 2013a, Appendix C: RMAMP, Section 5.2.1). BRE's curtailment plan will be modified only with the written agreement of the Service.

- BRE will conduct post-construction mortality monitoring every year of turbine operations. The first three years of intensive monitoring will include: 1) daily searches at turbines from April 1 to November 15 to measure Indiana and Virginia big-eared bat take, to assess the use of surrogate species in estimating take, and to determine baseline levels of all bat fatality and seasonality at control turbines; and 2) daily searches at treatment and control turbines from mid-July to mid-October to evaluate the effectiveness of the curtailment plan in achieving the biological goals and objectives. Follow up monitoring occurring in years 4 through 25, will include weekly searches of turbines from April 1 through November 15 to ensure that total bat mortality with curtailment has not increased and that estimated take of listed bats (as tracked through a surrogate) remains within expected levels. More intensive monitoring may occur as needed during years 4-25 if any of the meet-and-confer triggers are met, and BRE and the Service determine that additional monitoring is appropriate. Monitoring results will include corrections for scavenger removal, searcher efficiency, and searchable area.

- In the event that one of following take thresholds is met in any given year, the Permittees will meet and confer with the Service, and take appropriate action as determined through discussions with staff of the Service to reduce this fatality and ensure the project remains within authorized cumulative take levels and achieves the HCP objectives of 60% reduction of *Myotis* fatality and 50% reduction of Virginia big-eared bat fatality[5]:

  1. The number of estimated Indiana bat fatalities exceeds 4.5 or the number of Virginia big-eared bat fatalities exceed 1.0 (based on the actual number of carcasses found corrected for field biases), or
  2. The 3-year running average estimated Indiana bat fatalities exceeds 1.8 or Virginia big-eared bat fatalities exceeds 0.5 (with a 90% confidence interval), based on the actual number of surrogate carcasses found corrected for field bias and corrected for the Indiana bat-to-surrogate ratio and the Virginia big-eared bat-to-surrogate ratio as described in section 5.0 of Appendix C to the HCP.

- Responses to meeting the above meet-and-confer thresholds include, but are not limited to, adjusting the curtailment plan by: (1) extending the season or hours of night when the curtailment strategy is applied; (2) curtailing selected turbines if specific turbines are causing significantly greater mortality than others; (3) raising the turbine cut-in-speeds under which turbine blades are feathered; (4) making operational adjustments based in part on other environmental factors; and (5) deploying and testing bat deterrent technology if available.

---

[5] Exceeding a meet-and-confer threshold would not be considered a permit violation as long as the cumulative level of authorized take of 53 Indiana bats and 14 Virginia big-eared bats has not been exceeded.

- Changed circumstances also are included in the HCP (section 8.2) related to: 1) elevated annual take of covered species due to changing environmental conditions; 2) Indiana bat or Virginia big-eared bat population declines or catastrophic population failure due to White Nose Syndrome (WNS); 3) listing of additional bat species; 4) changed technology/techniques developed to avoid or minimize bat mortality from wind turbines; and 5) detection of an Indiana bat maternity colony in or within 2.5 miles of the project, or discovery during post-construction monitoring of a dead female Indiana bat or juvenile during the maternity season (May 15 to August15). Circumstances 1, 2, and 3, and 4 require the same suite of possible responses as indicated above for the meet-and-confer take thresholds. Circumstances number 3 and 4 also require a permit amendment if take of the newly listed species or individuals from an Indiana bat maternity colony cannot be avoided. Circumstance 4 involves reducing bat fatality through new turbine design, automated turbine operation, or other new techniques or technology that meet the bat fatality reduction objectives.

- With respect to the WNS changed circumstance for Indiana bat, if, at any time the AMRU Unit population decreases by 70% or greater than the peak 2011 level, this will constitute a changed circumstance as a key assumption of the Thogmartin population model will have been violated, triggering further analysis to determine whether the level of Indiana bat take at the project is having a material negative effect (after accounting for benefits of mitigation) to the remaining Indiana bat populations in the AMRU. If the analysis demonstrates that a 60% take reduction is no longer sufficient to prevent material negative effects to the declining population, BRE will, after consultation with the Service, implement additional operational restrictions or minimization measures by the next bat spring emergence season (i.e. the same list of possible responses as above).

- With respect to the maternity colony changed circumstance, BRE will immediately raise cut-in speeds to 6.9 mps during the maternity season from sunset to sunrise to prevent another take, conduct surveys to locate the colony and evaluate bat home ranges and movements, and thereafter implement operational adjustments known to be effective in avoiding take or apply for a permit amendment.

- BRE will submit the following four annual reports to the Service by February 15 of each year the ITP is in effect (see section 4.2 of appendix C to the HCP and the errata sheet.):

  A) The Scientific Report will track take and include, at a minimum the following information:
  1. Quantity and species composition of observed bat carcasses, including covered species carcasses.
  2. Estimates including 95% confidence intervals of total mortality of all bats, *Myotis* species, and covered species using searcher efficiency and carcass removal trial and search area adjustments.
  3. An estimate of covered species probability of carcass detection.
  4. Cumulative estimated Indiana bat and Virginia big-eared bat take for permit term to date.

5. Specific conditions, dates, locations, and circumstances of each observed covered species carcass
6. Weather conditions during nights preceding and during carcass searches.
7. Adaptive management measures implemented.
8. Raw data of bat carcasses in Excel spreadsheet format.
9. Summary of carcass search dates, location, and time.
10. Injured bat reporting forms and rehabilitator reports.
11. Subsequent year's research and monitoring plan and description of adaptive management measures to be implemented.
12. Subsequent year's monitoring cost estimate.

B) The Facilities Report will include a summary of project activities conducted that year which are covered activities, including construction, operation, maintenance, and decommissioning activities; acres disturbed; and turbine operation reports.

C) The Off-site Conservation Report will include funding expenditures for off-site conservation, balance and accrual, and the status of off-site conservation areas.

D) The Changes Report will include a description of any minor or major amendments, changed circumstances, and actions taken.

IV. STATUS OF THE INDIANA BAT

A. Status of the Indiana Bat Rangewide[6]

Listing status and critical habitat: The Indiana bat was one of 78 species first listed as an endangered species on March 11, 1967 (Federal Register 32[48]:4001) under the Endangered Species Preservation Act of October 15, 1966 (80 Stat. 926; 16 U.S.C. 668aa[c]). In 1973, the Act subsequently extended full protection to the species.

Thirteen winter hibernacula (11 caves and 2 mines) in 6 states were designated as critical habitat for the Indiana bat in 1976 (Federal Register, Volume 41, No. 187). One of these caves (Hellhole) is located in West Virginia; however, no critical habitat occurs in the action area.

Description and rangewide distribution: Indiana bats are medium-sized insectivorous bats in the *Myotis* genus, with a head and body length of about 41-49 millimeters (mm) (1.6 to 1.9 inches). They closely resemble little brown bats (*Myotis lucifucus*) but are distinguishable by shortened toe hairs and a slightly keeled calcar, a protuberance on the ear. There are no recognized subspecies of Indiana bat.

---

[6] Unless noted otherwise, the information in this section is summarized from the Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision 2007 (USFWS 2007).

Indiana bats are found over most of the eastern half of the United States (USFWS 2007). States within the current range of the Indiana bat include Indiana, Missouri, Kentucky, Illinois, New York, Alabama, Arkansas, Connecticut, Iowa, Maryland, Michigan, New Jersey, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Vermont, Virginia, and West Virginia.

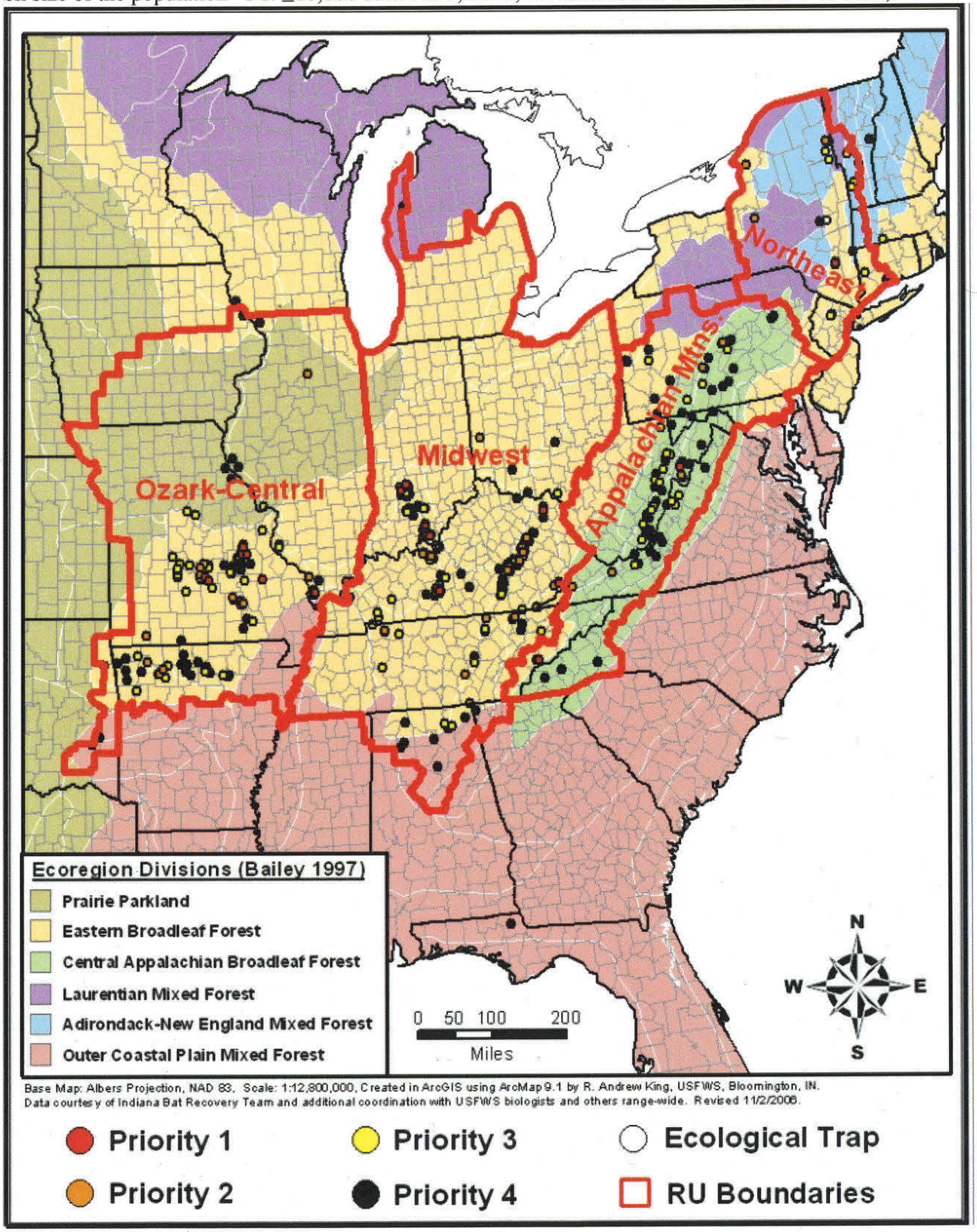
In the summer, Indiana bats occur in forested areas and forage for insects flying at or below the forest canopy, especially over streams or ponds where insects are abundant. They also forage in or along the edges of forested areas. Females raise their young in maternity colonies of 20 to 60 or more females located under the loose bark of trees or snags. During the summer, males roost alone or in small groups. In late summer and early fall, Indiana bats migrate from summer areas to winter hibernacula (e.g., caves, abandoned mines). The winter range is typically associated with areas of well-developed limestone caverns. Mating occurs during fall before Indiana bats enter their hibernacula. Females store sperm though winter and become pregnant in spring soon after they emerge from the hibernacula. Hibernation is a critical time for Indiana bats and undisturbed winter hibernacula that have a constant cool temperature are important components of their habitat needs and population success (Brack et al. 2002, Tuttle and Kennedy 2002).

Recovery plan and recovery units: The Service has published a recovery plan (USFWS 1983) which outlines recovery actions. Briefly, the objectives of the plan are to: (1) protect hibernacula; (2) maintain, protect, and restore summer maternity habitat; and (3) monitor population trends through winter censuses. An agency draft of a revised recovery plan was provided for public review and comment in the Federal Register on April 9, 1999, but has not yet been finalized. A revised draft recovery plan was noticed in the Federal Register for public review and comment on April 16, 2007 (USFWS 2007). This document identifies four recovery units (RU): the Ozark-Central, Midwest, Appalachian Mountains, and Northeast (Figure 3). This Project is located in the AMRU.

Threats rangewide: The original recovery plan (USFWS 1983) identified threats or "causes of decline" as: (1) natural hazards (i.e., flooding, freezing, mine ceiling collapse), (2) human disturbance and vandalism at hibernacula (identified as "the most serious cause of Indiana bat decline"), (3) deforestation and stream channelization, (4) pesticide poisoning, (5) indiscriminate scientific collecting, (6) handling and banding of hibernating bats by biologists, (7) commercialization of hibernacula, (8) exclusion of bats from caves by poorly designed gates, (9) man-made changes in hibernacula microclimate (blocking or adding entrances and/or by poorly designed gates), and (10) flooding of caves by dams/reservoir developments. Listing of the Indiana bat brought attention to the dramatic declines in the species' populations and led to regulatory and voluntary measures to alleviate disturbance of hibernating bats (Greenhall 1973).

The 2007 draft Recovery Plan (USFWS 2007) identified several additional threats including: (1) quarrying and mining operations (summer and winter habitat), (2) some silvicultural practices and firewood collection, (3) disease and parasites, (4) predation, (5) competition with other bat species, (6) environmental contaminants (not just "pesticides"), climate change, and (8) collisions with man-made objects (e.g., wind turbines, communication towers, airplanes, and vehicles) (USFWS 2007, pp. 71-100). However, the most significant threat to this species currently is WNS, which is a significant threat to the recovery of the Indiana bat (Thogmartin et al 2013).

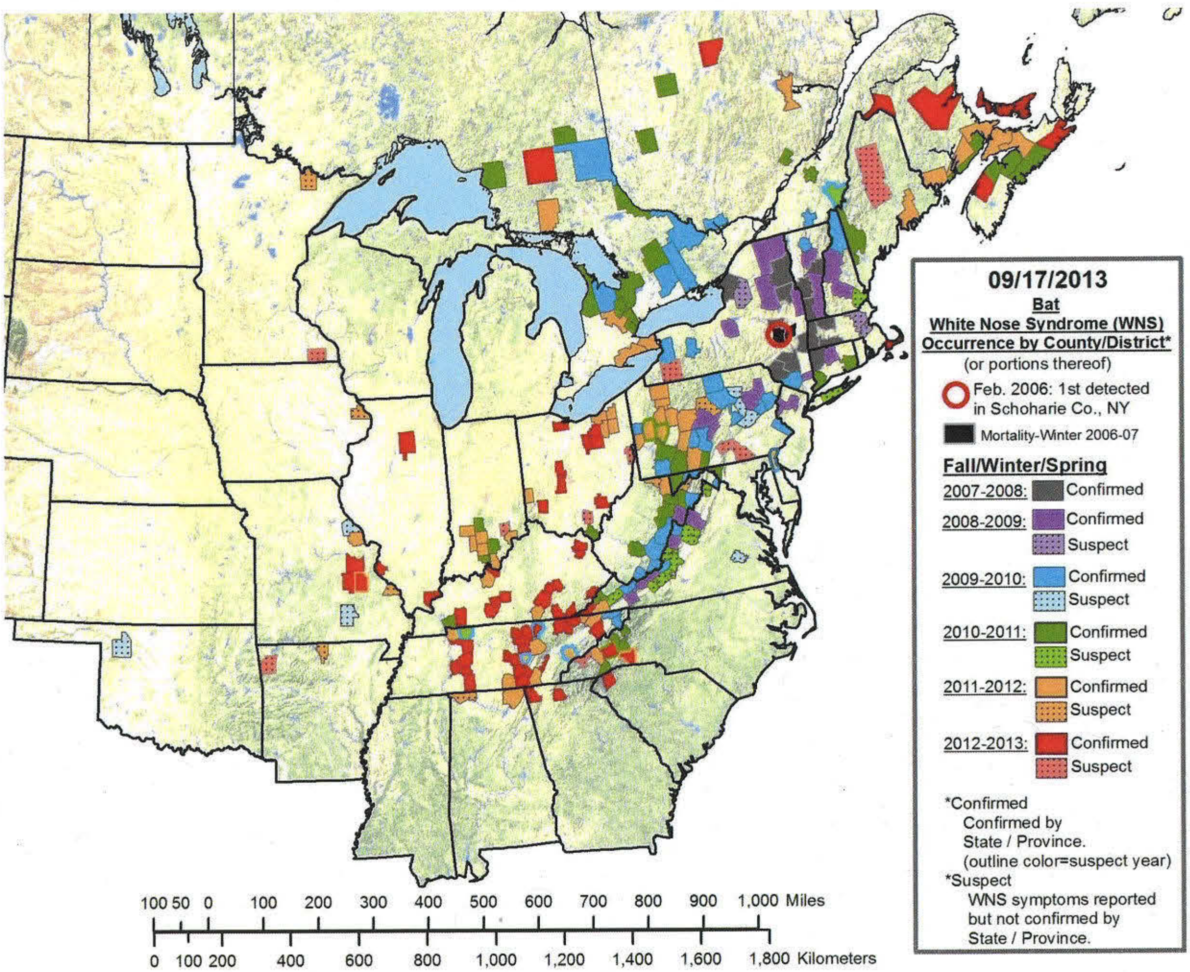
Figure 3. Indiana bat recovery units. Note: Priority numbers of hibernacula are based on size of the population - P1: ≥10,000 bats. P2: 1,000-9,999 bats. P3: 50-999 bats. P4: 1-49 bats.)



WNS is an emergent disease of hibernating bats that has spread from the northeastern to the central United States at an alarming rate (Figure 4). First documented in a photo taken in a New York Cave in 2006, WNS has now spread to more than 24 states and four Canadian provinces (Figure 4). Some affected hibernacula, especially in New York and New England, have experienced 90 to 100% mortality (Frick et al. 2010).

The disease is named for the white fungus, *Pseudogymnoascus destructans,* as per Minnis and Lindner (2013). This fungus infects the skin of hibernating bats. Affected bats usually exhibit the white fungus on their muzzles and often on their ears and wings as well (Blehert et al. 2009, 2011). Some affected bats display abnormal behavior including flying during the day and in cold weather (before insects are available for foraging) and roosting towards a cave's entrance where temperatures are much colder and less stable. Fat reserves in these bats are also severely diminished or non-existent, making survival to spring emergence difficult.

Figure 4. Bat White-Nose Syndrome Occurrence by County/District 09/17/2013.



Map by: Cal Butchkoski, PA Game Commission

It is believed that WNS is primarily transmitted through bat-to-bat contact. In addition, people may unknowingly contribute to the spread of WNS by visiting affected caves and subsequently transporting fungal spores to unaffected caves via clothing and gear (USFWS 2011). Seven bat species have been confirmed with WNS to date including little brown bats, Northern long-eared bats (*M. septentrionalis*), Indiana bats, eastern small footed bats (*M. leibii*), tricolored bats (*Perimyotis subflavus*), gray bats (*M. grisescens*), and big brown bats (*Eptesicus fuscu).* *P. destructans* has been found growing on hibernating bats in European countries, but does not appear to be causing widespread mortality there (Puechmaille et al. 2010).

Current rangewide population and trend. The 2013 rangewide Indiana bat population was estimated to be 424,708 bats, with the vast majority occurring in the Midwestern and Ozark-Central RUs (Table 1). About 72% of the entire rangewide population occurs in the Midwestern RU. The AMRU (all of West Virginia, most of Pennsylvania, and portions of western Maryland, eastern Virginia, western North Carolina, and eastern Tennessee) supported approximately 3.3% of the 2013 total population estimate.

In the last 10 years, the rangewide population of Indiana bats had been generally stable with increases in eastern RUs and some declines in western RUs (Thogmartin et al. 2012). That trend has been reversed recently due to the spread of WNS. WNS was first detected in the Northeastern RU in 2006, and by 2011, the RU had declined by approximately 70% (Table 1). Although Indiana bat population estimates show a 13% increase from 2011 to 2013 (in the 8th year post-WNS), it is unclear if this increase represents true population growth, immigration from other areas, or other factors. Continued monitoring of population status will yield more conclusive trends as WNS moves through this population over time. As WNS continues to spread across the other RUs, the Indiana bat populations are expected to decline, though the nature and magnitude of population impacts from this disease may vary by RU. For the purposes of this BO, we assume the magnitude of the AMRU population declines will be similar to those occurring in the Northeast RU.

B. Status of the Indiana Bat in the Appalachian Mountain Recovery Unit

Indiana bat populations in the AMRU exhibited a strongly increasing trend between 1983 and 2011 (Thogmartin et al. 2012), peaking at 32,468 individuals in 2011 (Table 1). However, beginning in 2008, WNS was first detected in the AMRU at several sites in Pennsylvania, and by 2010 had spread to the largest hibernacula in West Virginia. Population estimates from 2013 show a 46% decline in the AMRU compared to 2011, attributable to the impacts of WNS. The AMRU currently supports about 3% of the total range wide Indiana bat population with a total of 17,584 bats.

Winter distribution in the AMRU: Indiana bats over-winter in hibernacula (e.g., caves, and abandoned mines) in the AMRU. There are three areas in the AMRU with large hibernacula: 1) Blair County, Pennsylvania, where a priority 2 hibernaculum occurs; 2) Pendleton County, West Virginia, where a priority 1 hibernaculum occurs (Hellhole); and 3) Blount County, Tennessee, where a priority 1 hibernaculum and several priority 2 hibernacula occur (see Figure 3 for definitions of priority numbers). There are many smaller hibernacula (priority 3 and 4) scattered throughout the AMRU (Figure 3).

Table 1. Indiana bat population estimates rangewide and by recovery unit (RU). Estimates are based primarily on winter surveys at known priority 1 and 2 hibernacula. Additional data from priority 3 and 4 hibernacula were included when available; however, survey efforts for these smaller hibernacula vary over time (USFWS 2013c).

Recovery Unit (RU)	2005	2007	2009	2011	2013	2011-2013 percent change	% of 2013 total population rangewide
Appalachian Mountain:							
West Virginia	13,417	14,745	17,965	20,296	3,845	-81.1	0.7
Tennessee (East)	8,853	5,977	11,058	11,096	13,200	19.0	2.5
Pennsylvania	835	1,038	1,031	519	120	-76.9	<0.1
Virginia	567	535	514	556	418	-24.8	0.1
North Carolina	0	0	1	1	1	0.0	<0.1
Maryland	No info.	No info.	No info.	No info.	No info.	No info.	0
RU Total	23,672	22,295	30,569	32,468	17,584	-45.8	3.3
Other RUs:							
Ozark-Central*	196,197	194,475	191,446	195,554	197,707	1.1	37.0
Midwest	265,729	320,342	281,977	308, 324	300,675	-2.5	56.3
Northeast	42,710	53,763	33,855	16,124	18,273	13.3	3.4
Rangewide Total	548,308	590,875	537,847	552,470	534,239	-3.3	100.0

*A previously unknown Indiana bat hibernaculum was discovered in Missouri in 2012 containing approximately 123,000 Indiana bats when surveyed in January 2013. The Service has included the same number of Indiana bats as was found in 2013 to each previous biennium through 1981 to avoid an artificial spike in population trends based upon first-hand accounts of very large numbers of bats observed at this site for several decades.

Spring migration in the AMRU: Indiana bats leave their winter hibernacula in the spring and migrate to summer habitat. The migratory distances traveled by Indiana bats between winter and summer areas can vary substantially among the RUs. Generally speaking, the routes in the Northeastern RU and AMRU are multi-directional and short (100 miles or less), with most of the Northeast RU bats migrating less than 42 miles (Butchkoski et al. 2008). Migrations in the Midwest RU and Ozark-Central RUs tend to be mostly south to north and can be short or long ranging between 5 and 357 miles (Winhold and Kurta 2006, Gardner and Cook 2002, Pruitt pers. comm. 2008).

Migration distances in the AMRU are generally 100 miles or less and most are much shorter. Of 79 records of migrating animals (from radio-tagged animals or band recoveries), 51% of the records are short distance movements of ≤ 20 miles, 75% of all records are ≤ 50 miles, and 95% are within 100 miles (USFWS 2013d).

During spring migration, females move quickly across the landscape. One radio-tagged female bat released from Canoe Creek Mine in Pennsylvania traveled approximately 60 miles in one evening (Cal Butchkoski, PA Game Commission, pers. comm. 2005). A female Indiana bat from a hibernaculum in Luzerne County, Pennsylvania traveled 56 miles to her summer habitat in Berks County, Pennsylvania in two nights (Butchkoski and Turner 2006). Based on a combination of aerial and ground tracking, Indiana bats tracked from a hibernaculum in Pennsylvania took several nights and flew almost straight lines to their roost trees 83 to 92 miles away in Maryland (Butchkoski and Turner 2006).

The extent to which migrating bats follow landscape features during migration is not clearly understood. Most migration movements have been tracked during spring migration, not the fall migration which is when most of the mortality from wind turbines occurs (USFWS 2011). However, there is some evidence that bats follow landscape features while migrating in the spring. Based on observations of 22 bats tracked during spring telemetry studies in Pennsylvania from 2000 to 2006, bats appeared to go out of their way to follow tree lines, including riparian buffers along streams through otherwise developed areas, and avoided open areas (Turner 2006). Similarly, 12 bats tracked in western Virginia during spring migration generally followed the direction of the ridges and valleys in the area, which run northeast-southwest, with only one bat flying east (i.e., into the Shenandoah Valley) and none flying west (i.e., over the higher mountain ridges into West Virginia) (McShea and Lessig 2005). The authors think that these movement patterns suggest that bats were using these corridors as migration flyways.

Summer distribution in the AMRU: Indiana bats generally migrate to forested habitats during the summer period, with females congregating in maternity colonies and males staying solitary or congregating in small bachelor colonies. Trees used for roosting during this time generally are characterized as dead and dying trees (i.e. snags) greater than 5-inches in diameter-at-breast height with loose sloughing bark or crevices in the bark where bats can hide.

Summer maternity colonies are considered especially important for the long-term recovery of the species. There are at least 17 known maternity colonies in the AMRU (this estimate does not include the North Carolina and the Tennessee portion of the AMRU). Given that the average size of maternity colonies throughout the range of Indiana bat are 60 bats (Kurta 2004), and that half of the estimated Indiana bats in the AMRU (Table 1) are expected to be females, we assume that there currently are up to 129 additional maternity colonies in the AMRU that have not been detected (based on 2013 numbers), or 146 total colonies. It is difficult to predict the location of these additional maternity colonies, though they are thought to occur primarily in lower elevation forested habitats that have access to good foraging habitat. The AMRU includes extensive forested habitat that could meet these characteristics and we do not believe Indiana bats in general are limited at the landscape level by the availability of potential maternity habitat. For example, West Virginia is about 78% forested, Pennsylvania 59% forested, and western Maryland counties are about 70% forested (West Virginia Division of Forestry 2010; U.S. Forest Service 2008, 2013).

Brack et al (2002) describe the potential role of climate and elevation affecting the thermal suitability of forests. They suggest that some areas of forest at high elevations may be too cold to provide good maternity habitat. They analyzed mist-net captures from West Virginia,

Virginia and Pennsylvania, and found reproductive females of little brown bats were proportionately less common at high elevations though other species such as small footed bats had the opposite relationship (Brack et al. 2002). There were not sufficient numbers of Indiana bat captures in their study to specifically analyze the species.

Our general understanding of suitable maternity habitat for Indiana bats in the AMRU is that warm temperatures are important. Female bats generally raise their pups in colonies which often are on the edge of forests where solar exposure can maintain warm temperatures. The physiology of reproducing female bats makes thermal conditions critical to successful reproduction. Thus major determinants of summer temperature which include latitude, elevation and microclimate, may all have an influence on where suitable maternity roosts are located.

Generally, in northern areas, high elevations may be too cold for suitable maternity habitat. Britzke et al (2006) found female Indiana bats roosted extensively in the valleys and not the mountains of a Lake Champlain study area. Thus currently, the elevation limit for suitable summer habitat in the Northeastern RU is considered to be below 900 feet (USFWS, NYFO, R. Niver pers. com 2012). However, at the southern end of the Indiana bat range, such as North Carolina and Tennessee, maternity colonies have been found at much higher elevations, especially when they can find suitable micro-climates where solar exposure to the roost tree or snag is present (Britzke et al 2003). The range of conditions available may also be important in determining where maternity sites occur. At an Indiana bat maternity site in a mountainous area of Boone County, West Virginia, the only summer habitat available was forest with steep ravines, cool valley streams, and associated dirt roads (Beverly et al. 2009). These conditions are similar in nature to those at the Beech Ridge Wind Energy Project. Reproductive Indiana bats equipped with radio-transmitters at the Boone County site foraged within a steep ravine containing a headwater stream between upper and mid slopes (in contrast to other studies where bats forage in riparian areas). Heavy fog and cool temperatures that settle in valleys associated with mountain streams may explain why these bats consistently foraged higher up the slope (Beverly et al. 2009). In addition, the ravine provided shelter from strong winds typical of the ridge tops. Thus foraging ravines may provide ideal conditions for both bat and insect prey (Beverly et al. 2009).

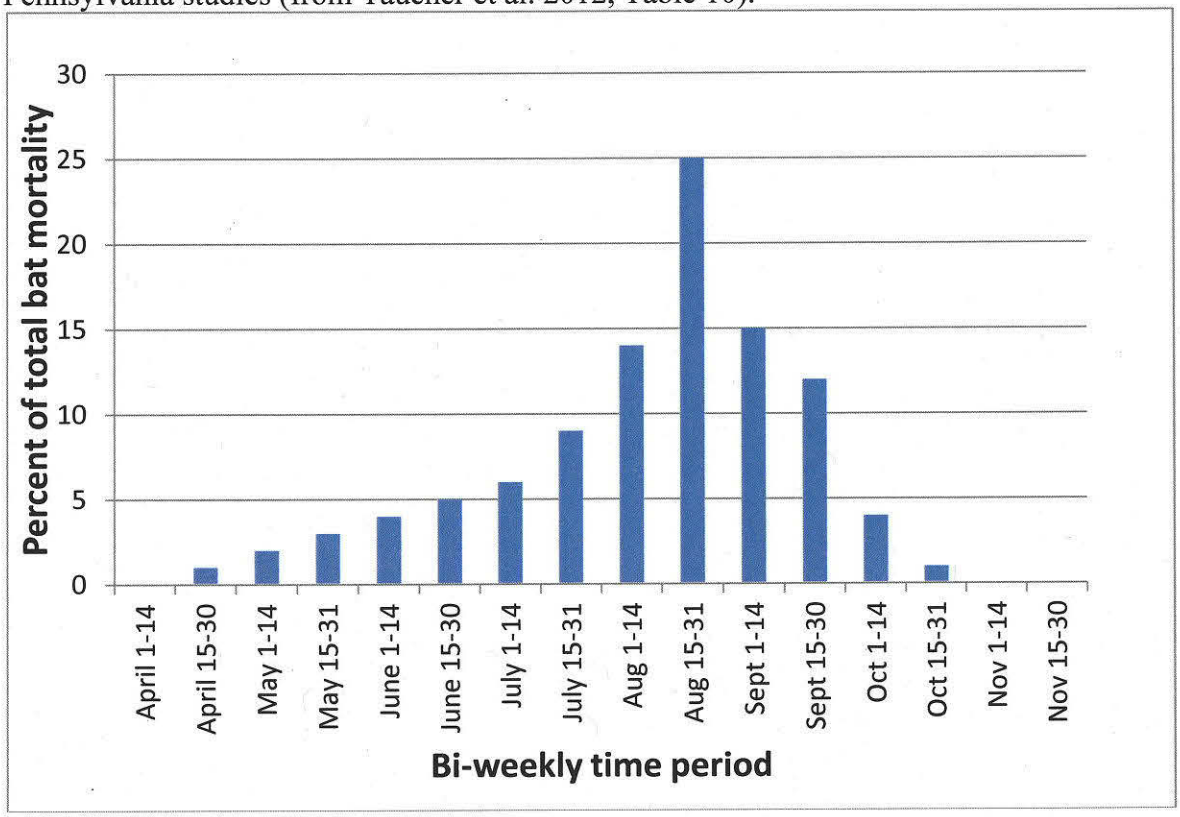
During spring and fall migration, male Indiana bats leave the hibernacula later than females and return to the hibernacula swarming area sooner. During summer, some males remain near their winter hibernacula (Whitaker and Brack 2002), while others disperse throughout the range and roost individually or in small numbers in the same types of trees (although males often use smaller trees and are more likely to roost in live trees, probably because the solar exposure possible for snags is not as important for males).

Fall migration in the AMRU: In late summer and early fall, Indiana bats return to their winter hibernacula. They migrate to areas within close proximity to the hibernacula, where swarming behavior and mating occurs. Indiana bat populations generally concentrate within 10 miles of priority 3 and 4 hibernacula and 20 miles of priority 1 and 2 hibernacula (USFWS 2011).

The majority of the bat mortality that occurs at wind turbines happens during the late summer and early fall as bats migrate from summer habitat to winter habitat. This seasonal pattern is seen in both cave dwelling bats and migratory tree bats and has been observed in many areas of the country (Kunz et al. 2007, Arnett et al. 2008, Taucher et al. 2012). In Pennsylvania, results from 26 post-construction monitoring studies conducted between 2004 and 2011 indicate that 79 % of all bat mortality occurred between July 15 and October 15 (Figure 5), though the specific peak may vary by species (Taucher et al. 2012, from results in Table 10). For little brown bats, 73% of the mortality occurred in this time period. A similar pattern of high fall bat mortality has been found in studies from West Virginia, Pennsylvania, and states in the Northeast RU.

The cause of this peak in mortality during fall migration is not clear. It may relate to social behavior that happens at this time for migratory tree bats. Cryan (2008) hypothesizes that males displaying at tall sites may attract migratory tree bats to turbines. It is possible that social behavior is starting to occur in
cave dwelling bats as they approach their swarming areas, as well, however, there is no evidence that Indiana bat migrate in groups.

Figure 5. Percent of total bat fatalities (n=2,820 bats) found in each time period from 26 Pennsylvania studies (from Taucher et al. 2012, Table 10).



The following summarizes the Indiana bat life history information for this fall migration time period as described in the Service guidelines (USFWS 2011). There is little telemetry data for fall migrating Indiana bats; however, there is data from roost tree exit counts and fall swarming surveys that may provide some insights into fall migration behavior. Data from the eastern United States show that adult males, adult females, and young migrate separately, with adult males arriving at the hibernaculum first, followed by adult females and lastly juveniles (Brack et al. 2005, Brack 1983, Kurta and Rice 2002). Further, we know that females and juveniles do not usually congregate with males during the summer and that males are frequently solitary during the summer (USFWS 2007). This may indicate that at least some males migrate independently. It is further known that females depart from maternity colonies at different times, though just because the maternity colony disbands does not necessarily mean that bats have begun to migrate (Kurta, pers. comm. 2011). Further, not all females from the same maternity colony hibernate in the same hibernacula (Kurta and Murray 2002, Winhold and Kurta 2006). This information suggests at least some females may migrate independently.

Threats to Indiana Bats in the AMRU:

WNS: As previously mentioned, of all the threats impacting Indiana bats across the range (as summarized above and in the 2007 draft recovery plan), the threat of greatest significance in the AMRU are declines from WNS. The population in the AMRU declined by 46% between 2011 and 2013 (Table 1) and is at its lowest number in the last 12 years. Although populations in the AMRU previously were increasing, WNS can now be considered prevalent throughout the RU. All cave dwelling bats in the AMRU are now considered to be experiencing population declines. Despite significant effort by the Service and many partners to understand, combat, and control the disease, there are currently no solutions.

To conserve the species, it is important to maintain all hibernacula complexes and keep the population distributed as broadly as possible. Thus the importance of some of the smaller hibernacula that might escape WNS infections and act as refugia for populations is increasing.

Impacts from operating wind turbines: A potential risk to Indiana bats is the recent increase in the number of wind turbines being constructed and operated in the AMRU, as efforts to create domestic, alternative sources of clean energy increase. Below we provide a current snapshot of the wind energy development within the AMRU and explain how it relates to the baseline condition of the AMRU's Indiana bat population. We separately analyze the effects to Indiana bats *from this Project within the action area* , later in this BO.

There currently are over 25 wind power Projects, with a total of 1,116 wind turbines which are operational in four of five states in the AMRU, as well as at least 19 additional turbines under construction in Virginia, and none in North Carolina (Table 2) (American Wind Energy Association 2013). At the time we conducted this analysis in late October 2013, the American Wind Energy Association website was under construction and no information was available on the number of turbines under construction in most states in the AMRU. Thus our analysis may underestimate the number of turbines.

Indiana bats in the AMRU can migrate up to100 miles between hibernacula and maternity colonies (USFWS 2013d), thus Indiana bats from many areas may be flying near project sites. If we assume that the turbines across the AMRU will take Indiana bats at the same rate as calculated for the Beech Ridge Wind Energy Project without minimization (0.045 Indiana bats/turbine/year), then we predict that the approximately 1,116 turbines in the AMRU currently take approximately 50 Indiana bats annually. The predicted number of annual Indiana bat

Table 2. Estimates of the number of wind turbines in the AMRU currently operational or under construction (source: American Wind Energy Association 2013).

State	Total # of Operational Turbines	Turbines under construction	Total # turbines
West Virginia	327	Unknown	327
E. Tennessee	18	0	18
Pennsylvania	720	Unknown	720
Maryland	51	0	51
Virginia	0	19	19
North Carolina	0	0	0
Total Turbines	1,116	19	1,135

fatalities would increase in the near term when a currently unknown number of turbines currently under construction are completed and begin operating.

Alternatively, if we assume that the turbines across the AMRU will kill an average of 25.98 bats per turbine per year (see FEIS Table 5.20), then the 1,116 turbines would kill approximately 28,994 bats annually, and Indiana bat mortality would be 0.2% of that or 58 per year (based on a weighted average of the total number of Indiana bat carcasses found to all bat carcasses found at the four facilities where Indiana bat fatality have been documented to date, see Table 4.1 in Service 2013g).

These are rough ballpark estimates because the actual impact of each project will be site specific, and impacts at some projects may be reduced by avoidance and minimization measures being applied. We also recognize that the risk to Indiana bats is likely different for each project, depending on the project's size and proximity to hibernacula or maternity colonies. However, this analysis allows a general understanding of the relative magnitude of how much baseline fatality is potentially occurring cumulatively from turbines currently operating in the AMRU.

The 2013 population size for Indiana bats in the AMRU was 17,584 individuals (which we consider to primarily reflect post-WNS population levels) (Table 1). Therefore, an annual loss of roughly 50 to 58 bats per year would represent 0.3% of the AMRU population rangewide. We anticipate that these bats are associated with multiple maternity colonies and hibernacula in the AMRU. To understand the impact the loss of these individuals would have to the overall species, we would need to know local populations from which the bats originate, since it is ultimately the fate of the local populations that impacts the sustainability of this species. This information is largely unknown as most bats are not banded and other techniques, such as genetic and radio-isotope analysis currently are insufficient to identify the specific hibernacula or maternity colony from which a bat originated. Absent this information, we assume that there are multiple Indiana bat maternity colonies and hibernacula in the AMRU being affected by wind turbine related mortality at relatively low rates.

As WNS spreads across the AMRU, we anticipate declines comparable to those observed in the Northeastern RU which reduced the population by 2011 to about 30% of its peak 2007 population (Table 1). We expect Indiana bat mortality that occurs from operating wind turbines during the fall migration will likely be reduced by approximately the same amount as the total population because fewer bats will be exposed to wind turbines. Thus we anticipate the proportion of the population that will be taken by wind turbines to be approximately the same as before WNS. However, it is clearly important to maintain as many bats as possible while they experience this population decline and turbine operational measures that reduce Indiana bat fatality should be incorporated into every project.

Previous incidental take authorizations: All previously issued Service BOs involving the Indiana bat, including those within the AMRU, have been non-jeopardy. These formal consultations have involved a variety of actions including surface mining, forest management plans, road and bridge projects, natural gas pipelines, timber harvest, prescribed burns,[7] and other activities. Generally, these projects result in take through habitat modification and loss, or lethal take of only a few individuals over a short time frame (USFWS 2013e). These types of projects generally have short term effects. Take of individuals that may occur from these projects is generally reflected in the baseline of the population estimates generated through the biannual winter surveys.

The take of Indiana bats that is already occurring at existing wind facilities and by other land uses is reflected in the baseline population estimates generated biannually during winter surveys of hibernacula. Further, population growth rates (lambda values) generated for the AMRU based on biannual hibernacula survey data should capture this existing take. These lambda values will be used later in this BO to analyze the effect of the take of Indiana bat from operation of the Beech Ridge Wind Energy Project at multiple population scales.

C. Status of the Indiana Bat in West Virginia

Winter distribution and numbers in West Virginia: In West Virginia there are 37 total known Indiana bat hibernacula (occupied or historically occupied), well distributed along the ridgeline of the Appalachian Mountains. Prior to WNS, 27 of the 37 hibernacula were considered to have extant winter populations (defined as one or more Indiana bats since 1995) (USFWS 2007). Of these 27 hibernacula, one is classified as priority 1 (a maximum winter population of 10,000 or more Indiana bats currently and/or historically), one is classified as priority 2 (1,000 to 9,999 Indiana bats), 11 are classified as priority 3 (50 to 999 Indiana bats), 22 are priority 4 hibernacula (fewer than 50 Indiana bats), and two are unclassified (USFWS 2007). Thirteen of the 22 priority 4 hibernacula are considered extinct or had a maximum population size of zero since 2000 (USFWS 2007). The priority 1 hibernaculum, Hellhole, is located in Pendleton County, approximately 75 miles from the Project.

[7] See: http://www.fws.gov/midwest/endangered/mammals/inba/inbaBOs.html. Accessed November 8, 2013.

Prior to WNS, the population trend in West Virginia was increasing (Table 1). The largest number of Indiana bats ever recorded in a West Virginia hibernaculum was 18,557 individuals in Hellhole in 2010, after WNS first appeared in the state but before it had widely spread (WVDNR 2010). By 2013, the population in Hellhole had declined 86% to 2,540 Indiana bats, attributed to the spread of WNS (WVDNR 2013). WNS has spread to almost every Indiana bat cave checked in West Virginia and the total population statewide has dropped from a historic high of 20,296 Indiana bats in 2011 to 3,845 in 2013 (Table 1).

Summer distribution in West Virginia: The locations of only eight maternity colonies are known in West Virginia, but they are well distributed across the state. The two colonies closest to the Project are located in Boone and Kanawha counties, in the southern part of the state roughly 55 miles west of the Project. The other colonies are more distant: one colony is located approximately 90 miles away in Tucker County, in the northcentral part of the state; one colony is about 100 miles away in Wetzel County in the northwest portion of the state; and four colonies are roughly 140 miles away in the northern panhandle in Brooke and Ohio counties. The distribution of known maternity colonies where roost tree locations are known, as well as other records such as capture of reproductively active females and juveniles where the roost tree locations are unknown, suggests that we have found evidence of Indiana bat reproduction in only a small portion of potential summer distribution due to the limited extent of surveys conducted and the difficulty in finding them in a forested state with steep terrain (Craig Stihler, WVDNR, personal communication).

In addition to evidence of summer reproduction, there also is evidence of male and non-reproductive female Indiana bats caught in mist-nets during summer in eight counties spanning south, central and northcentral portions of the state (Fayette, Raleigh, Clay, Nicholas, Pendleton, Randolph, Preston, and Tucker). The capture of both male and female bats confirm that Indiana bats use forested habitats throughout the state for summer foraging and roosting. Therefore we conclude that Indiana bats occur throughout West Virginia during the summer and undetected maternity colonies exist across the entire state in suitable habitat.

Spring and fall migration in West Virginia: Of 26 records of migrating Indiana bats (from radio-tagged animals or band recoveries) in West Virginia, the majority (86%) are short distance movements between winter and summer range within the state. Approximately 14% are longer distance movements across state lines of 50 or more miles. Five banded Indiana bats moved in a generally southeast direction from summer habitat in Pennsylvania to winter hibernacula in West Virginia, with an average distance moved of 90 miles.

Threats to Indiana bats in West Virginia: Indiana bats in West Virginia face the same threats as previously described for the AMRU. Specific to the impacts of wind power, there are five currently operating wind energy projects with 327 operating turbines (including phase I of Beech Ridge), two projects (totaling 232 turbines) that have not initiated construction but which have been granted citing certificates by the West Virginia Public Service Commission, and several projects proposed or in the planning stages. The closest approved or operating project is approximately 75 miles northeast of the Beech Ridge Project. Other existing projects are located within approximately 100 miles of the Beech Ridge Project.

Of the five existing projects, all have done post-construction monitoring to varying degrees (typically for 1 to 3 years at a subset of turbines), and one Indiana bat fatality has been detected at one facility (a male in July 2012). Two projects (128 existing turbines) are currently operating in such a manner so as to be unlikely to take Indiana bats while an ITP is pursued. One project (23 turbines) is testing curtailment strategies to reduce unusually high baseline bat fatality. One project (132 turbines) has completed post-construction monitoring studies, had average bat fatality, and is operating in a manner to reduce bat fatalities. The final project (44 turbines) is operating normally without turbine curtailment.

V. STATUS OF THE VIRGINIA BIG-EARED BAT

A. Status of the Virginia Big-eared Bat Rangewide

Listing status and critical habitat: Virginia big-eared bats (*Corynorhinus townsendii virginianus*, formally *Plecotus townsendii virginianus*) are one of two subspecies of Townsend's big-eared bat that were jointly listed as endangered under the Endangered Species Act on December 31, 1979 (USFWS 1979b).

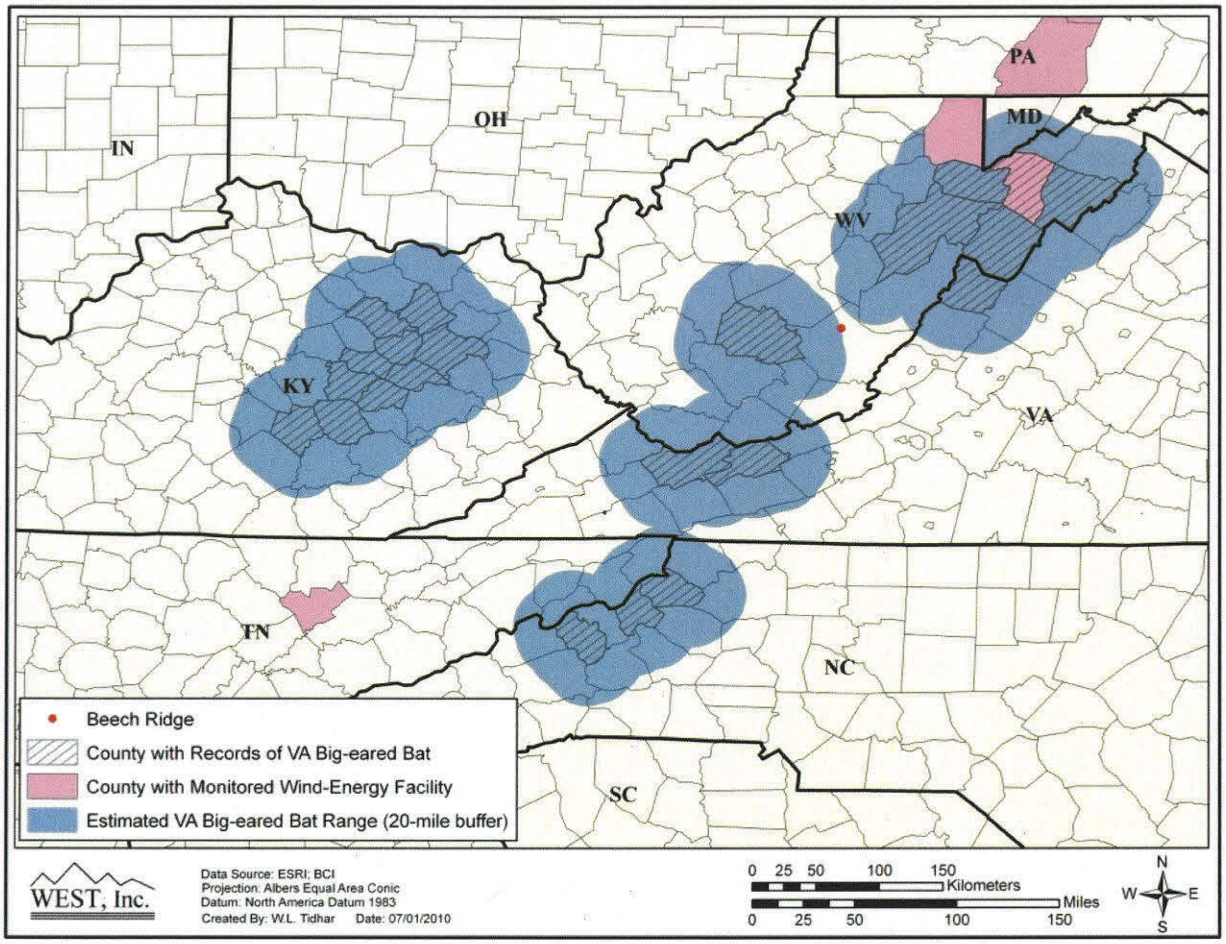
Critical habitat was designated concurrent with the listing (USFWS 1979b) and consists of 5 caves, all in West Virginia (Cave Mountain Cave, Hellhole, Hoffman School Cave, Sinnett/Thorn Mountain Cave, and Cave Hollow Cave/Arbogast). No critical habitat occurs within or near the action area.

Description and rangewide distribution: Virginia big-eared bats are medium-sized with forearms measuring 39 to 48 millimeters (mm) long and weighing 7 to 12 grams. Total body length is 98 mm, the tail is 46 mm, and the hind foot is 11 mm long. They are distinguishable by having long ears (over 2.5 centimeters) and facial glands on either side of the snout. Virginia big-eared bats closely resemble the Ozark big-eared bat (*Corynorhinus townsendii ingens*), but the subspecies do not have overlapping ranges.

Virginia big-eared bats are distributed in isolated populations in the Appalachian Mountains in Kentucky, North Carolina, Virginia, and West Virginia (Figure 6). They use caves and mine portals year-round for shelter and reproduction; thus they occur in caves during both winter and summer. Unlike Indiana bats, they do not roost in trees; however, some Virginia big-eared bats have been known to roost in exposed rock cliffs during summer. While not truly migratory, they move relatively short distances of up to 20 miles (32 kilometers) between their winter hibernacula and maternity colonies (Stihler 1994; Stihler 1995; C. Stihler, WVDNR, pers. comm. 2007). The caves they occupy are typically located in karst regions, a landscape characterized by limestone caves and sinkholes, dominated by oak-hickory or beech-maple-hemlock forest. The Virginia big-eared bat population is known to occur in roughly 15 caves, with the bulk of the population occurring in only a few.

Virginia big-eared bats principally feed on moths but eat other insects as well. They forage in open areas (e.g. pastures and old fields), along forest edges, and in small openings in forests, but

Figure 6. Approximate Virginia big-eared bat range. Known locations are buffered by 20-miles, the maximum recorded distance Virginia big-eared bats have moved between winter hibernacula and summer maternity caves.



do not use clear-cuts. They tend to use forested habitat to a greater extent in Kentucky than in West Virginia. While flying they use both echolocation and listening to detect moving prey in the air and stationary prey on vegetation.

Reproduction occurs in the fall and winter and the females store the sperm until ovulation in late winter or spring. Gestation takes about 3 months and a single pup is born in May or June. In the early spring, females congregate in maternity colonies in the warm parts of certain caves and give birth to a single young. Most males are solitary during this time. The large offspring (25% of the adult female's weight) are capable of fight in about three weeks and are fully weaned at six weeks (Barbour and Davis 1969, Schmidly 1991, Kunz and Martin 1982). Before the young can fly, the females leave them in the cave so the females can forage, returning periodically to nurse. Virginia big-eared bats hibernate in the cooler, well-ventilated portions of caves during the winter and may lose half their autumn body weight before spring.

Recovery plan and recovery units: The Service published a recovery plan for Virginia big-eared and Ozark big-eared bats in 1984. A recovery plan specific to Ozark big-eared bats was finalized on March 28, 1995; therefore, the 1984 plan no longer applies to that subspecies. A revised recovery plan specific to Virginia big-eared bats was drafted in 1995, but has not yet been finalized due to higher priority workload. The revised recovery plan (USFWS 1995) outlines recovery actions specific to Virginia big-eared bats. The objectives of the draft plan relate to achieving recovery of the species, for which the following criteria have been established: (1) long-term protection of priority 1 winter and summer colony sites (i.e., colonies with population levels of more than 100 bats); (2) populations in 80% of priority 2 winter and summer colony sites (colonies with10 to 99 bats) are shown to be stable or expanding, or a commensurate number of new colonies are discovered; (3) the current geographic distribution of the Virginia big-eared bat is maintained; and (4) a periodic monitoring program is established to ensure a continued awareness of the status of the bats.

The rangewide distribution of Virginia big-eared bats is considered as a single recovery unit for the species.

Rangewide population: Rangewide the population was estimated to be 15,360 Virginia big-eared bats in 2000 (Currie 2000). Survey data from 2006-2007 indicate a hibernating population of approximately 10,900 bats and 7,169 bats within known maternity colonies (USFWS 2008). Both represent a large increase from the 3,500 bats estimated when the species was initially listed as an endangered species (USFWS 1979b). More recent information suggests that populations are stable or potentially increasing in portions of their range (USFWS 2008).

Threats rangewide: At listing the threats were initially attributed to the small population size, limited distribution, and vulnerability to human disturbance (USFWS 1979a, 1979b). The apparent vulnerability to human disturbance was due to the population concentrations in only a small number of caves. More recently, the draft revised recovery plan considers the primary threats to be vandalism and increased human visitation to maternity roosts and hibernacula (USFWS 1995). Virginia big-eared bats are extremely sensitive to human disturbance. Even slight disturbances can cause adults to abandon caves, abandon young, and force bats to use valuable energy reserves needed to survive hibernation.

Virginia big-eared bats are considered a suspect species for white-nose syndrome (WNS) due to detection of DNA suggestive of the fungus (*Geomyces destructans*) on the species. However, to date there have been no signs of the disease affecting Virginia big-eared bats and no known population impacts from WNS to this species.

Impacts from operating wind turbines: As previously discussed for the Indiana bat, the recent increase in the number of wind turbines being constructed and operated also poses risk to Virginia big-eared bats. To date, within the four-state range of the species, turbines have been built in one state (West Virginia) and are proposed or under construction in another (Virginia). To date, no Virginia big-eared bat carcasses have been reported at operating wind power projects within the species range. Below we provide a current snapshot of the wind energy development within West Virginia and explain how it relates to the baseline condition of the species rangewide population. We separately analyze the effects to Virginia big-eared bats *from this Project within the action area*, later in this BO.

B. Status of the Virginia Big-eared Bat in West Virginia

There are 9 active winter hibernacula and 12 active summer maternity colonies in West Virginia that provide habitat to a large portion of the known Virginia big-eared bat population. Most of these colonies and hibernacula have been monitored annually for over 27 years. This long-term monitoring shows that most of the known Virginia big-eared bats are concentrated in a small number of caves, with over 95% of the known hibernating population in just three caves (Stihler 2011). Hellhole supports the largest known hibernating population in the state, with 7,640 Virginia big-ear bats during the 2013 winter count (WVDNR 2013). Peacock, Hoffman School, and Cliff caves support the largest maternity colonies in the state, with approximately 1,100 to 1,200 individuals each in 2013 (C. Stihler, WVDNR, pers. communication 2013).

Although there have been population declines at certain maternity caves over the 27-year monitoring period, the overall trend has been that of a population increase (Figure 7) after human disturbance at these caves was curtailed (Stihler 2011). The most recent population censuses suggest a steady increase in numbers over the last few years for both summer and winter colonies at most West Virginia caves (C. Stihler, WVDNR, pers. communication 2013). The estimated number of hibernating Virginia big-eared bats in West Virginia in 2012 was 11,792, a 61% increase from 2007. Similarly, the estimated number of bats in maternity colonies statewide increased 24% from 2008 to 2013 (7,934 individuals). Efforts to protect these key cave sites and reduce disturbance have likely contributed to stable or slowly increasing populations in the state (USFWS 2008, Stihler 2011).

Impacts from operating wind turbines: As previously mentioned there currently are five operating wind projects in West Virginia with a total of 327 existing turbines; two projects (totaling 232 turbines) have approved siting certificates but have not initiated construction; and several more projects have been proposed or are in the planning stages. For the most part, existing projects are located outside of the 6-mile foraging radii of occupied caves, with exception of one project located near a historically occupied cave (Figure 8). The risk of take of Virginia big-eared bats from these projects currently is low, as most are curtailing at least some turbines. While no fatalities have been detected to date, the risk of take is not zero and a small amount of mortality may go undetected given that not all turbines are searched daily and all of

Figure 7. Virginia Big-eared Bat Maternity Colony Statewide Population Trend in West Virginia

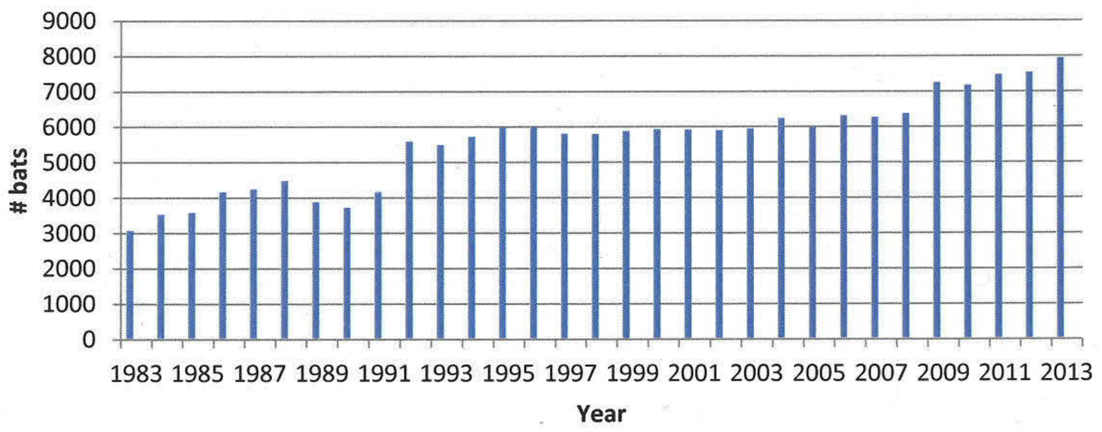
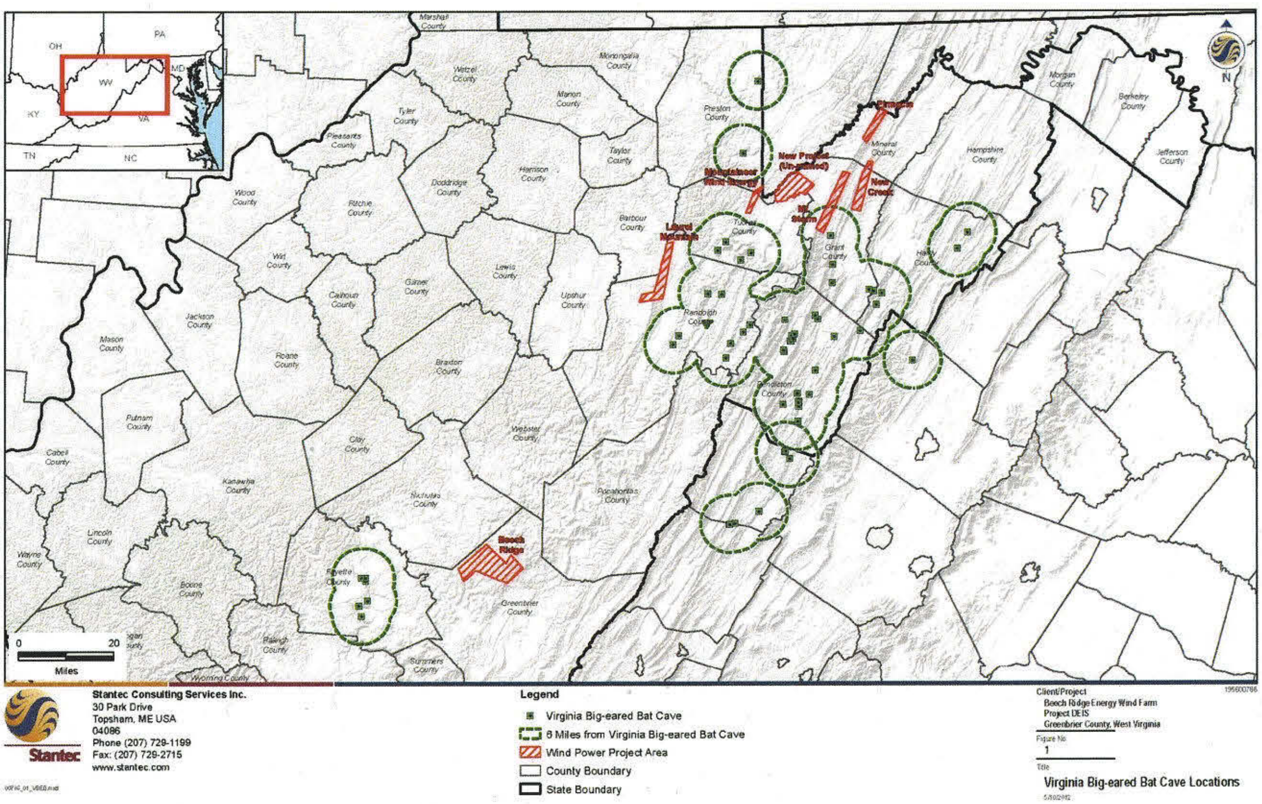


Figure 8. Proximity of existing wind energy projects to Virginia big-eared bat caves. Caves are buffered by a 6-mile radius, the typical maximum foraging distance.



the area under turbines typically is not searchable.

If we assume that the existing turbines in West Virginia will take Indiana bats at the same rate as calculated for the Beech Ridge Wind Energy Project without minimization (0.01 Virginia big-eared bats/turbine/year), then we predict that the existing 327 turbines in the state (and rangewide) currently take approximately 3 Virginia big-eared bats annually. The predicted number of annual Virginia big-eared bat fatalities could increase in the near term should the two projects with siting certificates be built; however, we know that funding for one project currently is uncertain and recent discussions with the developer of the second project indicate plans for construction of far fewer turbines than authorized.

Based on winter cave counts, the 2012 population size for Virginia big-eared bats in West Virginia was 11,792 individuals. Therefore, an annual loss of roughly 3 bats per year would represent 0.03% of the West Virginia population, a very low rate of mortality. We anticipate that these bats are associated with multiple maternity colonies and hibernacula , further minimizing the effect to populations.

A check of the Service's database of biological opinions and coordination with Service offices indicates that take of Virginia big-eared bats has not been previously authorized. Thus this is the first biological opinion for the species in West Virginia and rangewide. The main threat to the species has been human disturbance of caves on private land and these activities have not been the subject of consultations or HCPs. Minor effects to Virginia big-eared bat foraging habitat may result from clear-cutting and other land use practices that fragment the forest and create large openings; however, these non-lethal effects likely do not rise to the level of take (affecting reproduction, feeding, or sheltering).

VI. ENVIRONMENTAL BASELINE WITHIN THE ACTION AREA

Under section 7(a)(2) of the Act, when considering the "effects of the action" on federally listed species, the Service is required to take into consideration the environmental baseline. The environmental baseline includes past and ongoing natural factors and the past and present impacts of all federal, state, r private actions and other activities *in the action area* (50 CFR 402.02), including federal actions in the area that have already undergone section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultations in progress. In the case of this project, almost all past and present impacts of human activities on the status of the species and its habitat in the action area have been and continue to be private actions (industrial timber management and private homes), with past surface mining and some recent but very limited natural gas exploration. No proposed Federal actions in the action area have undergone or are currently going through section 7 consultations.

As such, the environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including critical habitat), and ecosystem, within the action area (USFWS and NMFS 1998). The environmental baseline is, therefore, a "snapshot" of the species' health at a given point in time, but it does not include the effects of the proposed action.

A. Indiana Bat

Status of the species in the action area: As further explained below, we assume that Indiana bats travel through the action area during spring and fall as they migrate between winter and summer habitat, and they forage and mate in a small portion of the action area during the fall swarm. In addition, there may be incidental Indiana bat occurrences in the action area during the summer period.

Wintering populations - There are no known Indiana bat hibernacula in the action area. However, as discussed in more detail below for Virginia big-eared bats, there are a dozen caves within close proximity of the Project which have suitable characteristics and thus provide potential sites for colonization, especially as WNS devastates Indiana bat populations in other currently occupied caves and WNS-survivors abandon caves with low populations and seek to restore social cohesion with other survivors.

Migrating populations - Based on known migration distances, statewide mist-net survey data, distance to the nearest known hibernacula, and project -specific acoustic data, we anticipate that Indiana bats likely migrate through the action area between April 1 and November 15 when moving from winter hibernacula to summer habitat.

Summering populations - Despite the lack of summer captures, the Service considers it likely that Indiana bats use the action area.

In 1999, a juvenile male was captured during the maternity period approximately 14 miles from the Beech Ridge Project area. This bat was not tracked so no additional information on the potential maternity usage in the area is available.

Acoustic monitoring conducted in 2005 and 2010 on the project site detected likely Indiana bat calls, identified by multiple analytical methods, during the period corresponding to the summer breeding season and the early fall migration period (Young and Gruver 2011, District Court Memorandum of Opinion dated December 8, 2009). BRE supplemented the limited 2005 acoustic data with additional monitoring on the project site from July 21 to November 15, 2010 (Young and Gruver 2011). A total of 12,431 bat call sequences were recorded in 2010 and analyzed by three analytical methods. Depending on the method used to analyze the data, anywhere from 3 to 111 potential Indiana bat calls sequences were detected. The total timeframe when the 111 calls were detected was not identified. These calls were classified using the discriminant function analysis method, which was set so that the probability of correctly classifying a call sequence to match characteristics of species known call sequences in the model was 0.99 or better. The confidence level of correct species identifications using the other two analytical methods is unknown; however, the Britzke filter generally is considered a coarse filter, and visual observation of call sequences by an expert can be highly variable. Of all calls detected by any method, seven were identified as probable Indiana bat calls based on concurrence of two or more methods. These seven calls were detected between late-July and early August, corresponding to the late summer breeding season and start of early fall migration.

While we do not know if these calls represent one or a few individuals, or if the calls were made by males, reproductively active females, non-reproductive females, or juveniles, the calls do provide evidence of use of the action area across space and time during summer and/or early fall. It should be noted that sampling at the project site was limited in 2005 to a night or two, and in 2010 the four detectors at two turbines (two detectors at ground level and 2 at the nacelle height) were positioned at only two locations in a project area spanning over 30 miles of ridgeline. When considering that detectors have a limited space within which bat calls can be detected, and that this zone would not typically extend beyond the air-space of one turbine, the rotor-swept area within the 100-turbine action area was not extensively sampled, yet detected calls considered likely to be Indiana bats based on the analytical methods. In contrast to the acoustic data, on-site summer and fall mist-net surveys following protocol in effect at the time[8] did not capture Indiana bats in 2005, 2006, and 2010 (BHE Environmental 2006, Young and Gruver 2011). Indiana bats are extremely difficult to capture in mist-nets, so the conflicting mist-net and acoustic data are not surprising.

The action area provides suitable summer foraging and roosting habitat. As further described below, habitat conditions for the Indiana bat in the action area are extensively forested (Figure 9), with ample riparian and forest-edge habitats for foraging, as well as an unknown quantity of potential roost trees (dead, dying, and live trees, at least 5 inches in diameter at breast height, with peeling bark).

Fall swarming populations - In addition, the action area includes a portion of the swarming radius of Snedegar's Cave, the closest known winter hibernacula. Snedegar's Cave is approximately 9 miles from the eastern end of the existing phase I turbine footprint, which means a portion of the Project (approximately 14 turbines) occur on the outer edge of the 10-mile swarming habitat radius for this priority 3 hibernaculum. Therefore Indiana bats are anticipated to be in the action area during fall swarming periods. Also, there is potential for bachelor males to remain in that swarming habitat radius during the entire summer.

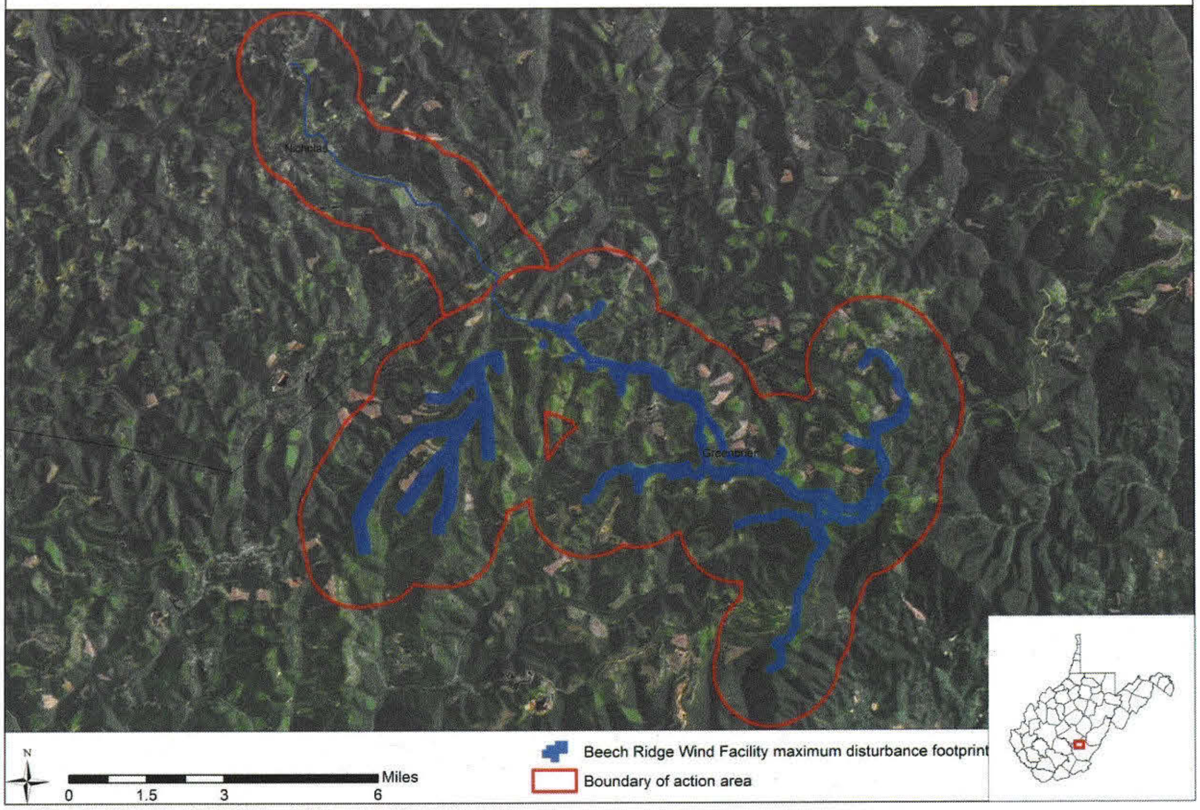
Factors affecting the species environment in the action area: The factors affecting Indiana bats in the action area are a subset of the factors affecting the species rangewide and in the AMRU, as summarized above. The main factors currently affecting the species in the action area are WNS, wind turbine operations, and timber management.

The most recent Indiana bat population estimate (USFWS 2013c) indicates the population is unstable and declining due to WNS. WNS is now affecting Indiana bats in the AMRU as well as those bats that may use the action area. The population of bats in Snedegar's Cave is small and currently infected with WNS. This local population declined from a historic high of 304 Indiana bats in 2009 to 179 bats in 2011 (a 41% change). As previously mentioned, we anticipate declining AMRU population trends in the future that are similar to the declines experienced in the Northeast RU. Therefore, the numbers of Indiana bats that may occur within the action area are also likely to decline.

---

[8] A team of Service biologists have analyzed past Indiana bat summer survey protocol and recommended changes to improve detectability of Indiana bats through use of acoustics and increased level of effort when mist-netting. These revised protocol are not yet formally adopted and were not available at the time the acoustic and mist-netting surveys were conducted at the Project site.

Figure 9. Aerial view of the Beech Ridge Wind Energy Project action area.



The predominant land use in the action area historically has been and continues to be timber management by a private industrial timber company. Portions of the action area were historically impacted by surface mining, and most recently 373 acres were cleared during construction of phase I of the Project. Thus as a result of past and present private actions, Indiana bat habitat in the action area currently consists predominantly of second and third growth forest, interspersed with open areas (e.g., roads, abandoned surface mines, wind turbines, transmission line, substation, and O&M building). Currently, approximately 80% of the forest in the action area and surrounding landscape is greater than 26 years old, 19% is less than 26 years old, and 2% is non-forested. The forest in the action area is typical of much of the landscape in West Virginia. In general managed forested habitats such as this are common in West Virginia and are not considered a limiting factor for Indiana bat populations due to the abundance of ample foraging habitat, and the availability of potential roosting habitat. Timber management typically results in snags which are created, either intentionally or unintentionally, by periodic application of timber management prescriptions in a shifting mosaic across the landscape. The density of snags in a stand, however, can be highly variable and can be limited in certain areas. Thus the action area currently contains ample and good quality foraging habitat for Indiana bats, as well as an unknown quantity of potential breeding habitat (roost trees) in the form of snags. Whereas snags are currently thought to be limited on the ridgeline where phase I turbines were built, they are likely more abundant at lower elevations within the action area. Roost tree surveys have not been conducted at the project site or elsewhere in the action area.

Other factors affecting the action area are activities associated with a low density of homes, past surface mining, past natural gas extraction in a few locations, and potential for limited future natural gas extraction by directional drilling or fracturing techniques. The action area lays at the edge the Marcellus shale geological formation. Thus the threat of future fracking activities in the action area is low compared to the boom occurring in north-central West Virginia. Collectively, these other land uses have a minor impact on Indiana bat habitat.

Environmental baseline for critical habitat within the action area: Critical habitat designations identify habitat areas that provide essential life cycle needs of the species, to the extent known using the best scientific and commercial data available.[9] Two of the 13 areas of designated critical habitat for the Indiana bat occur in the AMRU. As previously mentioned, Hellhole is the closest critical habitat to the action area, and is approximately 78 miles away. While bats from Hellhole potentially travel through the project site during migration periods, the cave itself is outside of the action area and there will be no habitat related impacts from facility construction, operation, maintenance, or decommissioning that affect the cave or other designated critical habitat. As no critical habitat occurs within in the action area, there is no potential for the Project to impact it.

B. **Virginia Big-eared Bat**

Status of the species in the action area: Virginia big-eared bats are not currently known to occur within the action area and there are no records of this species occurring within the surrounding Greenbrier and Nicholas counties. No Virginia big-eared bats were captured during mist-net surveys in 2005, 2006, and 2010 (BHE 2006, Young and Gruver 2011) at the project site. However, consistent with Service recommendations, BRE included Virginia big-eared bats in the HCP because the Project is on the edge of the species range and there is potential for Virginia big-eared bats to pass through the Project area due to proximity to known range and an expanding population.

There are two populations of Virginia big-eared bat in West Virginia, a northern population and a southern population (Figure 6). The Project is located between these two populations, approximately 27 miles northeast of the southern-most population in Fayette County. Due to this proximity, there is potential for Virginia big-eared bats to pass through the Project area during their movements between winter and summer caves. Of the few records existing, the farthest recorded movement between summer and winter caves has been 20 miles (C. Stihler,

[9] The term "critical habitat" for a threatened or endangered species means—
(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 1533 of this title, on which are found those physical or biological features **(I)** essential to the conservation of the species and
(II) which may require special management considerations or protection; and
(ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 1533 of this title, upon a determination by the Secretary that such areas are essential for the conservation of the species (16 USC 1532 (5)(A)).

unpublished data in Piaggio et al. 2009); however, longer distance movements are plausible given the abundance of suitable unoccupied caves between the Project area and the population in Fayette County.

During 2005 pre-construction surveys, BHE (2006) identified 24 caves within 3 miles of the phase I footprint of the Project. These caves predominantly are owned by private landowners and not gated. They were assessed for hibernacula suitability and bat presence, including cave length, entrance and structural access by bats, flooding potential, air flow, floor and ceiling temperatures, and amount and composition of water in the cave. Based on these assessments, 12 of the 24 caves may provide suitable habitat for hibernating bats, including Virginia big-eared and Indiana bats. Although none of these caves were occupied by these listed bats at the time of the survey, they do provide potential sites for colonization.

Factors affecting the species environment in the action area: As explained above, the primary threats affecting Virginia big-eared bat populations across the species range are losses of habitat, vandalism, and increased human visitation to maternity roosts and hibernacula. The 12 caves near the Project face these threats but are currently unoccupied by Virginia big-read bats. The only other potential threat in the action area (wind turbines operations) currently is alleviated because the phase I Project turbines are operating in such a manner so as not to be likely to take a Virginia big-eared bat until an ITP is issued. (See previous discussion in the Consultation History section of this BO.).

Suitable foraging habitat for Virginia big-eared bats currently exists within the action area in the form of a moderate amount of small grassy openings or other clearings and forest edges created and maintained by past and ongoing land uses (primarily timber harvesting, and a limited amount of surface coal mining, natural gas extraction, and residential development.

Environmental baseline for critical habitat within the action area: All designated critical habitat for Virginia big-eared bats occurs within West Virginia. However, no critical habitat occurs within or near the action area. Sinnett/Thorn Mountain Cave is the closest critical habitat to the action area and is approximately 72 miles away. There will be no habitat related impacts from facility construction, operation, maintenance, or decommissioning that could potentially impact critical habitat.

VII. EFFECTS OF THE ACTION

In evaluating the effects of the action, section 7 of the Act and the implementing regulations (50 CFR 402) require the Service to consider both the direct and indirect effects of the action on the listed species and its designated critical habitat, together with the effects of other activities that are interrelated and or interdependent with that action which will be added to the environmental baseline. Direct effects are those effects that have immediate impacts on the species or its habitat, whereas indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur (50 CFR §402.02). Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consultation. The effects evaluation is necessary to make the required determination under 7(a)(2) of ensuring the Federal action does not jeopardize the continued existence of the species, or result in the destruction or adverse modification of designated critical habitat.

In this case, the Federal action being analyzed is the issuance of an ITP conditioned upon the implementation of the HCP and associated implementing agreement. Several components of the Project and associated HCP have the potential to affect Indiana bats and Virginia big-eared bats in the action area. These components are: (1) vehicle collisions, (2) light emission, (3) water contamination, (4) water use, (5) weed control, (6) turbine operation noise disturbance, (7) construction, maintenance, and decommissioning noise; (8) habitat removal, and (9) turbine collision and barotrauma. We have determined that the first eight components are not likely to adversely affect Indiana and Virginia big-eared bats, as explained below. Collisions with turbine blades and barotrauma, however have the greatest impacts and are likely to cause take of both species. That component is therefore discussed in the greatest detail. Compensatory mitigation for take through collision and barotrauma will be implemented as part of the HCP and will have long-term benefits. It is therefore also be considered below as an effect of the action.

Vehicle collisions: There is evidence that bats (including Indiana and Virginia big-eared bats) can be killed by collision with vehicles. A single Indiana bat fatality along with multiple little brown bat fatalities were documented over a 36-day study resulting from presumed collision with vehicles on U.S. Route 22 in Pennsylvania (Russell et al. 2008). This study was conducted on a highway with a narrow corridor, surrounded by forest.

Both the U.S. Forest Service and WVDNR have noted examples of Virginia big-eared bats being struck by vehicles, and two individuals were found dead in the road near Minor Rexrode Cave (USFWS 2008). The Forest Service found dead insects and a dead Virginia big-eared bat in the grille of a truck. Because the bat carcass was in bad shape (dried up), they were unsure when the collision occurred. The WVDNR hit a Virginia big-eared bat with a vehicle in June at night while travelling about 55 mph on a road. The Virginia big-eared bat carcasses found dead in the road near Minor Rexrode Cave were believed to have died when exiting the entrance to this cave; the entrance is next to the road and bats must swoop up over the road which has a 30 to 35 mph speed limit.

Within the action area, vehicles and heavy equipment will be used during construction of the phase II turbines and associated infrastructure, as well as during decommissioning at the end of the project. Vehicles also will travel along access roads to provide routine maintenance of turbines and other components of the project. However, these vehicles will be few in number and will be moving slowly compared to the highway projects referenced above, providing little chance for collisions with agile bats. Roads in the project site will be posted with 25 mph speed limits. Vehicles will be traveling within the action area mostly during the daytime, when Indiana and Virginia big-eared bats are not flying. There are no cave entrances near roads on the project site. Given the slow moving, daylight traffic that will anticipated, and lack of cave entrances near roads, we do not expect bat/vehicle collisions. Therefore, effects to both species from vehicle collisions during Project operation, maintenance and decommissioning activities are unlikely to occur (i.e. are discountable).

Light emission: There are several aspects of lighting that have the potential to affect Indiana and Virginia big-eared bats within the action area, including Federal Aviation Administration (FAA) required lighting on wind turbines and meteorological towers, security/safety lighting at project facilities, and lighting that occurs within the wind turbine nacelles for maintenance purposes. As required by the West Virginia Public Service Commission citing certificates for the project, BRE must comply with turbine lighting per specifications of the FAA. FAA lights are flashing red strobes (L-864) used only at night and are placed on select turbines. Meteorological towers will also utilize the minimum lighting as required by the FAA. It is not anticipated that the flashing red FAA lighting, nor the security lighting will concentrate a significant amount of prey to attract Indiana or Virginia big-eared bats. There have been many post-construction monitoring studies at wind projects which compared bat mortality at wind turbines with and without the FAA red flashing strobe lights, and a summary of 21 of these studies indicate none found differences between turbines with and without FAA lighting (Arnett et al 2008). Thus the FAA lighting is not anticipated to result in any effects to Indiana and Virginia big-eared bats.

Lighting accidentally left on at night on buildings, substations, or within turbines at wind energy facilities has been shown to cause increased mortality of birds during fall migration, especially on foggy nights with low visibility (Young and Courage 2011, Stantec 2011). However, turbine lighting at night does not appear to be correlated with increased bat mortality, though data are limited. A limited number of security lights may be required at the Project's substation and the O&M facility. As explained in the Avian and Bat Protection Plan (APP) (BRE 2013d, as indicated in Appendix B to the APP submitted to the Service on October 27, 2013), BRE has committed to keeping security lighting at the O& M facility to a minimum, installing motion sensors on exterior lights at the O&M building and substation so they operate only when needed, and using only down-shielded exterior lights at both facilities to minimize light emission into the sky. BRE also has committed to providing annual training for implementation of the APP and stressing the importance of minimal lighting to employees. No turbine entrance lights are installed on the existing 67 turbines and the roofs of the nacelles of these turbines do not have skylights. While the light design features of the 33 additional turbines are currently unknown (i.e. the turbine design has not been selected), turbine lighting is not known to affect bat mortality.

Based on the information and commitments presented in the citing certificates and the APP, the Service anticipates that Indiana bats and Virginia big-eared bats will not be attracted to lighting. Therefore, adverse effects to either species from security/safety lighting at the Project's O&M building, substation, and lighting that occurs within the wind turbine nacelles for maintenance purposes are unlikely to occur (i.e., discountable effects). .

Water contamination: Drinking water is essential, especially when bats actively forage. Thus Indiana and Virginia big-eared bats potentially could be affected by contamination of their drinking water supplies (streams, ponds, and wetlands). Accidental toxic chemical spills, storm water run-off, soil erosion, and stream sedimentation potentially could occur during construction of the phase II turbines and associated infrastructure, during operation and maintenance of the facility, and during decommissioning activities. However, we anticipate these effects will be localized and of very short duration should they occur.

Minor oil spills from leaking transformers and gear boxes are possible. To the extent that such spills enter surface waters, they may cause localized impacts to water quality, and in turn, have the potential to impact vegetation and wildlife. BRE is required to have a Spill Prevention, Control, and Countermeasures Plan in place as part of the HCP and state regulations. Implementation of that plan will ensure that any potential spills are small, localized, short duration, and adequately remediated in a timely fashion. Therefore, impacts from such spills are not likely to adversely affect Indiana and Virginia big-eared bats.

In addition, construction activities will be performed using standard construction best management practices (BMPs) so as to minimize the potential for accidental spills of solid material, contaminants, debris, and other pollutants. Excavated material or other construction material will not be stockpiled or deposited within 100 feet (30 m) of streams, nor will any vehicle refueling or routine maintenance occur within 100 feet of streams. Project operations will not involve the discharge of water or waste into streams, ponds, or wetlands.

Run-off from project activities will be managed under National Pollutant Discharge Elimination System (NPDES) construction storm water permits and the associated Storm Water Pollution Prevention Plans (SWPPPs). Sediment and erosion control measures implemented through the NPDES permit will help to minimize sedimentation and other water quality impacts in the action area. Standard BMPs will minimize soil erosion and sedimentation during and after construction and during decommissioning (e.g., silt fences, straw bales, netting, soil stabilizers, water bars, terraces, and check dams). Areas disturbed during construction and during decommissioning will be stabilized and reclaimed, including site-contouring and reseeding, to promote successful revegetation, provide for proper drainage, and to prevent erosion. Therefore impacts to water quality within the action area are expected to be localized and temporary in nature, resulting in no or only negligible impacts to potential drinking water sources of Indiana and Virginia big-eared bats. With proper implementation of these measures, water contamination is not likely to adversely affect Indiana bats and Virginia big-eared bats.

Based on commitments presented in the HCP and required by existing state regulations, the Service considers water contamination related effects are not likely to reach the scale where take of Indiana and Virginia big-eared bats will occur (i.e., insignificant effects).

Water use: Indiana and Virginia big-eared bats potentially could be affected by dewatering of their drinking water sources during the construction and decommissioning phases of the project. This could result in bats expending additional energy to find reliable water sources.

Road dust suppression during phase II construction and during decommissioning of the entire Project will affect water levels in local streams and ponds. BRE estimates that dust suppression during phase II construction will require 1.8 to 2.7 million gallons of water per year for 1 to 2 years, withdrawn in small increments (no more than 15,000 gallons per day, 20 days per month, for 6 to 9 months per year). Similarly, dust suppression during decommissioning will require 220,000 gallons of water per year for 2 to 3 years, withdrawn in small increments (no more than 2,500 gallons per day, 3 days per week, or no more than 37,500 gallons per month during dry months).

Impacts to surface water resources due to water withdrawals will vary based on the source. Water withdrawals will have the greatest impacts to habitat conditions in streams higher in the watershed at higher elevations especially during dry periods when dust suppression is likely to be required. Volumes of water in headwater streams are significantly less than streams lower in the watershed. Water withdrawals will have fewer effects to surface water resources if water is taken from human-made ponds. To reduce impacts to intermittent headwater streams, BRE has committed to taking water only from perennial water sources and ponds.

Pursuant to West Virginia Code §§22-26, BRE is not required to register with the WVDEP and provide all requested survey information regarding withdrawals of state waters. Only large quantity users are required to register, which means "any person who withdraws over [750,000] gallons of water in a calendar month from the state's waters." However, to assist water users in making smart choices about where to withdraw water, the WVDEP has guidance and an on-line mapping tool that can be used to determine in real time whether it is safe to withdraw water from a stream. This tool is based on percentages of mean annual flow over a 10-year period to ensure that water sources maintain an appropriate flow to protect the aquatic habitat.

BRE has agreed to use this tool to assess when it is safe to withdraw water from local streams and to apply standard practices so as not to dewater streams (see HCP errata sheet). The tool should be checked daily before withdrawing significant quantities of water from any watershed, and users should exercise caution particularly during drought or extended dry conditions or in cases where multiple users may be withdrawing water from the same source. Implementation of these measures will reduce the likelihood of dewatering streams in the action area to the point that it is unlikely.

In addition to surface water quantity impacts, ground water impacts potentially could occur. Approximately 290,000 gallons of groundwater per year will be withdrawn from an existing well for 1 to 2 years to prepare the concrete foundations for construction of the phase II turbines. Groundwater withdrawal can have impacts on nearby surface water sources. Water withdrawal impacts on groundwater resources are most often related to the rate of withdrawal (gallons per minute) and the rate of groundwater recharge. Water withdrawal for the batch plant could have effects on groundwater, and in turn nearby surface waters, if withdrawal rates exceed recharge rates. These effects are uncertain because withdrawal and recharge rates have not been measured or predicted. While effects to groundwater are uncertain, even if they do occur at the well, there are many potential water sources for Indiana and Virginia big-eared bats in the action area. Therefore, this localized effect is not likely to have adverse effects to Indiana and Virginia big-eared bats.

Based on commitments presented in the HCP and required by existing state regulations, the Service considers water use related effects are not likely to be rise to the scale where take of Indiana and Virginia big-eared bats will occur (i.e., insignificant effects).

Weed control: BRE will use mechanical means to control noxious weeds in all surface-disturbed areas near wind turbines on the project site. Vegetation within 130 feet (40 m) of turbines receiving post-construction fatality monitoring will be regularly mowed to improve searcher ability to find bat and bird carcasses (appendix C to HCP). Frequent mowing of pads should prevent reestablishment of trees and will not result in removal of Indiana bat or Virginia big-eared bat habitat, as it will only be used to maintain previously cleared areas.

BRE anticipates the periodic need, over the 25 year ITP, to mechanically control and apply herbicides along the 15.6-mile-long[10] transmission line corridor (an area of about 95 acres) to control unwanted vegetation that could pose a fire or safety risk to the facility and adjacent property. To minimize chemical drift, herbicides will be applied by hand using back-pack sprayers or similar non-aerial methods, such as low volume foliar applications, directly applying herbicides to stumps, or the "hack and squirt" method. Foliar applications would be applied shortly after leaf-out, likely in late May or early June. Stump or hack and squirt methods could occur throughout the growing season but likely in combination with foliar application to reduce the need for multiple visits.

BRE anticipates its herbicide contractors will use products such as Arsenal, Escort, Tordon, Plateau, Oust, Garlon, Roundup, and Transline, or other similar compounds during the duration of the ITP. The herbicide selected will have characteristics that allow the active chemical compound to degrade rapidly, not bio-accumulate, and not pose a chronic risk to wildlife. Herbicides will be applied at or below the rate specified by the label using low volume techniques. All herbicides will be applied by qualified and certified contractors in accordance with Federal label requirements and standards.

Herbicide applications will be spot treatments with minimal and dispersed applications on a per acre basis. One potential risk to Indiana and Virginia big-eared bats could be that herbicides negatively impact insects, thereby reducing forage. However, impacts are expected to be minimal due to the small proportion of the action area being treated at any one particular point in time, and because the herbicides proposed for use degrade rapidly and do not bio-accumulate. Therefore, the Service considers weed control related effects are not likely to reach the scale where take of Indiana and Virginia big-eared bats will occur (i.e., insignificant effects).

Wind turbine noise: We know little about the effects to Indiana and Virginia big-eared bats, or other bats species from increases in ambient sound generated by wind turbines. Studies have shown that gleaning bats, or bats that rely on prey-generated sounds to locate and capture insects while foraging (Neuweiler 1989) are susceptible to the masking effects of sound emissions and this can cause avoidance of noisy areas or reduced foraging efficiency by gleaning bats (Schaub et al. 2008, Siemers and Schaub 2011). Virginia big-eared bats use both gleaning and aerial hawking foraging strategies in the specialized capture of moths. Thus they use echolocation calls while flying to capture or "hawk" moving prey, in combination with passive listening while slowly flying to "glean" stationary prey resting on surfaces (Lacki and Dodd 2011). Indiana bats, on the other hand, are "hawkers;" i.e. they hunt prey in the air while flying, using echolocation (an auditory behavior that uses ultrasonic signals to detect prey and maneuver through the environment). Little information is available in the literature regarding the specific effect of noise on bat species utilizing echolocation in their search for prey. Instead, most studies on this topic have researched the ability of echo-locating bats to detect and avoid spinning and stationary turbines (Long et al. 2009).

---

[10] The phase I existing transmission line is approximately 14 miles long and the future Phase II supplemental line will be approximately 1.6 miles long. Both lines have a 50-foot permanent right-of-way.

With respect to Virginia big-eared bats, as explained in the Baseline, we do not anticipate regular use of the action area by this species for the 25-year duration of the ITP. It is unlikely that noise would adversely affect the Virginia big-eared bat at present. Should they occupy the Action Area or pass through the Project area in the future, it is unlikely they would be disturbed by noise during the day when they roost or hibernate in caves, given that caves effectively mask exterior noises. However, given that Virginia big-eared bats forage at night by both gleaning and hawking moths, their ability to capture prey potentially could be masked by wind turbine noise within 200 feet of the turbine (see description of the turbine noise attenuation effect below for Indiana bat). This masking of prey sounds by wind turbine sound close to the turbine potentially could cause Virginia big-eared bats to avoid the turbine area (thus reducing risk of collision or barotrauma), or result in somewhat reduced foraging efficiency by gleaning. However, because these bats also forage by echolocation, we do not expect somewhat reduced foraging efficiency by one mode (gleaning) to have reproductive and survival consequences as they have an alternate foraging mode (hawking). Thus we conclude noise effects are not likely to reach the scale where take of Virginia big-eared bats will occur (i.e., insignificant effects).

With respect to Indiana bats, we assume that there likely will be Indiana bats moving through the action area at night during spring and fall as they migrate between winter and summer habitat, as well as at night during fall when they forage in the swarming area of Snedegar's Cave. There also is potential for use of roost sites during the day and foraging at night within the action area during the summer period. Thus there is potential for Indiana bats to be exposed to turbine noise from operational turbines.

When operating, wind turbines emit low-level noises that come from the gear box and movement of the blades though air. The predicted turbine noise levels range from between 28 dB and 52 dB, or 22 dB lower to 2 dB higher than background noise levels of approximately 50 dB (Acentech 2006). Operational turbines that occur in the vicinity of undocumented roost trees or foraging areas, or in the flight path of migrating bats, may create sound that is detectable to Indiana bats in these areas, albeit not extremely loud. In general, sound from a wind turbine is loudest close to the turbine but quickly attenuates to a low level low[11] (less than 50 dB) 200 feet from a wind turbine (Hessler 2009). On occasion, noise from turbines at the project site has been heard for short periods of time at distances of 2 miles (Acentech 2011). Given this attenuation effect, and the low level of the wind turbine sound overall, we think it unlikely that Indiana bats would be adversely affected by exposure to long-term or sporadic low-level noise should they select a summer roost tree within proximity of operating wind turbines, or anywhere within the action area. Male Indiana bats recently were found roosting under an interstate bridge in West Virginia subject to very loud traffic noise and vibration, suggesting that noise may not be a factor in roost site selection. Additionally, as a minimization measure for the HCP, BRE will implement cut-in speed prescriptions at night, coupled with turbine feathering at low wind speeds at night (further explained below), that will reduce turbine-generated noise at wind speeds when Indiana bats are most likely to be migrating or foraging. Therefore, cut-in speed prescriptions coupled with feathering will simultaneously reduce bat strike fatalities and keep

[11] 50dB is roughly equivalent to background noise levels measured in the Project area during pre-construction noise studies (Acentech 2011.) It is a moderate noise level likened to that of normal human conversation or a quiet suburb.

ambient sound levels low at night. Therefore, effects to the Indiana bat from turbine generated noise during the day or night are not likely to reach the scale where take of Indiana bats will occur (i.e., insignificant effects).

Construction, maintenance, and decommissioning noise: Several components of the Project may produce noise that could directly impact bats in the action area. These activities include phase II construction activities, maintenance activities, and decommissioning activities at the end of the project. These activities are generally expected to be of limited duration and occur primarily during daylight hours when Indiana and Virginia big-eared bats are not active. Bats deep underground in caves during the day are not likely to be disturbed by daytime noises. Hence, should Virginia big-eared bats establish summer or winter maternity caves in the action area in the future, or should Indiana bats colonize winter caves in the action area the future, they would not be disturbed while underground. Indiana bats migrating across the action area at night also will not be disturbed by daytime noise. Thus construction, maintenance, and decommissioning noise will only have potential to affect Indiana bats during summer should they be roosting during the day in trees within hearing distance of the source of the noise. And hence the following discussion only applies to Indiana bats potentially using the action area during the summer.

Indiana bat maternity colonies are not known to currently be on the project site (i.e. within the ground disturbance footprint) but could occur in the action area now or in the future at unknown locations, especially considering the abundance of suitable habitat within and adjacent to the action area, and acoustic data suggesting presence during summer and/or fall. Male Indiana bats also may roost in trees in the action area during summer, as males tend to summer within 10 miles of their winter hibernacula and the eastern end of the action area is within that distance of Snedegar's Cave. Thus roosting bats (reproductive females and young in maternity colonies or males in bachelor colonies) have potential to be exposed to project-related noise during the day when they may be potentially roosting in the action area. Depending on the intensity, duration, and geographic extent of the noise, this disturbance could cause Indiana bats to abandon primary roost trees in the immediate vicinity of the disturbance or shift their centers of activity to secondary roost trees.

During the operational life of the project, turbine pads will be regularly mowed throughout the growing season, and cranes will be used on occasion to perform maintenance on specific turbines. These types of noises will be sporadic, limited in area, and persist in each area for a day or two before moving to another location. The potential for the activities to occur at a time that overlaps with an Indiana bat actually roosting within the same general location on the project site is extremely remote. In addition, any potential disturbance would be localized and very short in duration such that maintenance related noise effects are not likely to reach the scale where take of Indiana bats will occur (i.e., insignificant effects).

Most tree-clearing associated with phase II construction will occur between November 15 and March 30 when bats are in hibernation, thus avoiding disturbance of any bats that may be within the action area during the active seasons for bats. The HCP does allow BRE to clear up to 15 acres between April 1 and May 15 (spring migration) or between October 15 and November 14 (fall migration) in circumstances where weather, deep snow, or ice prevent clearing or create safety issues for construction workers. To avoid and minimize the potential for disturbing bats during these seasonal exceptions for limited activity during adverse events, BRE will have a qualified wildlife biologist conduct surveys for potential roost trees prior to clearing and confirm that potential roosts are not occupied by Indiana bats. If trees are found to be occupied, BRE will delay tree removal until such time as the trees are unoccupied. Therefore, it is very unlikely that noise related impacts from tree clearing in these limited circumstances will adversely affect Indiana bats. In addition, the seasonal exceptions correspond with periods that avoid the critical Indiana bat maternity season. Therefore, disturbance or noise related impacts during these limited circumstances will not affect the reproductive potential of bats, should an undetected maternity area occur in the action area and not be detected by roost tree surveys. Therefore, noise effects from tree-clearing associated with phase II construction are not likely to reach the scale where take of Indiana bats will occur (i.e., insignificant effects). .

Non-emergency cutting or trimming of hazard trees with chainsaws will occur between November 15 and March 30, thus avoiding noise related disturbance of any Indiana bats that may be within the action area during the active seasons for bats. However, emergency cutting of hazard trees can occur at any time of year, and in some cases, could potentially be extensive following severe weather events which result in many downed trees. For example, during late October 2012, an early season ice storm caused widespread power outages throughout West Virginia, resulting in extensive emergency tree clearing over several weeks to restore power. Ice storms are frequent on high ridgelines but typically occur in late fall when bat activity greatly diminishes and during winter when bats are hibernating. Hence it is very unlikely that noise associated with emergency tree cutting following an ice storm would adversely affect Indiana bats.

Wind storms during spring and summer also would be expected in the action area, whereas tornadoes are quite rare. Such events could result in widespread tree damage, especially along the 15.6 miles of transmission-line corridor because trees along hard edges are prone to toppling. The permanent 50-foot right-of-way (ROW) on each side of the transmission line minimizes the chance of trees on the edges hitting the line should they fall. We would expect trees shorter in height than 50 feet to fall into the ROW and not hit the line; thus they would not be hazard trees needing to be cleared during an emergency. Trees greater than 50 feet tall could fall on the line; however, it is likely that many taller trees prone to toppling have already fallen given the October 2012 ice storm. And the next ice or wind event may topple additional trees, however, the percentage of non-hazard trees falling into the ROW increases over time with each storm event, while the percentage of tall hazard trees hitting the line diminishes.

Moreover, during such emergencies we would expect crews with chainsaws to target only those locations where trees or branches have actually fallen on or snapped the transmission line. They would clear these sections of line as quickly as possible and then move on to other problem areas. Hence chainsaw noise from emergency tree clearing would not persist in any one location for long periods of time; rather short, intense periods of noise (for 1 to 2 days per location) would move around the landscape. The potential for the activities to occur at a time that overlaps with an Indiana bat actually roosting in the action area adjacent to the noise-generating location is extremely remote. In addition, any potential noise disturbance would be localized and very short in duration such that noise effects are not likely to rise to the level where take Indiana bats will occur (i.e. insignificant effects).

Noise related disturbance associated with construction and decommissioning activities (e.g. blasting, jackhammers, and pile driving) also would be sporadic and short-term, with loud noise shifting around the action area as different field crews sequentially move around the project area (K. Coppinger, BRE, pers. communication, November 12, 2013). Construction of phase II of the project, including up to 33 turbines and associated infrastructure, will occur over a 6 to 9 month period beginning as soon as possible after ITP issuance. Decommissioning activities would not exceed an approximate time period of 2 to 3 years. The maximum potential construction or deconstruction noise disturbance at any particular project location would extend cumulatively over a period of few days to up to a few weeks, but there would be periods of silence at each work location as crews sequentially move from one work site to another. For example, the vegetation clearing crew would move through the project area first (sequentially from one turbine location to the next), followed by a gap in construction noise at the first turbine location until the next field crew arrived (the turbine foundation pourers); then another noise gap until the next crew arrived at that turbine (the turbine erecters). Road-grading and cable excavation crews also would shift around the landscape. Thus at any one project location there would be short periods of loud noise, followed by periods of normal ambient background noise.

This disturbance could cause Indiana bats to abandon primary roost trees in the immediate vicinity of the disturbance or shift their centers of activity to secondary roost trees. However, shifts in Indiana bat activity that may occur are likely to be localized as the project components have a small physical footprint and loud noises will be dispersed intermittently across the action area. Shifts in activity that may occur also are likely to be temporary, since construction and deconstruction activity is not likely to exceed a few days to at most a few weeks in any one location. Temporarily-disturbed bats may return to the area once the loud noise has ceased.

In summary, most of the project activities that will generate noise will occur outside of the bat active season or will occur during the daytime when bats are not active. Therefore, these activities are not anticipated to adversely affect Indiana or Virginia big-eared bats. The exceptions are emergency cutting of hazard trees and noise related disturbance associated with construction and decommissioning activities. These have the potential to impact bats to the extent they occur when bats are roosting in the action area. In those circumstances, we anticipate roosting bats may temporarily leave their roost trees during the period of disturbance. However, to rise to the level of take via harassment, the noise disturbance would have to create the likelihood of injury to the extent as to significantly disrupt normal behavioral patterns including, but not limited to, breeding, feeding, and sheltering. Rather, we believe the noise disturbance will generally be temporary and localized and not of the intensity or duration as to result in injury to bats. We anticipate disturbed bats would use other roost sites within the action area or return to affected roost sites after periods of disturbance. Therefore adverse effects to Indiana bats from these noise-related impacts are not likely to rise to the scale where take will occur (i.e. insignificant effects).

Habitat removal: Several components of the Project will result in limited tree and forest clearing, which has the potential to have direct impacts on summering Indiana bats in the action area by felling of undiscovered potential roost trees occupied by non-flying young and indirect impacts from habitat removal in the action area. The potential for direct impacts from noise disturbance during implementation of these activities was analyzed separately above.

Direct Effects of Habitat Removal

During construction of the phase II expansion area, approximately 148 acres will be disturbed during construction of turbines, pads, meteorological towers, roads, underground cables, and a 1.6-mile long supplemental transmission line. Of the total 148 acres of land disturbance, 117 acres of forest will be cleared.

The clearing of these 117 acres of forest is not likely to result in direct mortality of adult or juvenile Indiana bats, given that adults would likely fly away from a tree about to be cut, and the likelihood of felling a tree occupied by a non-flying young is remote given BRE's commitment to seasonal tree clearing restrictions which avoid the bat active season for all but 15 acres, and roost trees surveys and delayed cutting of occupied trees if the 15-acre exception is used. (See noise section for further details.) Therefore, injury or mortality of Indiana bats during these limited circumstances is not anticipated during 117 acres of tree-clearing associated with phase II construction.

Likewise, as previously discussed under noise, maintenance activities associated with non-emergency hazard tree cutting are not likely to directly kill Indiana bats because these trees will only be cut during the bat inactive season. And as discussed in more detail under noise, the likelihood of occupied roost trees being cut during emergency hazard tree removal in summer is remote and decreases over time as each prior ice or wind storm reduces the supply of residual trees along the edges that are tall enough to hit the line should they fall. Therefore, injury or mortality of Indiana bats during hazard tree cutting is not likely.

Indirect Effects of Habitat Removal

While direct effects of felling a roost tree are obvious and can be avoided or greatly minimized, the indirect effects of tree cutting on the quantity and quality of Indiana bat habitat, and the concomitant effect of that habitat alteration on bats, are more nuanced. Generally, small amounts of tree clearing in a highly forested landscape do not adversely affect Indiana bats provided sufficient quantity and quality of forested habitat remains. The percent forest canopy remaining in the landscape, degree of forest fragmentation, and retention of snags are three important components of Indiana bat habitat which we consider below.

Approximately 164 acres of Indiana bat potential foraging, roosting, or commuting habitat would be removed during the construction phase (117 acres of trees) and maintenance phase (47 acres of trees) of the project. The amount of tree clearing is small in relationship to the 51,147-acre action area which is roughly 95% forested prior to project impacts (Figure 9). Loss of 164 acres would reduce forest cover in the action area by approximately 0.3%. Hence at the landscape scale, an ample quantity of potential foraging habitat would remain in the action area after project implementation.

Commuting habitat in the action area includes wooded tracts, forest edges, forest roads, transmission line corridors, and other pathways that connect potential roost trees to foraging areas. Indiana bats avoid crossing open areas, and forest gaps of more than 1,000 feet may act as barriers to commuting bats (Murray and Kurta 2004; Ecology and Environment 2009). In general, the forest in the action area is fairly contiguous, not highly fragmented, and appears to contain adequate connections between foraging and potential roosting habitat. There are many large blocks of intact forest greater than 1,000 acres and scattered small openings (Figure 9). Less than 1,000 acres (2.4%) of the action area is classified as barren, likely a result of past timbering or mining activities. Although there are several locations within the action area where previous clearings are greater than 1000 feet in at least one dimension, impacts from construction and maintenance of the project will be 4 to 150 feet wide, and thus we do anticipate the project will create additional barriers to foraging. Given the quality of the forested habitat and the small openings anticipated from project clearing, tree loss is not likely to adversely affect the ability of Indiana bats to move between potential roost trees and foraging areas.

Retention of a sustained supply of large snags in sufficient numbers is an important component of maintaining Indiana bat roost tree habitat. Whereas roost tree surveys have not been done on the project site or elsewhere in the action area, it is unknown how many potential roost trees will be lost and how many alternative roost trees will be left in the action area after project clearing. However, given the extensive forested landscape context for this project, we do not anticipate the amount of roost trees remaining will adversely affect the breeding or sheltering of Indiana bats in the action area. We would not expect roost trees to be limiting for bats in a 95% forested action area, owned predominantly by one industrial timber owner, where snags are created on a sustained basis, either intentionally or unintentionally, by periodic timber harvest prescriptions.

In conclusion, sufficient habitat quality and quantity should remain in the action area after implementation of the project. Foraging, commuting, and potential roosting habitat is abundant in the action area and the project will have only minor effects on its quantity and quality.

Because Virginia big-eared bats do not roost in trees, tree removal will not adversely impact habitat conditions for this species. In fact, tree removal could indirectly benefit them incidentally by creating small openings and forest edges that result in increased suitable foraging habitat.

Therefore, the Service considers direct and indirect effects from habitat removal during project construction and maintenance activities to be not likely to adversely affect Indiana and Virginia big-eared bats (i.e., insignificant effects).

Collision/barotrauma mortality: It is well documented that wind turbines kill bats of several different species through collision with turbine blades and barotrauma (Arnett et al 2008, Taucher et al, 2012). Barotrauma is internal hemorrhaging due to an over-expansion of hollow respiratory structures and is caused by a sudden drop in air pressure near wind turbine blades.

The species most commonly found as fatalities from wind projects are the long-distance migratory tree bats, such as red bats (*Lasiurus borealis*), hoary bats (*Lasiurus cinereus*), and silver haired bats (*Lasionycteris noctivagans*). These three species comprise 50 to 75% of bat mortality at all of the wind projects across the eastern and midwestern United States (Arnett et al. 2008, Kunz et al. 2007, Taucher et al 2012). Migratory tree bats do not winter in caves but migrate to warmer southern areas during the winter roosting in hollow trees, leaf litter or other protected areas.

Cave dwelling species of bats, like Indiana bats, are also killed at wind turbines but in smaller numbers and there appear to be species specific vulnerabilities. For example, the bat community in West Virginia can be described from the 330 summer mist-net surveys conducted across the state from 2005 to 2009, which captured a total of 17,440 bats (compiled by C. Stihler, WVDNR, 2011). In this sample, the long-eared bat (*Myotis septentrionalis*) is the most common species in mist-net surveys in West Virginia, but this species is rarely found in wind turbine mortality monitoring in vicinity of the Project (Figure 10). Conversely, the tri-colored bat (*Pipistrellus subflavus*) is frequently found in wind turbine fatalities but less commonly found in mist-net surveys. These differences may reflect the height at which species typically fly and whether they fly high enough to be within the rotor swept area or mist-net area. For example, the long-eared bat may commonly fly low and within the heights of mist-nets, but not within the much higher rotor swept areas. The species-specific vulnerabilities of Indiana bats and Virginia big-eared bats are not known. Indiana bats are described as typically foraging at the canopy level or lower, which would place them below the rotor swept area, however, the height at which they migrate might be different than when foraging. Virginia big-eared bats also fly at tree height and lower. While flying over open areas, Virginia big-eared bats exhibit horizontal sweeps of up to 20 feet (6 meters), with vertical flights approximately 2 to 3 feet (0.6 to 1.0 meters above the surface of vegetation. This behavior is often interrupted with deeper vertical drops of 7 to 98 feet (2 to 30 meters) as bats shift back and forth between the surface of clearings and the edge of forest canopies (Lacki and Dodd 2011).

Currently, there have been no Virginia big-eared bat fatalities and five Indiana bat fatalities documented at wind turbines across the country. Of the Indiana bat fatalities, most of these are female bats that have been killed in late September or early October, however, one male was killed in West Virginia in early July (Table 3). And since two of the fatalities are from the AMRU, Indiana bats clearly have some vulnerable to wind turbines in the RU. It is likely that additional Indiana bat mortality has occurred at wind farms across the country, but has not been documented due to lack of post-construction monitoring, inaccurate identifications, or the difficulty of detecting rare species. It is possible that Virginia big-eared bat fatality also has gone undetected, although fewer turbines have been built within their range than Indiana bats. Variables such as searcher efficiency and carcass persistence are measured and addressed in post-construction surveys and incorporated into the estimates of total bats killed, but cannot change the difficulty in detecting rare species. Thus, the five Indiana bat carcasses found represent a larger number of estimated fatalities if adjusted for these variables.

Based on our understanding of how Indiana bats are using the action area, we anticipate that most of the take will affect individuals that are migrating through the action area during the fall, and some take will occur during summer and/or fall swarm. While there also is some potential

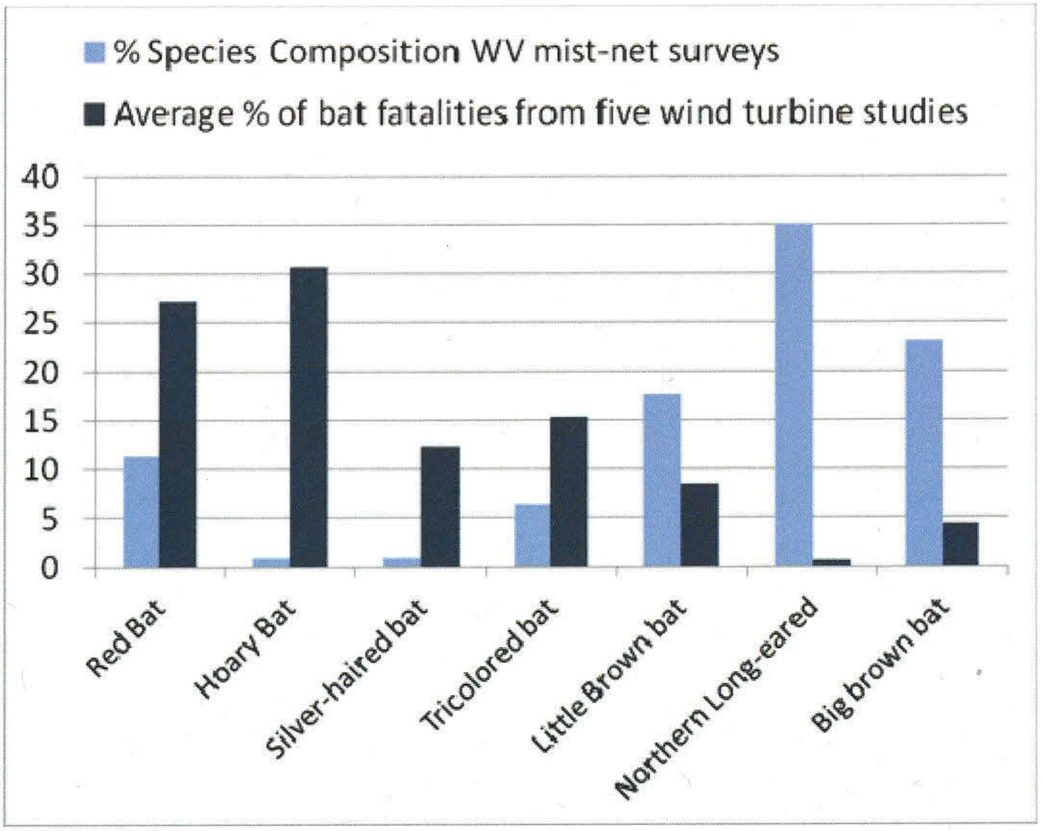


Figure 10. Species composition of bats captured in mist-nets across West Virginia compared to the species composition of bat fatalities from five post-construction studies within 200 miles of the Project.

Table 3. Indiana bat fatalities documented at wind turbine facilities.

Location	Date	Species	Project
Benton Co, IN	September 11, 2009	Adult female	Fowler Ridge
Benton Co, IN	September 18, 2010	Adult female	Fowler Ridge
Blair Co, PA	September 26, 2011	Juvenile female	North Allegheny
Randolph Co, WV	July 8. 2012	Adult male	Laurel Mountain
Paulding Co, OH	October 3, 2012	Adult female	Blue Creek

for take during spring migration, we think that Indiana bats migrate so quickly that they do not have much exposure to the wind turbines. These patterns of increased fatalities during the fall migration period are supported by existing studies (Arnett et al. 2008, Taucher et al. 2012).

Bat activity is highest at wind turbines on warm nights with low winds as these conditions are best for foraging bats. The effect of wind speed may be even greater on smaller bats like the Indiana bat. Multiple studies have considered different cut-in speeds to date, and evidence demonstrates that use of feathering and a variety of different raised cut-in speeds can significantly reduce all bat mortality compared to wind turbines that are not operating with feathering and cut-in speeds (Table 4). These studies are summarized in Section 4.1.5.2 in the HCP, section 2.1 in the final RMAMP, and Sections 3.2.3.1, 5.8.2.2, and 5.8.2.3 in the FEIS. Though there are differences in how these studies were conducted, generally we conclude that feathering turbine blades all night so that they do not rotate at greater than 2 rpm when wind speeds are at or below 6.5 and 6.9 m/s can reduce total bat fatalities on average by roughly 73 and 93%, respectively. In contrast, feathering turbine blades all night so that they do not rotate at greater than 2 rpm when wind speeds are 5.0 mps or less can reduce total bat fatalities by an average of 60%; however, there is much variation among the studies testing 5.0 mps cut-in speeds, with bat fatality reduction ranging from 35 to 87% reduction (Table 4). Whereas existing available information from testing different cut-in speeds is inconsistent in terms of terminology, methods, and ultimately results and interpretations, the one thing that does seem to be clear is that feathering turbines below raised cut-in speeds at night during the seasons of greatest bat exposure at wind projects can significantly reduce bat fatalities.

Because of the large variation among studies, there is uncertainty as to the actual results that can be achieved at the Beech Ridge Project through particular cut-in speed adjustments. Such results are likely to be influenced by site-specific variables such as blade feathering, local bat population use, habitat conditions, wind speeds, and temperatures. Rather than relying on results from any particular studies, BRE's plan relies on the RMAMP process to evaluate whether the initial curtailment plan will achieve the stated biological goals and objectives.

As a minimization measure in the HCP, BRE will be evaluating the effectiveness of a curtailment strategy to achieve the objective of reducing annual *Myotis* fatality (and by extension Indiana bat fatality) by 60%, and reducing annual Virginia big-eared bat fatality by 50% as detailed in BRE's RMAMP (BRE 2013a, appendix C to HCP). BRE initially will study treatment turbines that compare feathering blades at wind speeds below 4.8 mps for half the night versus all night from July 15 through October 15. If these minimization measures prove to be ineffective in achieving 60% annual reduction in *Myotis* fatality and 50% annual reduction in all other bat fatality, BRE has committed through the RMAMP process to increase the cut-in speed levels, the nightly duration of applying the cut-in speeds, and/or extending the season of applying the curtailment measures until such point as the HCP biological goals and objectives are achieved. Once the objective is achieved, BRE may further refine the curtailment strategy to allow for increased operation but only so long as the objectives continue to be met and only with written agreement of the Service. While the Service believes higher cut-in speeds for longer durations of the night and/or season are more likely to achieve the objectives, we are confident the RMAMP process will be equally effective in achieving the fatality reduction objectives for Indiana and Virginia big-eared bats, as well as greatly minimize the fatality of all bats.

For example, during fall 2010 bat fatality was reduced by 50% at the Fowler Ridge Wind Farm in Indiana when cut-in speeds were raised to 5 m/s, applied all night <u>without</u> turbine feathering (Good et al. 2011). Similarly, during fall 2011 bat fatality was reduced by 58% at the Fowler Ridge Wind Farm by <u>fully</u> feathering blades all night below a 4.5 m/s cut-in speed (Good et al. 2012). These fall season bat reduction estimates are higher than would be anticipated when considered across the entire year, but demonstrate that significant bat fatality reductions can result from the right combination of raised cut-in speeds and turbine feathering. BRE's biological goal and objective, to produce a 60% annual reduction in *Myotis* fatalities and 50%

Table 4. Summary of curtailment studies and associated bat fatality reductions at wind turbine projects.

Study	Start-up speed (m/s)	Study period	Fatality reduction for study period
Tidhar et al. (2013)	6.9 (feathered)	April 1 - Oct. 28, 2012	73% all night (compared to average fatality rate of non-curtailed turbines at other projects across many years)
Shoener Environmental (2013)	6.9 (feathered) when > 33.5°C (38°F)	July 1 to Sep. 30, 2012	74% to 92% all night (compared to 4.0 m/s controls for same study season in 2010 and 2011, respectively)
Stantec (2013b)	Variable speeds (feathered), dependent on site-specific weather variables	Sept. 6 to Nov. 15, 2012	87% all night (compared to 3.5 m/s controls for Aug. 15 to Oct. 31, 2011)
Stantec (2013a)	3.5 (control)	August 15 to Oct. 31, 2011 and Apr. 1 to Oct. 31, 2012	--
	3.5 (feathered)	Aug. 15 to Oct. 31, 2011	35% all night
	4.5 (feathered)	Aug. 15, 2011 to Oct. 31, 2012 and Apr. 1 to Oct. 31, 2012	72% all night
Hein et al. (2013)	3.0 (control)	July 15 to Sep. 30, 2012	--
	5.0 (feathered)		7% first half of night
	5.0 (feathered)		35% all night
Young et al. (2012b)	4.0 (control)	July 16 to Oct. 15, 2011	--
	4.0 (feathered)		9% all night
Young et al. (2013b)	4.0 (control)	April 1 to Nov. 15, 2012	--
	5.0 (feathered)	April 1 to Nov. 15, 2012	51% all night
	5.0 (feathered)	July 15 to Oct. 15, 2012	62% all night
Young et al. 2011	4.0 (control)	July 15 to Oct. 15, 2010	--
	4.0 (feathered)		47% first half of night
			22% second half of night

Study	Start-up speed (m/s)	Study period	Fatality reduction for study period
Good et al. (2011)	3.5 (control)	Aug. 1 to Oct. 15, 2010	--
	5.0		50% all night
	6.5		79% all night
Good et al. (2012)	3.5 (control)	July 15 to Oct. 31, 2011 observed fatality	--
	3.5 (feathered)		36% all night
	4.5 (feathered)		58% all night
	5.5 (feathered)		75% all night
Arnett et al. (2011)	3.5 (control)	July 27 to Oct. 9, 2008	--
	5.0 (feathered)		87% all night
	6.5 (feathered)		74% all night
Arnett et al. (2011)	3.5 (control)	July 26 to Oct. 8, 2009	--
	5.0 (feathered)		68% all night
	6.5 (feathered)		76% all night
Baerwald et al. (2009)	4.0 (control)	Aug. 1 to Sep. 7, 2007	--
	4.0 (feathered)		58% all night
	5.5		60% all night
Mean fatality reduction	3.5 m/s and 4.0 m/s, feathered		Avg. = 34% (range: 9 to 58%) (n=6)
	5.0 m/s, feathered		Avg. = 60% all night (range: 35 to 87%) (n=5)
	6.5 m/s, feathered		Avg. = 76% all night, for a season (range: 74 to 79%) (n=3)
	6.9 m/s, feathered*		Avg,.= 82% all night for a season (range: 73 to 92%) (n = 4)

*Includes Stantec (2013b).

annual reduction in other bat fatalities, is achievable and is within the range demonstrated by other similar projects.

However, we recognize that this curtailment regime does not entirely eliminate risk to Indiana bats from operating turbines. For example, the second Indiana bat fatality at Fowler Ridge occurred at a turbine that was programmed to cut-in at wind speeds below 5.0 mps. The night that the bat was killed, wind speeds were often higher than 5.0 mps (Figure 17, Good et al. 2011) and it is likely that the bat was killed when the turbine was operating at higher wind speeds. Therefore, we anticipate that curtailing wind turbines at wind speeds below 5.0 mps will minimize, but not fully avoid, take of Indiana bats.

Impacts of wind turbines on Virginia big-eared bats are less certain because there have been no fatalities to date and wind projects have largely been constructed outside of the 6-mile[12] foraging

[12] Based on radio-telemetry data, Virginia big-eared bats typically forage within 6 miles of their hibernacula (Stihler

activity radii applied to occupied caves (Figure 8). However, we assume that to the extent that the species occurs in the action area and thus is exposed to operating wind turbines, they will have similar vulnerabilities as the other bat species that have been evaluated. Therefore, we similarly assume that the effectiveness of turbine curtailment for the bat species that have been evaluated will also extend to Virginia big-eared bats.

With implementation of the turbine curtailment strategy in the HCP, we assume that fatality of Indiana and Virginia big-eared bats will be minimized, but not fully avoided. Therefore, adverse effects to both species are anticipated from turbine operations. Incidental take from this component of the project would be authorized through the ITP.

Quantifying take of individual bats by collision or barotrauma

Fatality-related impacts to individual Indiana and Virginia big-eared bats will occur in the action area due to collision and barotrauma during turbine operations. As previously analyzed, there are potentially other effects from the project (vehicle collisions, light emission, water contamination, water use, weed control, noise disturbance, and habitat removal) but with implementation of the HCP conservation measures they are not anticipated to result in take of Indiana or Virginia big-eared bats in the action area.

With respect to fatalities of individual Indiana bats from turbine operations, the Service and BRE worked together to develop a model (BRE 2013a; Section 4.1.3) to estimate take of Indiana bats based on surrogate variables that include the mortality of a more common species, the little brown bat. Following the public comment period on the DHCP and DEIS the Service independently revised the take estimate using the best available regional post-WNS data (Service 2013f, Appendix F, Report F-5 in FEIS), and BRE subsequently incorporated the results into their HCP. We felt it was important to revise the take estimate using post-WNS data as the composition of bats on the landscape is changing due to WNS. As bat populations decline due to WNS, we expect reduced total numbers of bats killed because fewer bats are flying in the air-space and potentially interacting with turbine blades.

As explained in the Service's FEIS (USFWS 2013g, Appendix F-5 in the FEIS), the surrogate model used to estimate take of Indiana bats is based on the following formula:

(Estimate of total annual bat fatality for the project) x (Percent of fatalities that are little brown bats at other projects) x (Percent of Indiana bats to little brown bats in the population) x (100 turbines) x (Number of years of operation)

The take model is sensitive to total annual bat mortality rates and to the ratio of Indiana bats to the surrogate species. Therefore, we carefully considered which data sets would give the most unbiased estimates. With regard to annual bat fatality rates, post-WNS bat fatality rates at four projects within the 200-mile[13] migration distance of the Beech Ridge project vary from 15 to 96 bats per turbine per year and average 43 bats per turbine. These post-WNS rates are higher than

---

2010, and C. Stihler, WVDNR. pers. communication).

[13] The HCP and our memorandum (USFWS 2013g) refer to projects within 200 miles, however, as it turns out, all projects with post-WNS data cited are located within the 100-mile migration distance of the Beech Ridge project.

pre-WNS rates averaging 32 bats per turbine per year and ranging from 24 to 48 bats per turbine for other projects within 200 miles of Beech Ridge. We used the average rate as it is not reasonable to assume the extreme values (the low end or high end estimates) would occur consistently every year at Beech Ridge. While the sample size of post-WNS studies is small (n = 4), these studies reflect the best current bat species fatality rates in the regional landscape.

The proportion of little brown bats to all bat fatalities at these 4 projects is currently in the range of 0 to 4.4%, compared to 3.0 to 2.9% pre-WNS. To account for uncertainty and err on the side of the species (which may overestimate take), the Service decided to use 4.4% in the surrogate take model as the proportion of all bat fatalities that are little brown bats.

To determine the ratio of Indiana to little brown bats in the natural population, we used a robust long-term summer mist-net survey data set from West Virginia. We excluded mist-net surveys that occurred in areas of known Indiana bat use so as to reflect an unbiased representative sample of bat populations and not skew the dataset in favor of higher Indiana bat concentrations. The ratio of Indiana bats to little brown bats was 2.38% in 2012 (the most current available dataset), and averaged 2.38 percent for the post-WNS period from 2009 to 2012, versus an average of 0.81% for the pre-WNS period from 2003 to 2008. We therefore used 2.38% as the ratio of Indiana to little brown bats in the surrogate take model because it best reflects current conditions.

The Service considered hibernacula survey data as a potential alternative to the summer mist-net data for determining the ratio of Indiana to little brown bats in the surrogate model. However, we believe the cave dataset inflates the ratio because the data is collected from caves with the largest known Indiana bat populations. Caves with only small bat populations or without listed bats are typically not included in the hibernacula surveys, which means the dataset may be skewed towards higher Indiana bat estimates. In addition, cave surveys sometimes do not count all bats, but focus instead on the inventorying only the listed bat species in the cave. Finally, in recent years (starting in 2009/2010), fewer caves than normal were surveyed due to concerns about WNS. To the extent that larger caves were not surveyed (e.g., Hellhole), many bats may have been missed by the survey efforts. For these reasons, the Service concludes that the mist-net data are more representative of bat species compositions on the landscape than winter hibernacula counts.

Applying these variables to the surrogate model resulted in a cumulative 25-year estimated take from turbine operations of up to 112 Indiana bats prior to curtailment and up to 53 bats after curtailment is applied. The calculation based on turbine curtailment assumes that take is higher during the first three years of curtailment trials (4.5 bats per year for 100 turbines), and is reduced by 60% (1.8 bats per year for 100 turbines) for years 4 through 25. We believe it overestimates take during the first three years because it assumes no reduction in bat fatality during the trials. However, this overestimate allows for the uncertainty of how much fatality reduction will occur during these three calibration years and errs on the side of the species in assuming a worst case scenario.

Finally, in addition to the surrogate model approach, the Service independently estimated take of Indiana bats for the Beech Ridge project using an alternate method that relies on actual Indiana bat fatality data at those projects where carcasses have been found rangewide. (Note: we applied this same alternate method to estimate an annual rate of ongoing take of Indiana bats from wind energy projects in the AMRU earlier in section IV of this BO). This is a more simple formula with fewer variables than the surrogate method:

(Average annual bat fatality rate per turbine) x (100 turbines) x (Proportion of all bat carcasses found that are Indiana bats)

Using this method, we assumed that all wind turbines within the AMRU will kill an average of 25.98[14] bats per turbine per year, consistent with the analysis in our FEIS (Table 5.20). This is a lower average fatality rate than the 43 bats per turbine used in the surrogate model, because our FEIS used a much larger data set of 17 studies, irrespective of the onset of WNS, and applied certain criteria to the studies which were included (e.g. only studies for the full bat active season were included). Using a large regional data set that includes both pre- and post-WNS studies makes sense for this formula because the Indiana bat fatalities occurred at locations throughout the range in multiple recovery units at a time when the full brunt of WNS had not yet manifested.

Using actual Indiana bat fatalities rangewide, and using the larger regional data set as in the FEIS, and therefore applying an average rate of 25.98 bats per turbine per year to the 100 turbine Beech Ridge project yields approximately 2,598 bats killed annually without curtailment measures in place. The Indiana bat mortality rate is calculated to be 0.2% of the annual bat fatalities, or 5.2 per year before curtailment. The Indiana bat proportion (i.e., 0.2%) is based on a weighted average of the total number of Indiana bat carcasses found to all bat carcasses found at the four facilities where Indiana bat fatality have been documented to date (see Table 4.1 in Service 2013g). With curtailment in place, mortality would be reduced by 60% to 2.1 Indiana bats per year. Assuming curtailment averages 2.1 bats per year for 25 years yields an estimated fatality rate of 53 Indiana bats cumulatively over the duration of the ITP. This is the same estimated take as derived from the surrogate model method, which included the assumption of higher bat fatality during the first 3 years when curtailment is being tested.

If one assumes no reduction in bat fatality during the first 3 years, followed by 60% reduction in years 4 through 25, this alternate take calculation method yields an estimate of 62 Indiana bats for the duration of the ITP. This likely overestimates take during the first 3 years because it assumes no reduction in bat fatality during the trials.

In summary, the Service independently evaluated alternate methods, datasets, and assumptions for estimating Indiana bat take. The estimates ranged from 45 to 62 Indiana bats, but when the most reasonable assumptions are considered both estimation methods suggest there will be take of 53 Indiana bats after curtailment is applied. Therefore, we believe 53 is a reasonable estimated take for the project.

We are not aware of appropriate surrogates for Virginia big-eared bats and no carcasses of this species have been detected at wind projects to date. Because the project is on the edge of the range of the Virginia big-eared bat, and risk of take is low, we assumed take of up to 1 bat per year during years 1 through 3 and take of 0.5 bats per year during years 4 through 25 when the

[14] We are using average bat fatality rates from other projects (where turbines were not curtailed) because this information is not available for the Beech Ridge project.

objective of reducing fatality by 50% is achieved. This yields an estimated 14 Virginia big-eared bats for the life of the project, or 0.56 per year on average. This rate of annual mortality is so low that it may not be detectable during monitoring. For such a rare event, finding just one carcass in 25 years may translate to 10 or more estimated fatalities given bias correction factors for searcher efficiency and scavenger removals.

The amount of take authorized by the permit is the amount not to be exceeded and could be modified over time in response to new information. Our take estimates are based on the best available information. The baseline bat fatality rate (without curtailment) will be determined during years 1 through 3 of the permit. It may be higher or lower than initially estimated. The 60% fatality reduction of Indiana bats and 50% fatality reduction of Virginia big-eared bats is then applied to the average baseline fatality for year 1 through 3. If baseline fatality levels are low, the estimated future take will be lower than currently predicted. If necessary, and consistent with the HCP No Surprises policy, the Service could amend the permitted take consistent with 50 CFR 13.23(b). If baseline fatality levels are high, the estimated future take will be higher than currently anticipated, which could trigger the need for a permit amendment.

Although take of individual Indiana and Virginia big-eared bats from turbine operations will occur within the action area, it is the impact from the loss of those individuals to their associated maternity colonies or hibernacula that will determine the impact of the take to the broader populations. This will be further assessed in the jeopardy analysis section IX of this BO.

Mitigation: As a mitigation measure in the HCP, BRE will be implementing conservation projects intended to offset the anticipated incidental take of Indiana and Virginia big-eared bats that may occur during project implementation. For Indiana bats, the mitigation project will be to purchase priority winter hibernacula that support at least 53 Indiana bats or summer maternity areas through fee simple acquisition, lease, or conservation easement, and transfer ownership rights to a Service-approved land manager who agrees to protect and manage the site in perpetuity; or to implement a cave gating project at known hibernaculum supporting at least 53 Indiana bats that is threatened by human activity (BRE 2013a; section 5.3). On a similar vein, for Virginia big-eared bat, the mitigation project will be to implement a cave gating project at a known hibernaculum supporting at least 14 Virginia big-eared bats that is threatened by human activity (BRE 2013a; section 5.3). Specific criteria for these projects are more fully outlined in the HCP. The mitigation projects are intended to eliminate threats, increase the survival probability of the Indiana and Virginia big-eared bats that overwinter in hibernacula, and maintain and in some cases improve reproductive success at the mitigation sites. Short-term adverse effects from disturbance related to noise and human disturbance during project implementation (e.g., gate installation, forage/roost habitat enhancement) are not expected because the projects will be conducted during periods when bats are not anticipated to use the sites (e.g., not during the winter for gating projects). Therefore, implementation of the mitigation projects also will not cause take, but we do anticipate that these projects will provide conservation benefits to Indiana and Virginia big-eared bats.

Effects of the action to designated critical habitat

Critical habitat designations identify habitat areas that provide essential life cycle needs of the species, to the extent known using the best scientific and commercial data available. As previously explained, no designated critical habitat for either Indiana or Virginia big-eared bats occurs in the action area. Hellhole is the closest designated critical habitat for the Indiana bat and is located roughly 78 miles away from the Project. Similarly, Sinnett/Thorn Mountain Cave is the closest designated critical habitat for the Virginia big-eared bat and is 72 miles away. The proposed action will have no effect on the underground geology, air, or water in Hellhole and Sinnett/Thorn Cave, nor any other designated critical habitat. Therefore, the proposed action will not impact critical habitat of Indiana bat or Virginia big-eared bat.

VIII. CUMULATIVE EFFECTS WITHIN THE ACTION AREA

In addition to the effects from the proposed action, the implementing regulations require us to evaluate the effects of the action (above) taken together with the cumulative effects. Cumulative effects include the effects of future state, tribal, local or private actions reasonably certain to occur *within the action area* considered in this BO(50 CFR 402.02). Future Federal[15] actions, unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

No tribal or state lands occur in the action area. Hence the Service is unaware of any future tribal or state actions on tribal or public lands that would cause cumulative effects on the local Indiana or Virginia big-eared bat populations or their habitat in the action area.

The only potential future state action in the action area that we are aware of is the potential for issuance of a natural gas fracking permit by the West Virginia Department of Environmental Protection (WVDEP). A recent check of the WVDEP's on-line data base of oil and gas permit applications in Greenbrier and Nicholas counties showed that the primary landowner in the action area applied for a fracking permit in 2009 but the application was "returned" by the WVDEP and there was no evidence of a new or resubmitted application; hence, this particular action is not reasonably certain to occur in the action area (WVDEP 2013). This is further supported by the fact that there is only a low density of natural gas exploration and drilling occurring in the landscape in and immediately surrounding the action area (Map 4.3 in WVDOF 2010). The current natural gas fracking "boom" in West Virginia is occurring much farther to the north of the action area. Hence, we do not reasonably foresee a level of oil and gas activity in the action area in the future that would cause cumulative effects to local Indiana or Virginia big-eared bat populations or their habitat.

We anticipate that all potential cumulative effects would arise from future private or local actions. Most land in the action area is privately owned by one landowner. A few residences and small rural communities with declining human populations also occur in the action area. Additional residences may be constructed within the ITP term, but are not expected to result in

[15] Given the evidence of past surface mining in the action area, mining would be an example of a potential future Federal action that is not considered in this section because of the need for Federal permits under the Surface Mining Reclamation and Control Act and Clean Water Act.

significant cumulative effects to Indiana or Virginia big-eared bats. We are not aware of any large proposed developments or additional wind energy facilities in the action area.

The action area is located in a landscape dominated primarily by forest, managed for industrial timber production. Forestry management practices could potentially result in take of Indiana bats through direct mortality or injury, or indirectly through harm or harassment. However, the likelihood and severity of potential take depends on site-specific conditions, including Indiana bat activity in the action area, the timing of the action, the type of habitat modification proposed, and characteristics of and amount of habitat remaining available after the proposed activity is conducted.

Lacking such specific details, we assume timber harvest may occur in the action area at any time of the year. If trees are cut during the hibernation period (November 15 through March 31), the potential for direct effects (mortality) to Indiana bats can be avoided. However, tree removal during the non-hibernation season (April 1 through November 14) may result in mortality (take) of roosting Indiana bats if a tree that contains a roosting bat is removed, especially if the tree contains pups that are not yet able to fly. If the affected tree is a primary roost tree used by an Indiana bat maternity colony, adverse effects could include roost tree switching, potentially leading to reduced reproductive success. While such an occurrence cannot be ruled out, the likelihood of this occurring is low given the rarity of Indiana bats on the landscape.

Removal of living trees or snags that have the potential to serve as roosts for Indiana bat maternity colonies or individual bats, or reduction of density of mature trees and overstory canopy could result in the loss or reduction in suitability of summer roosting and foraging habitat. The web page of the current industrial forest landowner indicates the company is certified by the Sustainable Forestry Initiative and harvests less than 5% of its land annually, primarily through thinning prescriptions (54%) and clear-cutting systems (38%), depending on management objectives, forest stand type, and stand conditions. These types of harvest activities can have variable effects to Indiana and Virginia big-eared bats and their habitat, depending on size, intensity, and the time of year.

In West Virginia the practice of commercial tree thinning, to cull individual undesirable trees and maximize the growth of desired trees, typically occurs at 15 to 20 year intervals, followed by later harvest when trees are 20 to 40 years old, depending on the forest product to be produced. During light thinning, only a few trees are removed and there is little to no change in the forest environment. Light thinning would not be expected to decrease the long-term suitability of Indiana bat roosting habitat, and in some cases, can be beneficial to Indiana bats by opening up the canopy to optimum levels for foraging and by creating potential roost trees (snags), either intentionally or unintentionally. Heavy thinning, on the other hand, can reduce habitat suitability for Indiana bat foraging and roosting. However, since Indiana bats use many different types of habitats when foraging, the opening of the overstory as a result of thinning would not change the abundance of foraging habitat on the landscape. Given the extensive forested landscape in the action area, areas affected by thinning treatments should remain suitable for Indiana bat foraging and roosting.

Patch clear-cuts in the action area could affect potential Indiana bat foraging and roosting habitat and travel corridors by removing roost trees and reducing canopy below suitable levels. In West Virginia, clear-cuts typically are small (10 to 40 acres), and this appears to be the case in the action area (Figure 9). During clear-cutting, all or most trees are removed. Thus the effect of potential roost tree loss would last several decades until trees in the regenerated areas reach roost tree size. In some cases, however, clear-cut prescriptions, either intentionally or unintentionally, leave residual roost trees. Indiana bats have been known to roost in residual patch clear-cuts on the Fernow Experimental Forest. This seems to indicate Indiana bats could continue to use residual roost trees in clear-cuts in the action area.

We would expect the action area will remain able to support Indiana bats well into the future given that: 1) the action area currently is approximately 95% forested, 2) 80% of the trees are greater than 26 years old (and thus large enough to support roosting bats), 3) the current landowner harvests less than 5% of its land annually, and 4) trees typically begin to regenerate within 5 to 10 years after harvest in West Virginia. Changes in forest cover and open habitats over a 17-year period have been fairly stable in the action area (less than approximately a 2 to 3% change), based on a comparison of land cover data from 1992 [National Land Cover Dataset 1992 (Vogelmann 1992)] and 2009 [Landscape Fire and Resource Management Planning Tools, Ryan and others 2006)]. Similarly, land-use trends in Greenbrier County where the action area is located show less than 2% of forest was harvested between 2005 and 2009 (Map 4.5 in WVDOF 2010). Land-use trends in Nicholas County, where only a small portion of the action area occurs, show a 3 to 5% harvest of forest between 2005 and 2009 (Map 4.5 in WVDOF 2010). We expect these trends to continue in the future and have no evidence to suggest a greater intensity of future logging.

In conclusion, within the action area, periodic logging efforts are anticipated in blocks of forested habitat managed under similar timber prescriptions. This results in a matrix of large forest blocks with a sustained supply of potential Indiana bat roost trees, and openings and edges that provide potential foraging habitat for Indiana bats. Logging typically rotates around the landscape, resulting in a matrix of forest blocks of different types and ages. When considering the overall stable land-use trend in the action area, the relatively small amount of tree cutting in any year, and the large amount of forested land in the action area, in combination with both adverse and beneficial effects, these types of forest management activities are not expected to significantly impact the quantity and distribution of suitable habitat within the action area.

Given that the permit duration is 25 years, and the majority of trees in the 51,147-acre action area are greater than 26 years old, it is reasonably certain that timber harvest will occur in the action area during the ITP. A small amount of direct take (mortality) of Indiana bats from tree cutting during the summer maternity season is reasonably certain over such a large area and long timeframe; however, these cumulative effects would not be expected to have a significant effect on Indiana bat populations or habitat within the action area.

Because Virginia big-eared bats do not roost in trees, tree cutting would have no effect on their maternity habitat. Tree cutting, however, can affect their foraging habitat. Whereas Virginia big-eared bats do not use clear-cuts, forestry prescriptions such as thinning that create very small forest openings in the canopy and forest edge habitats can help to sustain Virginia big-eared bat foraging habitat in the long-term. Given the action area is on the edge of the species range and the rarity of Virginia big-eared bats in the action area, we would not expect loss of a small amount of potential foraging habitat from clear-cutting to adversely affect Virginia big-eared bats. Thus cumulative effects are not likely to adversely affect Virginia big-eared bat populations or habitat within the action area.

Cumulative effects to designated critical habitat

No designated critical habitat for either Indiana or Virginia big-eared bats occurs in the action area. Impacts from the proposed action are anticipated to be localized and cumulative effects of the proposed action and any future state, tribal, local or private actions in the action area are not expected to impact critical habitat at broader geographic scales.

IX. JEOPARDY ANALYSIS

Jeopardy determinations for Indiana and Virginia big-eared bats are made at the scale of the listed entity, which is the rangewide distribution of the species (Federal Register 32[48]:4001). As previously described, the jeopardy analysis in this BO follows an analytical approach that assesses the project impacts at several scales in a stepwise fashion. The analysis first examines the impacts of the take of individuals on the local populations (i.e., the closest hibernaculum and maternity colonies that may be within the distance bats migrate from the action area). If take of individual bats from the project will reduce the fitness (i.e., short or long-term persistence or reproductive potential) of these local populations, then the jeopardy analysis will need to further evaluate how reduced population fitness affects the likelihood of both survival and recovery of the species at the AMRU scale, in the case of Indiana bats, or at the rangewide scale, in the case of Virginia big-eared bats which have no RUs. If, however, take of individual Indiana bats or Virginia big-eared bats from the project will not reduce the fitness of local populations, then there will not be impacts to survival and recovery of the species at broader population levels and no additional analysis is required. For Indiana bats, if project impacts may affect the likelihood of survival and recovery at the RU scale, then the jeopardy analysis will need to take the final step of evaluating whether the species' rangewide reproduction, numbers, or distribution will be impacted in order to reach a jeopardy determination for the listed entity.

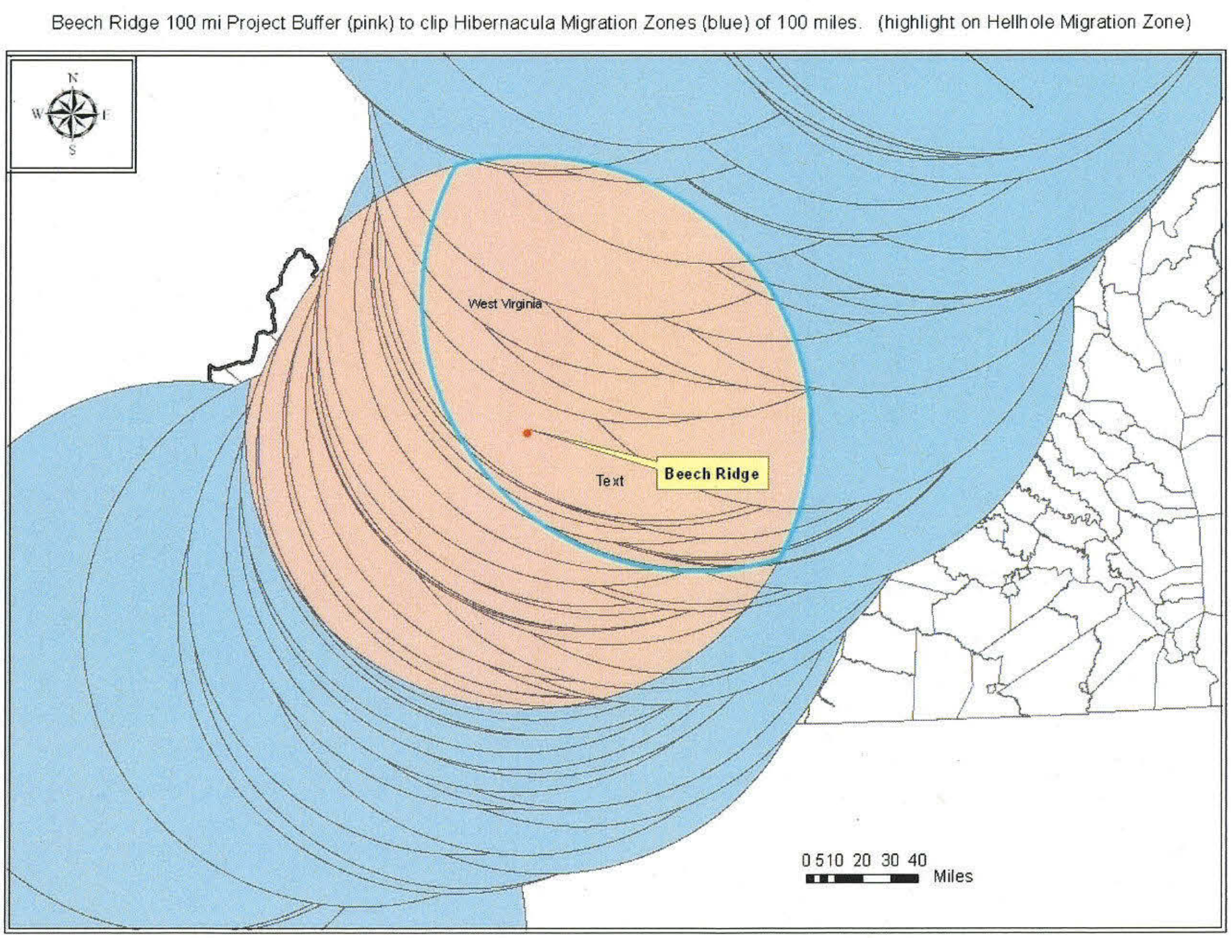
As previously described in the effects of the action section in this BO, with effective implementation of the curtailment strategy that achieves the objectives of reducing *Myotis* fatality (and hence Indiana bat fatality) by 60% and all bat fatality (and hence Virginia big-eared bat fatality) by 50%, we anticipate the cumulative take of up 53 Indiana bats and 14 Virginia big-eared bats in the action area over the 25-year period of the ITP. Further, we anticipate the Indiana bat take will largely occur during the fall migration period, thus bats that occur on site would be coming from a much larger area.

Impacts of Indiana bat take to local and regional hibernacula

Given that Indiana bats in the AMRU can migrate up to 100 miles between summer and winter habitat (USFWS 2013d), bats traveling through the project site could be going towards multiple hibernacula. The likelihood that a bat in the project vicinity is from any particular hibernacula is not known, but probably depends on the number of bats in each hibernacula and the distance from the project site to the hibernacula. Thus we conducted a GIS analysis to estimate how many Indiana bats could be flying past the project during migration and which hibernacula they are likely to be going towards as follows.

First, we buffered all the hibernacula in the AMRU by 100 miles as the maximum distance Indiana bats are anticipated to migrate between summer and winter habitat and consider this to be that hibernacula's migratory zone (the blue circles in Figure 10). Then we buffered the project location by 100 miles. The area where the project 100-mile buffer overlaps with the hibernacula migration zones was shaded pink and corresponds to the portion of the total hibernacula population that might intersect the project during migration. Thus, if 25% of the migratory radius of a large hibernaculum that contained 1,000 bats was within the impact radius of the project, we considered 250 bats from that hibernaculum to have the potential to encounter the project.

Figure 10. Area of overlapping Indiana bat hibernacula migration zones (pink) within a 100-mile distance of the Beech Ridge project (red dot).



There were 30 hibernacula that currently had at least 1 Indiana bat as of 2013 and that had 100-mile radii overlapping with the project site. If we assume migrating bats are evenly distributed within a 100-mile radius of each hibernaculum, there could be 4,324 Indiana bats flying within 100 miles of the Project. However, it is important to note that 81% of these bats are from only six hibernacula; Hellhole (54%), Snedegar's (7%), Arbogast/Cave Hollow (7%), Martha's (7%), Fortlick (4%), and Big Springs (2%). The rest of the caves each represent ≤1% of the potentially affected population. While this is a simple analysis and assumes bats are evenly distributed across the landscape, it also underscores the likelihood of bats coming from more than one hibernaculum and that it is especially likely that some would come from Hellhole. Project mortality also is likely to include bats from the closest cave (Snedegar's), small hibernacula which comprises about 7% of the potentially affected population due to the recent large decline of the Indiana bat population in Hellhole. Most of the bats killed would likely originate from Hellhole and other caves simply because there are more bats likely to be entering the action area from the largest extent hibernacula.

We looked closely at the potential effects to the population at Snedegar's Cave because it is the closest hibernacula and a conservation goal is to keep all hibernacula populations viable despite the take from wind projects. We examined the potential effects of take from this project with curtailment by attributing 50% of the cumulative take of 53 Indiana bats to bats that use Snedegar's Cave and 50% of the cumulative take to bats that use Hellhole, the largest hibernacula in the area. This represents a reasonable worst case scenario since the GIS analysis suggests that much smaller proportion of the take will be attributed to bats from Snedegar's Cave than from Hellhole. This skewing of the take toward Snedegar's Cave takes into account the fact a small portion of the project area (14 of 100 turbines) falls within the outer edge of the 10-mile swarming radius of Snedegar's Cave, and thus take of these bats during both fall swarming and migration is anticipated. Both sexes of Indiana bats return to the swarming habitat in the fall for several weeks of mating and foraging in preparation for hibernation. This allocation of 50% of the take to the closest hibernacula and 50% to the largest hibernacula is more skewed (i.e., more take is attributed to the smaller, closest cave) than we anticipate in reality, but we want to err on the side of caution in considering population affects.

To examine the population-level effects of Indiana bat fatalities on both Snedegar's Cave and Hellhole from the project, we used the Thogmartin et al. (2013) model, and assumed the fatality reduction objectives for curtailment are achieved. In our demographic model runs we assumed that WNS was already affecting the population of interest and would continue to do so. The model uses Indiana bat specific assumptions about the response to WNS. For example, the model forecasts the trajectory of the WNS-affected population trend based on what we have observed in Indiana bat populations in the Northeast Recovery Unit, i.e. a 70% population decline from its peak within four years after the on-set of WNS. This is a conservative approach as the response to WNS in the AMRU has been somewhat delayed (a 46% decline from the 2011 peak within 5 years of the on-set of WNS) compared to the Northeast RU. Nevertheless we wanted to be cautious and err on the side of the species. It is reasonable to expect the AMRU population will experience up to a 70% decline as has been seen in the Northeast RU.

If, however, at any time, the AMRU population decreases by 70% or greater than the peak 2011 level, this will constitute a changed circumstance as a key assumption of the population model will have been violated (HCP section 8.2.1), triggering further analysis to determine whether the level of Indiana bat take at the project is having a material negative effect (after accounting for benefits of mitigation) to the remaining Indiana bat populations in the AMRU. If the analysis demonstrates that a 60% take reduction is no longer sufficient to prevent material negative effects to the declining population, BRE will, after consultation with the Service, implement additional operational restrictions or minimization measures by the next bat spring emergence season such as: changes in the turbine cut-in speed; changes in timing of turbine operating regimes (if timing of Indiana bat fatalities suggests a specific period when these species are at greatest risk); selected turbine curtailment (if evidence indicates specific turbines are causing significantly greater mortality of bats); making operational adjustments based in part on other environmental factors such as temperature; and deployment and testing of bat deterrent technology if suitable technology is available.

In evaluating the effects of project take to the Indiana bat populations in Snedegar's Cave and Hellhole, we ran 10,000 simulations of the Thogmartin et al. (2013) model for each scenario. The model explicitly incorporates environmental variability in survival and reproduction rates and demographic stochasticity. It assumes individual wintering populations are closed (no immigration or emigration).

The model considers only the female portion of the population because of the polygnous nature of the species. We assumed a 50:50 sex ratio in mortality as the most likely ratio, though we recognize that four of the five Indiana bat mortalities identified so far have been females (Table 3). It is possible that female Indiana bats are more vulnerable, but currently we consider the sample size of five animals too small to accurately describe a sex ratio that is skewed. Lacking site-specific data from the Project we considered bat fatality sex ratios from other nearby projects. Of the little brown bat casualties found at the Criterion Wind Energy facility in Maryland during 2011, there were 8 females and 18 males of 26 animals where sex could be determined; thus 31% females and 69% males suggesting female little brown bats are not more vulnerable (Young pers.com. 2013). In addition, the sex ratio for all 2,820 bat causalities, including all species from many sites and years in Pennsylvania was 29% females and 31% males, and 40% unknown (Traucher et al. 2012, p.22), though this might be skewed by the large numbers of migratory tree bats. Data for Indiana bats is limited, but considering all of this information, we consider a 50:50 sex ratio an appropriate approach for the population modeling.

For each take allocation scenario, we evaluated model outputs that compared population trajectories over time with and without the estimated take from the project. In that way, we could evaluate whether take from the proposed action was influencing the population levels differently than how the populations would otherwise change over time. Because WNS was factored in to all of the model runs, the Indiana bat populations decline quickly over time for all scenarios. The ultimate question we were evaluating was whether take from the proposed action changes the nature of that decline or potential recovery.

Model results (Appendix B) indicate that under the reasonable worst case scenario where 50% of the Indiana bat fatalities came from the closest cave and 50% of the fatalities came from Hellhole, the difference in these two hibernacula population trajectories with and without the project is largely indistinguishable. The model projections for Snedegar's Cave began with a population of 179 Indiana bats, which is the current estimate from 2011 after WNS had severely reduced the population in this small hibernacula. With or without the Project related fatalities, the results of the population model for Snedegar's Cave are essentially the same. There is no difference in the Snedegar's median population sizes with or without the project at year 25 and 50, and in both cases the model predicts population growth. The Snedegar model projections also predict no change in median population growth rates. For those model runs that predicted extirpation of the Snedegar's population, the median time to extirpation is 15 years with the project and 20 years without the project; however, the formula to calculate median time to extirpation only includes runs that went to extirpation (< 1% of all runs), so the calculation gives the median time to extirpation for only a small subset of all model runs. Over 99% of all model runs predicted populations greater than zero at years 25 and 50, thus the risk of extirpation is low, without or without the project. Based on these modeling results, there is a discountable difference seen in the Snedegar's Cave population projections when adding the estimated take from the project.

The model projections for Hellhole began with a population of 2,540 Indiana bats, which is the current estimate from 2013 after WNS has severely reduced the population in this formerly large hibernacula. Similar to the results for Snedegar's Cave, with or without the project related fatalities at Hellhole, the results of the population model are essentially the same. These model projections predict no difference in the Hellhole median population size at years 25 and 50, and in fact, predict substantial population growth for this sized population. Because none of the model runs went to zero, the probability of the population being extirpated by year 25 or 50 is zero. There is no change in the median growth rate, with or without take from the project, at years 25 or 50. Overall, there is no difference seen in the population projections with and without the estimated take from the project, recovery of the population by year 25, and substantial growth to greater than pre-WNS numbers by year 50.

Therefore, we conclude that implementation of the project is not likely to impact the continued existence of Indiana bats at the scale of the local hibernacula population.

Impacts of Indiana bat take to non-local maternity colonies

The incidental take anticipated at this project from turbine operations will result in loss of female Indiana bats that are important for maintaining maternity colony populations. Therefore, we also evaluated the potential effects to a theoretical maternity colony of 60 females. Sixty bats[16] is the average population estimate for known Indiana bat maternity colonies (Table 2 in Kurta 2005).

The location of the nearest maternity colony in the action area is unknown and it would be speculative to assume a colony occurs on the project site. Moreover, the HCP specifically includes a changed circumstance which limits the take of a reproductive female or her young to a one-time event. Thus repeated take (i.e. multiple years in a row) of females and their pups in the

---

[16] The mean maximum emergence count after young began to fly (measured in 12 studies rangewide) was 119 bats (Kurta 2005), suggesting that 60 adult females were present (assuming that most adult females successfully raise one pup to flight stage). We note that the HCP cites a range of 60 to 80 adult females, citing the Indiana bat recovery plan (Service 2007) which cites Kurta (2005) but also mentions the average maternity colony size in Indiana was 80 adult females. We choose to use 60 females as the average size because it is based on studies across the range, and using 60 (a smaller number) in our population modeling as described in our biological opinion (USFWS 2013b), errs conservatively on the side of the species.

action area during summer is unlikely. In the event that this changed circumstance is triggered, the Service would likely reinitiate section 7 consultation to evaluate population-level effects from this one-time event, and BRE would immediately suspend or alter turbine operations to prevent additional summer take of females or young from re-occurring, until such time as they had completed a permit amendment to allow for summer take.

We therefore assumed it most likely that the take of most females would occur during fall migration rather than during the summer breeding season and these females would originate from maternity colonies located outside of the action area. We used the Thogmartin et al. (2013) demographic model and the same approach as described above for the local hibernacula impacts. Likewise, we assumed WNS had infected the colony and would continue to do so for the future. We also assumed that the fatalities from the project will include equal numbers of males and females, and thus we would expect 50% of the take with curtailment , or 26.5 females to be killed during fall spread across 25 years or 1.06 females per year. As explained above, we anticipate there may be up to 4,324 Indiana bats migrating within 100 miles of the project. With an average maternity size of 60 females, this suggests the potential for up to 72 maternity colonies in the vicinity of the project. Therefore we assume that the 1.06 female bats incidentally killed at the project annually will be coming from more than one colony, and most likely from multiple colonies.

For demographic modeling purposes we assumed a worst case scenario where all of the annual female take was attributed between only 2 maternity colonies. We anticipate in reality females will come from 2 or more colonies (and most likely from more than two), but there is no data currently available to evaluate precisely how take might be distributed. Thus, we evaluated the worst case scenario where all take results in the removal of females during fall originating from only two maternity colonies and WNS is present.

Even under this worst case scenario, the model predictions of the viability of the maternity colony population are essentially the same with or without project related fatalities (Appendix B). Under this model there was a predicted decrease in the maternity colony populations by year 25 (median population size decreased from 120 to 103 without the project take, and to 101 with the project take) but recovery of the maternity colonies back to the original size (120) was seen by year 50. These model projections predict little to no change in median population growth rates at years 25 and 50.

For those model runs where the population went to extirpation, the median time to extirpation was 13.5 years with the take from the project versus 18 years without the take from the project. The formula to calculate median time to extirpation only includes runs that predicted extirpation, so the calculation gives the median time to extirpation for only a subset of all model runs (< 2%). Over 98% of all model runs predicted populations greater than zero at years 25 and 50, thus the risk of extirpation is low, without or without the project.

Based on these modeling results, there is a discountable effect on the population projections predicted when adding the estimated take from the project. In both cases the model predicts that maternity colonies will still persist at year 25 and have recovered to their original size by year 50. Overall, there is no difference in the population predictions with and without the estimated project related fatalities. Again, we believe a more realistic scenario is that take of bats from the project will be distributed among more maternity colonies, which means the conclusions reached for the above worst case scenario are conservative. In either case, however, this analysis shows that implementation of the project is not likely to impact continued viability of Indiana bats at the scale of non-local maternity colonies. And the changed circumstances (one time "maternity event") provision of the HCP prevents the project from impacting the continued viability of Indiana bats at the scale of the local maternity colony (i.e. repeated takes of females and pups year after year at the same local colony are prevented).

Impacts of Indiana bat take at the AMRU scale

Given that take from this project is not likely to impact the fitness or viability of Indiana bats at the local population scale, we do not anticipate a reduction in the likelihood of survival and recovery of the species at the AMRU scale. An average annual loss of 2.1 Indiana bats per year (53 bats spread across 25 years) with the project take would represent 0.02% percent of the 2013 AMRU population of 17,584 individuals; and 0.29 to 0.34% of the AMRU population when added to estimated take of 50 to 58 Indiana bats per year from other existing wind energy projects in the AMRU. No additional analysis is necessary since the annual loss of individuals from the project is small and will not result in population level effects.

Impacts of Virginia big-eared bat take to local populations

It is anticipated that any take of Virginia big-ear bats would likely occur during the summer or fall when bats are in maternity colonies or moving between summer colonies and winter hibernacula. Take would likely originate from the closest local population to the south: a complex of mine portals and exposed rock cliff habitat in the New River Gorge National River of Fayette County. Few data are available for this population as the portal complex where the bats occur is unsafe to enter. Of 47 portals that provide suitable bat habitat, approximately half have been surveyed and Virginia big-eared bats have been confirmed at 15 portals since 2002 (Johnson et al. 2003, Varner 2008; C. Stihler , WVDNR, pers. communication). During the 2002 surveys, a total of 3 Virginia big-eared bats were captured during summer and 25 during fall harp trapping at mine entrances in the New River Gorge National River (Johnson et al. 2002). Since 2007, harp trapping at the entrances to these abandoned coal mines in the New River Gorge National River during the late summer and fall swarming period have captured small numbers of Virginia big-eared bats (usually 1 to a few bats per portal on a given night) (Varner 2008). Whereas no large colonies have been discovered in the area, the population is likely larger than 15 to 28 bats because portal entrance surveys underestimate bats. The relationship of these bats to other populations is unclear, although this population appears to be genetically distinct and most closely related to the Tazewell County population in Virginia which also has not been well surveyed (Piaggio et al, 2009, Stihler 2011).

In contrast to this southern population, the closest northern population to the project has been regularly surveyed during winter cave counts and has more reliable data. During the 2012 winter surveys, the hibernacula in the northern population in West Virginia was estimated to have 11,792 Virginia big-ear bats distributed among 9 hibernacula. However, all of these caves in the northern population are over 70 miles away from the project and Virginia big-ear bats are unlikely to move this far between summer and winter caves; hence, bats originating from the northern population are not likely to be affected by Beech Ridge turbine operations.

As a worst case scenario, we assumed the incidental take of up to 14 Virginia big-eared bats would be distributed evenly throughout the 25-year permit duration such that we would anticipate an average of 0.56 fatalities per year with project curtailment. This take would most likely originate from the Fayette County population; thus the maximum potential impact to this local population is 2.0 to 3.7% loss annually, if the population is as small as the roughly 15 to 28 bats captured at the entrances to portals. Unlike Indiana bats, we currently do not have a demographic model to evaluate the impact of this level of annual take to these populations. However, qualitatively it appears to be a small proportion compared to the annual average 30-year growth rate of Virginia big-eared bat maternity colonies in West Virginia. Between 1983 and 2013, Virginia big-eared bat numbers in West Virginia increased by an average of 162 bats per year, which is far greater than the anticipated take of 0.56 bats per year from the Fayette County population. In addition, the annual reproductive capacity for this population may exceed this level of take, assuming this population is growing like others in the State (i.e. the maternity populations in West Virginia grew by an average of roughly 5% per year from 1983 to 2013, whereas the annual project take, at worst, represents 2.0 to 3.7% percent of the current estimated Fayette County population). In reality, the population is likely larger than the 15 to 28 Virginia big-eared bats captured at the entrances to the Fayette County portals.

Moreover, BRE has committed to funding 2 cave gating projects which will benefit the Fayette County population by removing threats of cave vandalism and human disturbance in an area frequented by recreationists. Cave vandalism and disturbance are the primary threats to Virginia big-eared populations rangewide. Unlike Indiana bat, WNS currently is not a threat to the Virginia big-eared bat. The gating projects will be implemented within 2 years of ITP issuance. Hence the benefits of gating a winter or summer mine portal (increased over winter survival or increased reproduction) will likely begin accruing before take actually occurs. In reality, little take is anticipated early in the life of the ITP given that the project is 27 miles from the closest population, and the farthest recorded distance moved by a Virginia big-eared bat is 20 miles. Take is more likely to occur in the future with an expanding population and possible range shifts from climate change.

Virginia big-eared bats are extremely sensitive to human disturbance. Even slight disturbances can cause adults to abandon caves, abandon young, and force bats to use valuable energy reserves needed to survive hibernation. Circumstantial evidence suggests that Virginia big-eared bat populations in West Virginia have increased over the past 30 years following cave gating, and have decreased in only a few caves which were not gated or had other site-specific problems (such as cat predation on bats at the entrance to one cave) (Stihler 2010).

Therefore, in consideration of the effects of the taking, and the effects of the mitigation, we conclude that the level of incidental take of Virginia big-eared bats will not reduce the fitness (i.e., short or long-term persistence or reproductive potential) of the local Fayette County population. Given that there is no reduction at the local population scale, we do not anticipate a reduction in the likelihood of survival and recovery of the species at the rangewide [17]scale. No

[17] The rangewide distribution of the Virginia big-eared bat is considered a single recovery unit; thus we consider

additional analysis is necessary since the loss of individuals from the project will not result in population level effects.

Impacts of Indiana and Virginia big-eared bat take at the rangewide scale

As previously explained implementation of this project is not likely to impact the continued existence of either the Virginia big-eared bat or the Indiana bats at the local population scale. For Indiana bats, this also means that the project is not likely to appreciably reduce the likelihood of survival and recovery of the Indiana bat populations within the AMRU. By extension, the Service concludes that this Project will not appreciably reduce both the survival and recovery of either bat at their rangewide scales, which are the listed entity for these species.

This conclusion is further supported by the following:

- The risk of take of Virginia big-eared bats is low given the project is located on the edge of the species' known range.

- Because the overall population trend of Virginia big-eared bats is stable or increasing, the low level of take, should it occur, will most likely be spread over multiple maternity colonies and winter hibernacula.

- The maximum potential annual impact to the local Virginia big-eared bat population is low compared to the annual average growth rate and reproductive potential in the state.

- An average annual loss of 0.56 Virginia big-eared bats per year by the project represents only 0.005% of the 2013 rangewide population; and 0.03% of the rangewide population when added to estimated ongoing take of Virginia big-eared bats annually from other existing wind energy projects in the species range.

- The potential for take of Indiana bats from the project is greatest during the migratory period; hence the population impacts from the low level of annual take will most likely be spread over many maternity colonies and hibernacula over time.

- Our population modeling indicated that the low level of annual take of Indiana bat would not be additive to the effects of WNS, even under worst case scenarios for local hibernacula and non-local maternity populations. Results were virtually indistinguishable with the project take versus without.

- The AMRU is one of four recovery units comprising the rangewide distribution of Indiana bats (USFWS 2007). Further, it only represents 3% of the current rangewide population. An average annual loss of 2.1 Indiana bats per year by the project represents only 0.02% of the 2013 AMRU population; and less than 0.3% of the AMRU population when added to ongoing estimated take from other existing wind energy projects in the AMRU.

---

effects at the local and rangewide scales only.

After reviewing the current status of the Indiana bat including a declining population associated with WNS, the current status of the Virginia big-eared bat including a stable or increasing population, the environmental baseline for the action area, the effects of the proposed action and the Applicants' implementation of the HCP, and the anticipated cumulative effects, it is the Service's biological opinion that the actions as proposed, are not likely to jeopardize the continued existence of either species. This conclusion is based on the magnitude of the project effects (to reproduction, distribution, and abundance) in relation to the listed populations. Implementing regulations for section 7 (50 CFR 402) defines "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species."

Critical habitat adverse modification analysis

No critical habitat for Indiana bats or Virginia big-eared bats is designated within the action area. Impacts from the proposed actions are anticipated to be localized and not likely to impact critical habitat at broader geographic scales. Therefore, it is the Service's biological opinion that the actions as proposed, are not likely to destroy or adversely modify Indiana bat or Virginia big-eared bat critical habitat.

X. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavioral behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The proposed HCP and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary and appropriate to minimize those impacts. All conservation measures described in the HCP, together with the terms and conditions described in any associated implementing agreement and any Section 10(a)(1)(B) permit issued with respect to the HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this incidental take statement pursuant to 50 CFR §402.14(i). Such terms and conditions are non-discretionary and must be undertaken for the exemptions under Section 10(a)(I)(B) and Section 7(0)(2) of the Act to apply. If the permittee fails to adhere to these terms and conditions, the protective coverage of the Section 10(a)(1)(B) permit and Section 7(0)(2) may lapse. The amount or extent of incidental take anticipated from the Beech Ridge Wind Energy Project, associated reporting requirements, and provisions for disposition of dead animals are described in the HCP and its accompanying Section 10(a)(1)(B) permit.

XI. AMOUNT OR EXTENT OF TAKE

After analyzing the effects of the proposed action (issuance of the ITP and implementation of the HCP), the Service anticipates that up to 14 Virginia big-eared bats and up to 53 Indiana bats will be taken cumulatively as a result of the Project over 25 years. The incidental take is expected to be in the form of direct mortality of Indiana and Virginia big-eared bats from collision with turbines blades or from barotrauma during project operations.

XII. EFFECT OF THE TAKE

Through the analysis in this BO, the Service has determined that this level of anticipated take is not likely to result in jeopardy to Indiana or Virginia big-eared bats and that no critical habitat will be destroyed or adversely modified by this project.

XIII. CONSERVATION RECOMMENDATIONS

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

The Service provides itself (as the action agency) the following conservation recommendations; these activities may be conducted at the discretion of the Service as time and funding allow:

1. Continue to develop and refine the Indiana Bat Section 7 and Section 10 Guidance for Wind Energy Projects (USFWS 2011) by incorporating information gained from recent wind Projects, as well as current research on the topic.

2. Develop regional HCP strategies for wind projects that will effectively and efficiently streamline the ESA consultation process for impacts to listed bat species.

XIV. REINITIATION NOTICE

This concludes the formal intra-Service consultation on the issuance of an incidental take permit to the Applicants. As a basis for this permit action, the Applicants submitted the required HCP requesting an incidental take permit for Indiana and Virginia big-eared bats in the action area. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. Specific examples of new information which may trigger the need for reinitiation of formal consultation include, but are not limited to: 1) the changed circumstances threshold for WNS is met as described in section 8.2.1 of the HCP; 2) a maternity colony take event occurs as described in section 8.2.5 of the HCP; 3) baseline all bat fatality levels (at control turbines which are not curtailed) are significantly higher than was predicted in the HCP (43 bats per turbine per year), resulting in the need to re-estimate the amount of take anticipated and whether a major permit amendment is needed.

LITERATURE CITED

Acentech (Acentech Incorporated). 2006. Acoustical study of proposed Beech Ridge Wind Farm Greenbrier County, WV. Prepared for Invenergy Wind LLC. Acentech Incorporated, Cambridge, Massachusetts, USA. May.

Acentech. 2011. Acoustical Study of Proposed Expansion/Modification of Beech Ridge Wind Farm, Greenbrier County, WV. Prepared for: Beech Ridge Energy II LLC. Acentech Incorporated, Cambridge, Massachusetts, USA. July.

American Wind Energy Association. 2013. U.S. Wind industry second quarter market report (member download), July. American Wind Energy Association. <http://www.awea.org/2Q2013?RDtoken=10543&userID=>. Accessed 29 October 2013.

Arnett, E.B., W.K. Brown, W.P. Erickson, J.K. Fiedler, B.L. Hamilton, T.H. Henry, A. Jain, G.D. Johnson, R.R. Koford, C.P. Nicholson, T.J. O'connell, M.D. Piorkowski and R.D. Tankersley Jr. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. Journal of Wildlife Management 72:61–78.

Arnett, E.B., M.M.P. Huso, M.R. Schirmacher and J.P. Hayes. 2011. Altering turbine speed reduces bat mortality at wind-energy facilities. Frontiers in Ecology and the Environment 9:209-214.

Barbour, R.W. and W.H. Davis. 1969. Bats of America. University Press, Lexington, KY. 286 pp.

Baerwald, E. F. J. Edworthy, M. Holder, and R. M. R. Barclay. 2009. A large-scale mitigation experiment to reduce bat fatalities at wind energy facilities. Journal of Wildlife Management 73:1077-1081.

Beech Ridge Energy, LLC. 2012. Letter from David Groberg (BRE) to Paul Phifer (USFWS) requesting approval for limited night-time operations from April 1 – November 15, 2012 at the Beech Ridge Wind Energy Project, West Virginia. January 23.

Beech Ridge Energy LLC and Beech Ridge Energy II LLC. 2013a. Beech Ridge Wind Energy Project Habitat Conservation Plan, Greenbrier and Nicholas Counties, West Virginia. August.

Beech Ridge Energy LLC, Beech Ridge Energy II LLC. 2013b. Beech Ridge Wind Energy Project Habitat Conservation Plan, errata sheet. Submitted to USFWS on November 7, 2013.

Beech Ridge Energy, LLC. 2013c. Letter from Bryan Schueler (BRE) to Paul Phifer (USFWS) requesting approval for limited night-time operations from April 1 – November 15, 2013 at the Beech Ridge Wind Energy Project, West Virginia. February 12.

Beech Ridge Energy, LLC. 2013d. Final Avian Protection Plan for Beech Energy LLC's and

Beech Ridge Energy II LLC's Beech Ridge Wind project, Greenbrier and Nicholas Counties, WV. August.

Beverly, J., Sumner, D., Evans, J., and E. Holbrook. 2009. Summer 2008 monitoring for the federally endangered Indiana bat (*Myotis sodalis*) near known maternity colony trees, Boone County, WV. Report prepared for Black Castle Mining Company, Uneeda, WV by Apogee Environmental Consultants, Ermine, KY.

BHE Environmental, Inc. 2005. Mist Net Surveys at the Proposed Beech Ridge Wind Farm, Greenbrier County, West Virginia. Prepared for Beech Ridge Energy LLC, Olney, Maryland. Prepared by BHE Environmental, Inc., Columbus, Ohio.

BHE Environmental, Inc. 2006. Mist Net Surveys at the Proposed Beech Ridge Wind Energy Transmission Corridor, Nicholas and Greenbrier Counties, West Virginia. Prepared for Beech Ridge Energy LLC, Olney, Maryland. Prepared by BHE Environmental, Inc., Columbus, Ohio.

Blehert D. S., A. C. Hicks, M. Behr, C. U. Meteyer, B. M. Berlowski-Zier, E. L. Buckles, J. T. H. Coleman, S. R. Darling, A. Gargas, R. Niver, J. C. Okoniewski, R. J. Rudd, and W. B. Stone. 2009. Bat white-nose syndrome: an emerging fungal pathogen? Science 323:227.

Blehert, D.S., J.M. Lorch, A.E. Ballmann, P, M. Cryan and C.U. Meteyer. 2011. Bat white-nose syndrome in North America. Microbe 6:267-273.

Brack, V., Jr. 1983. The non-hibernating ecology of bats in Indiana with emphasis on the endangered Indiana bat, *Myotis sodalis*. Dissertation. Purdue Univ., West Layfaette, IN. 280 pp.

Brack, V., Jr., S. Johnson, and C. Stihler. 2005. Winter hibernacula temperatures used by Indiana bats in (1) caves in Indiana; (2) a mine in Preble County, Ohio; (3) caves in West Virginia; and (4) caves in Bland County, Virginia. Report prepared for the Indiana bat risk assessment workshop, Shepherdstown, WV 37 pp.

Brack, V., C. W. Stihler, R.J. Reynolds, C.M. Butchkoski and C.S. Hobson. 2002. Effect of climate and elevation on distribution and abundance in the mideastern United States. Pages 21-28 In: Kurta, A. and J. Kennedy, eds. The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, Texas.

Britzke, E.R., M.J. Harvey, and S.C. Loeb. 2003. Indiana bat, *Myotis sodalis*, maternity roosts in the southern United States. Southeastern Naturalist 2: 235-242.

Butchkoski, C., J. Chenger, A. Hicks, R. Reynolds. 2008. Spring Indiana bat migration telemetry. Page 12 in Abstracts of the Joint meeting of the Southeastern Bat Diversity Working Group, and Colloquium on Conservation of Mammals in the Southeastern United States, Blacksburg, VA. February 20-22, 2008.

Butchoski, C.M. and G. Turner. 2006. Indiana bat (*Myotis sodalis*) summer roost investigations. Project Annual Jobreport, Pennsylvania Game Commission, Bureau of Wildlife management, Research Division, Harrisburg, PA.

Currie, R. 2000. Federally listed threatened and endangered species of concern to mining. Paper presented at Bat Conservation and Mining: a technical and interactive forum, November 14-16, St. Louis, MO.

Cryan, P.M. 2008. Mating behavior as a possible cause of bat fatalities at wind turbines. Journal of Wildlife Management 72:845-849.

Ecology and Environment. 2009. Draft report: Indiana bat (*Myotis sodalis*) filed studies at Shuteye Creek wind Farm, Adair and Sullivan Counties, Missouri, 2007-2008. Prepared for Shuteye Creek Wind Project, LLC, Lenexa, Kansas, by Ecology and Environment, Chicago, IL, and Missouri State University, Springfield, MO.

Federal Highway Administration. 2006. Highway traffic noise, construction noise handbook. U.S. Department of Transportation, Volpe National Transportation Systems Center, Acoustics Facility, Cambridge, Massachusetts, USA. August. <http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/index.cfm> Accessed 5 November 2013.

Frick, W.F., J. F. Pollock, A. C. Hicks, K.E. Langwig, D. S. Reynolds, G. G. Turner, C. M. Butchkoski, and T. H. Kunz. 2010. An emerging disease causes regional population collapse of a common North American bat species. Science 329:679-682.

Gardner, J.E. and E.A. Cook. 2002 Seasonal and geographic distribution and quantification of potential summer habitat. PP. 9-20 in A. Kurta and J. Kennedy (eds.), The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, TX.

Good, R.E., W. Erickson, A. Merrill, S. Simon, K. Murray, K. Bay, and C. Fritchman. 2011. Bat monitoring studies at the Fowler Ridge Wind Energy Facility, Benton County, Indiana, April 13-October 15, 2010. Prepared for Fowler Ridge Wind Farm. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Good, R.E., A. Merrill, S. Simon, K. Murray, and K. Bay. 2012. Bat monitoring studies at the Fowler Ridge Wind Farm, Benton County, Indiana. April 1-October 31, 2011. Prepared for Fowler Ridge Wind Farm. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 31.

Hein, C.D., A. Prichard, T. Mabee, and M.R. Schirbacher. 2013. Effectiveness of an operational mitigation experiment to reduce bat fatalities at the Pinnacle Wind Farm, Mineral County, West Virginia, 2012. Prepared for Edison Mission Energy and Bats and Wind Energy Cooperative. Bat Conservation International, Austin, TX. April.

Hessler Associates, Inc. 2009. Environmental sound survey and noise impact assessment, Buckeye Wind Project. Prepared for EverPower Wind Holdings, Inc. Hessler Associates, Inc. Haymarket, Virginia, USA.

Johnson, J.B., P.B. Wood, and J.W. Edwards. 2003. Survey of abandoned mine portals for bats at the New River Gorge National River and Gauley River National Recreation Area, West Virginia. Final report to National Park Service prepared by West Virginia Cooperative Fish and Wildlife Research Unit and West Virginia University, Morgantown. 28 January.

Kunz, T.H., E.B. Arnett, W.P. Erickson, A. R. Hoar, G. D. Johnson, R. P. Larkin, M.D. Strickland, R.W. Thresher, and M.D. Tuttle. 2007. Ecological impacts of wind energy development on bats: questions, research needs and hypotheses. Front. Ecol. Environ 5(6):315-324.

Kunz, T.H. and R.A. Martin. 1982. Plecotus townsendii. Mammalian species No, 175. American Society of Mammalogists.

Kurta, A. 2005. Roosting ecology and behavior of Indiana bats (*Myotis sodalis*) in summer. Pages 29-42 *in* K.C. Vories and A. Harrington, editors. Proceedings of the Indiana bat and coal mining: a technical interactive forum (2004: Louisville, Kentucky). Office of Surface Mining, U.S. Department of the Interior 2004: http://www.mcrcc.osmre.gov/MCR/Resources/bats/pdf/Indiana_Bat_and_Coal_Mining

Kurta, A., S. W. Murray, and D. H. Miller. 2002. Roost selection and movements across the summer landscape. Pages 118-129 *in* A. Kurta and J. Kennedy, editors. The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, USA.

Kurta, A., and H. Rice. 2002. Ecology and management of the Indiana bat in Michigan. Michigan Academician 33:361–376.

Lacki, M.J. and L.E. Dodd. 2011. Diet and foraging behavior of Corynorhinus in eastern North America. Pages 39-52 in Loeb, S.C., M. J. Lacki, and D.A. Miller (eds.) Conservation and management of eastern big-eared bats: a symposium. Athens, GA, March 9-10, 2010. General Technical Report SRS-145, U.S. Forest Service Southern Research Station, Asheville, NC.

Long, C.V., J.A. Flint, P.A. Lepper, and S.A. Dible. 2009. Wind turbines and bat mortality: Interactions of bat echolocation pulses with moving turbine rotor blades. Proceedings of the Institute of Acoustics. Vol.31. Pt.1.

Michael, E.D. 1994. Preliminary report, environmental assessment –wildlife impacts, proposed wind turbine project in Greenbrier County, WV, submitted to Kenetech Windpower, Inc. Washington, D.C. West Virginia University, Morgantown. December 31.

McShea, W.J. and H. Lessig 2005. Migration of Indiana bats (Myotis sodalist) from winter hibernacula to summer maternity roosts. Draft report to the Virginia Department of Game and Inland Fisheries., Richmond, VA.

Minnis A.M. and D. L. Lindner. 2013. Phylogenetic evaluation of *Geomyces* and allies reveals no close relatives of *Pseudogymnoascus destructans*, comb. nov., in bat hibernacula of eastern North America. Fungal Biology 117(9): 638-649.

Murray, S.W. and A. Kurta. 2004. Nocturnal activity of the endangered Indiana bat (*Myotis sodalis*). Journal of Zoology 262:197-206.

Neuweiler, G. 1989. Foraging ecology and audition in echolocating bats. Trends Ecology and Evolution 4:160-166.

Piaggio, A.J., K.W. Navo, and C.W. Stihler. 2009. Intraspecific comparison of population structure, genetic diversity, and dispersal among three subspecies of Townsend's big-eared bats, *Corynorhinus townsendii*, *C. t. pallescens*, and the endangered *C. t. viginianus*. Conservation Genetics 10:143-159.

Puechmaille, S. J., P. Verdeyroux, H. Fuller, A. G. M. Behaert M., and E. C. Teeling. 2010. White-nose syndrome fungus (*Geomyces destructans*) in bat, France. Emerging *Infectious Diseases. Available at:* http://www.cdc.gov/eid/content/16/2/pdfs/09-1391.pdf

Ryan, K.C., K.M. Lee, M.G.Z. Rollins 9and others0. 2006. Landfire: landscape fire and resource management planning tools project. In: Andrews, P.L., B.W. Butler, comprehensive fuels management, how to measure success: conference proceedings. RMRS-P-41. Fort Collins, CO: USDA, Forest Service, Rocky Mountain Research Station: 193-200.

Schaub, A., J. Ostwald, and B. M. Siemers. 2008. Foraging bats avoid noise. The Journal of Experimental Biology 211:3174-3180.

Schmidly, D.J. 1991. Plecotus townsendii. Pages 137-141 in The Bats of Texas. Texas A&M University Press, College Station, TX.

Shoener Environmental. 2013. Post-construction bird/bat mortality monitoring report (2012). North Allegheny Wind Farm, Blair and Cambria Counties, Pennsylvania. Prepared for Duke Energy Renewables and North Allegheny Wind, LLC. Shoener Environmental, Dickson, PA. March 1.

Siemers, B.M. and A. Schaub. 2011. Hunting at the highway: traffic noise reduces foraging efficiency in acoustic predators. Proc. R. Soc. B (2011) 278, 1646–1652.

Stantec. 2011. Letter to USFWS regarding bird mortality event at the Laurel Mountain substation. October 25.

Stantec. 2013a. Fall 2011 and Spring/Summer 2012 post-construction monitoring, mortality estimate, acoustic analysis, and curtailment study for the laurel Mountain Wind Energy Project in Randolph and Barbour Counties, West Virginia. Prepared for AES Laurel

Mountain Wind, LLC, Belington, WV, by Stantec Consulting Services, Topsham, ME. March.

Stantec. 2013b. Fall 2012 post-construction 2012 monitoring at the Laurel Mountain Wind Energy Project in Randolph and Barbour Counties, West Virginia. Letter submitted to USFWS on behalf of AES Laurel Mountain Wind, LLC, Belington, WV, by Stantec Consulting Services, Topsham, ME. April 26.

Stihler, C.W. 1994. Radio telemetry studies of the endangered Virginia big-eared bat (*Plecotus townsendii virginianus*) at a maternity colony in Cave Mountain, Pendleton County, West Virginia. Report in fulfillment of the Challenge Cost Share Agreement between the WVDNR and the U.S. Forest Service.

Stihler, C.W. 1995. Radio telemetry studies of the female endangered Virginia big-eared bats (*Corynorhinus (=Plecotus) townsendii virginianus*) at a maternity colony in Cave Mountain, Pendleton County, West Virginia. Report in fulfillment of the Challenge Cost Share Agreement between the WVDNR and the U.S. Forest Service.

Stihler, C.W. 2011. Status of the Virginia big-eared bat (*Corynorhinus townsendii virginianus*) in West Virginia: 27 years of monitoring cave roosts. Pages 75-84 in Loeb, S.C., M. J. Lacki, and D.A. Miller (eds.) Conservation and management of eastern big-eared bats: a symposium. Athens, GA, March 9-10, 2010. General Technical Report SRS-145, U.S. Forest Service Southern Research Station, Asheville, NC.

Taucher, J., T.L. Mumma, and W. Capouillez. 2012. Pennsylvania Game Commission Wind Energy Voluntary Cooperation Agreement, Third Summary Report. Bureau of Wildlife Habitat Management, Dec 27, 2012. 72pp.

Thogmartin, W.E., R. A. King, P.C. McKann, J.A. Szymanski and L. Pruitt. 2012. Population-level impact of white-nose syndrome on the endangered Indiana bat. J. of Mammology 93(4):1086-1098.

Thogmartin, W.E., C.A. Sanders-Reed, J.A. Szymanski, P.C. McKann, L. Pruitt, R.A. King, M.C. Runge, and R. E. Russell. 2013. White-nose syndrome is likely to extirpate the endangered Indiana bat over large parts of its range. Biological Conservation 160: 162-172.

Tidhar, D., M. Sonnenberg, and D. Young. 2013. Post-construction carcass monitoring study for the Beech Ridge Wind farm, Greenbrier County, West Virginia, final report, April 1 – October 28, 2012. Prepared for Beech Ridge Wind Farm and beech Ridge Energy, LLC. Western Ecosystems Technology, Inc., Waterbury, Vermont. 18 January.

Turner, G. G. 2006. Bat Migratory Behaviors and Routes in Pennsylvania and Maryland. Proceedings NWCC Wildlife Workgroup Research Planning Meeting VI, San Antonio, Texas, USA. November 14-15, 2006

Tuttle, M.D. and J. Kennedy. 2002. Thermal requirements during hibernation. Pp. 68-78 in A. Kurta and J. Kennedy (eds.), The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, TX.

U.S. Fish and Wildlife Service. 1983. Recovery Plan for the Indiana Bat. Twin Cities, MN.

U.S. Fish and Wildlife Service. 1984. Recovery plan for the Ozark big-eared bat and Virginia big-eared bat. Prepared by Fred Bagley, USFWS, Region 3, Twin Cities, MN.

U.S. Fish and Wildlife Service. 1995. Revised draft recovery plan for the Ozark big-eared bat and Virginia big-eared bat. In prep.

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Endangered Species Consultation Handbook – Procedures for Conducting Consultation and Conference Activities under Section 7 of the Endangered Species Act. Washington, D.C

United States Fish and Wildlife Service. 2005. Biological opinion and incidental take statement for Indiana bat (*Myotis sodalis*) at the department of the Army 88th Regional readiness Command U.S. Army reserve Center, Twinsburg Township, Summit County, Ohio. USFWS, Ecological Services Field Office, Reynoldsburg, Ohio. 41 pp.

United States Fish and Wildlife Service. 2006. Letter from Thomas Chapman (USFWS) to Russ Romme (BHE Environmental) regarding the West Virginia northern flying squirrel and the proposed beech Ridge Wind Energy Project, West Virginia. March 7.

U.S. Fish and Wildlife Service. 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. Fort Snelling, MN. 258 pp.

U.S. Fish and Wildlife Service. 2008. Virginia big-eared bat: 5-year status review. Northeast Region, Hadley, MA.

U.S. Fish and Wildlife Service. 2011. Indiana bat Section 7 and Section 10 Guidance for Wind Energy Projects. Revised 26 October 2011. 63pp.

United States Fish and Wildlife Service. 2012. Letter from Paul Phifer (USFWS) David Groberg (BRE) approving request for limited night-time operations from April 1 – November 15, 2012 at the Beech Ridge Wind Energy Project, West Virginia. January 30.

United States Fish and Wildlife Service. 2013a. Final Environmental Impact Statement for Proposed Issuance of an Incidental Take Permit for the Beech Ridge Energy Wind Project Habitat Conservation Plan. Greenbrier and Nicholas Counties, West Virginia. Prepared by the U.S. Fish and Wildlife Service, West Virginia Field Office, Elkins, West Virginia.

United States Fish and Wildlife Service. 2013b. Letter from Paul Phifer (USFWS) to Bryan Schueler (BRE) approving limited night-time operations from April 1 – November 15, 2013 at the Beech Ridge Wind Energy Project, West Virginia. February 15.

U.S. Fish and Wildlife Service. 2013c. 2013 Range wide Population Estimate for the Indiana Bat (*Myotis sodalis*) by Recovery Unit. Compiled by Andy King, USFWS, Bloomington, Indiana, Ecological Services Field Office. Available at: http://www.fws.gov/midwest/Endangered/mammals/inba/index.html

U.S. Fish and Wildlife Service. 2013d. Indiana bat migration distances in the Appalachian Mountain Recovery Unit. Compiled by Laura Hill, USFWS. West Virginia Field Office, Elkins, WV.

U.S. Fish and Wildlife Service. 2013e. Biological opinion on the effects of the programmatic forest management plan for potential Indiana bat habitat areas on wildlife management areas for which the West Virginia Division of Natural Resources, Wildlife Resource Section has forest management authority. West Virginia Field Office, Elkins, WV. February 27.

U.S. Fish and Wildlife Service. 2013f. Memorandum to file. Revision of take estimate for the Beech Ridge Energy Permit. Prepared by Laura Hill, USFWS, West Virginia Field Office, Elkins, WV. May 22.

U.S. Fish and Wildlife Service. 2013g. Biological opinion on the application for an incidental take permit for the federally endangered Indiana bat (*Myotis sodalis*) for the Buckeye Wind Power Project, Champaign County, Ohio. Ohio Field Office, Columbus, Ohio. July 11.

U.S. Forest Service. 2008. Maryland's forests 2008. Stats, Methods, and Quality Assuarnce, Resource Bulletin NRS-58. Available on-line: fs.fed.us/nrs/pubs/rb/rb_nrs82.pdf

U.S. Forest Service. 2013. Pennsylvania's forests 2009. Resource Bulletin NRS-82. Available on-line: fs.fed.us/nrs/pubs/rb/rb_nrs82.pdf

Varner, M.S. 2008. Spring emergence and fall swarm bat monitoring at New River Gorge National River. Program report NPS/NER/NERI-1428-07B. National Park Service, Glen Jean, WV.

Vogelmann, J.E., T.L. Sohli, P.V. Campbell, and D.M. Shaw. 1998. Regional land cover characterization using Landsat Thematic mapper data and ancillary data sources. Environmental Monitoring and Assessment 51:415-428.

Whitaker, J. O., V. Brack and J.B. Cope. 2002. Are bats in Indiana declining? Indiana Acad. Sci. 111:95-06.

Winhold, L. and A. Kurta 2006. Are red bats (Lasiurus borealis) declining in southern Michigan? Bat Res. News 46:229.

West Virginia Department of Environmental Protection . 2013. Search for oil and gas permits, on-line data base. https://apps.dep.wv.gov/oog/permitsearch_new.cfm

West Virginia Department of Environmental Protection . 2012. Water withdrawal guidance tool. West Virginia Department of Environmental Protection, Water and Waste Management, Water Use Section, Charleston, USA. <http://www.dep.wv.gov/WWE/wateruse/Pages/WaterWithdrawal.aspx. Accessed 30 April 2012.

West Virginia Division of Forestry. 2010. West Virginia statewide forest resource assessment 2010. Part 4. WVDOF, Charleston, WV. Available on-line: wvforestry.com/DOF100_ Assesment_Revised_091310_Part4.pdf

West Virginia Division of Natural Resources. 2010. Results of the winter bat survey conducted on 20 February 2010 at Hellhole, Pendleton County, West Virginia.

West Virginia Division of Natural Resources. 2013. Results of the winter bat survey conducted on 23 February 2013 at Hellhole, Pendleton County, West Virginia.

Young, D. and Z. Courage. 2011. Memorandum dated September 30, 2011 to NedPower regarding a bird kill on September 25, 2011at the Mount Storm Wind Power facility. 2 pages

Young, D., and J. Gruver. 2011. Bat Mist Netting and Acoustic Surveys, Beech Ridge Wind Energy Project, Greenbrier and Nicholas Counties, West Virginia. Prepared for Beech Ridge Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyoming.

Young, D.P., S. Nomani, and W.L. Tidhar, and K. Bay. 2011. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2010. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 10.

Young, D., Z. Courage, and T. Poulton. 2012a. Avian and bat risk assessment: Beech Ridge Wind Energy Project Expansion Area, Greenbrier and Nicholas Counties, West Virginia. Prepared for Invenergy, LLC. Western Ecosystems Technology, Inc., Cheyenne, Wyoming and Waterbury, Vermont. February.

Young, D.P., Jr., Z. Courage, and K. Bay. 2012b. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2011. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 27.

Young, D., L, McManus, and M. Lout. 2013a. Technical memorandum submitted to K. Coppinger (BRE) regarding Beech Ridge post-construction monitoring summary for April – October 2013. November 11.

Young, D., C. Nations, M. Lout and K. Bay. 2013b. 2012 Post-Construction Monitoring Study: Criterion Wind Project, Garrett County, Maryland, April-November 2012. Prepared for: Criterion Power Partners, LLC, Oakland, Maryland. Prepared by: Western EcoSystems Technology, Inc. Cheyenne, Wyoming.

Appendix A. Indiana bat population model runs using the Thogmartin et al. (2013) model.

Each scenario was run 10,000 times with and without the estimated take due to the project. All are considered worst case scenarios where we assume White Nose Syndrome has and will continue to affect the population, and these model runs use the Indiana bat specific assumptions described in the model.

We assessed three scenarios:

(1) All of the project mortality occurs during fall migration. Half of the bats killed hibernate in the local hibernacula (Snedegar's Cave), with a starting population size of 179 bats in 2011 (based on the latest survey). Under this scenario, the other half of the project mortality would be spread among other hibernacula within the migration range of Indiana bats. The intent of this scenario was to determine if the estimated take from the project would cause measurable impacts to the Snedegar's Cave population. Assuming that 50% of the estimated take would be of bats from Snedegar's Cave was considered a worse-case scenario since there are many caves within the migration range of the project and in reality the take would be spread among these populations in unknown proportion.

(2) All of the project mortality occurs during fall migration. Half of the bats killed hibernate in the largest cave within 100 miles of the project (Hellhole), with a starting population size of 2,540 bats in 2013 (based on the latest survey). Under this scenario, the other half of the project mortality would be spread among other hibernacula within the migration range of Indiana bats. The intent of this scenario was to determine if the estimated take from the project would cause measurable impacts to the Hellhole population. Assuming that 50% of the estimated take would be of bats from Hellhole was considered a worse-case scenario since there are many caves within the migration range of the project and in reality the take would be spread among these populations in unknown proportion.

(3) All of the project fatality occurs during fall migration. Half is comprised of females originating from two non-local maternity colonies within 100 miles of the Project, with a hypothetical starting population sizes of 60 females each. Under this scenario, the other half of the project mortality would be of male Indiana bats. The intent of this scenario was to determine if the estimated take from the project would cause measurable impacts to maternity colonies within 100 miles of the Project. Assuming that 50% of the estimated take would be of female bats during fall migration was considered a worse-case scenario since the presence of local maternity colonies within or near the action area has not been confirmed, and the HCP includes a changed circumstance to prevent multiple year take of females and their young during the summer from a local population within or near the action area. There are likely many more maternity colonies than two located within 100 miles of the Project given the suitable habitat conditions. Thus in reality it is more likely the take would be spread among multiple maternity colonies (more than two) in unknown proportion.

Table 1. Snedegar's Cave, local hibernacula scenario - Comparison of model results for the local hibernacula population , without the estimated project take and with the estimated project take under the scenario where white nose syndrome has already affected the population and where half of the total project take, or 26.5 bats, occurs during fall migration and these dead bats are from Snedegar's Cave, the closest hibernacula.

26.5 bats taken over 25 years in fall or 1.06/year on average

Starting population size: 179 bats	WITHOUT project take (Scenario 2)	WITH project take (Scenario 1)	% Difference[a]
Median population size at year 50	456	456	0
Median population size at year 25	312	312	0
Median years to extirpation (of the runs that went to 0)	20	15	-33
Median growth rate at year 50	1.02	1.02	0
Median growth rate at year 25	1.03	1.03	0
Cumulative percent of all model runs with pop. size being > 0 through year 50	99.8	99.5	-0.3
Cumulative percent of all model runs with pop. size being >0 through year 25	99.9	99.7	-0.2

[a] % Difference = (WITH – WITHOUT)/WITH X 100

Conclusion: Model projections of a hibernacula that begins with 179 bats and loses 26.5 bats during fall migration spread equally across 25 years (13.25 females, or 0.53 females per year) are essentially the same with or without the estimated take from the project. These model projections predict no difference in the median population sizes with or without the project at year 25 and 50, and in both cases predict population growth. The model projections also predict no change in median population growth rates.

For those model runs that predicted extirpation of the population, the median time to extirpation is 15 years with the project and 20 years without the project; however, the formula to calculate median time to extirpation only includes runs that went to extirpation, so the calculation gives the median time to extirpation for only a small subset of all model runs. Over 99% of all model runs predicted populations greater than zero at years 25 and 50, thus the risk of extirpation is low, with or without the project.

Based on these modeling results, there is a discountable difference seen in the population projections when adding the estimated take from the project.

Table 2. Hellhole, largest hibernacula scenario. Comparison of model results for the largest hibernacula population within the 100-mile migration zone of the project, without the estimated project take and with the estimated project take under a reasonable scenario where white nose syndrome has already affected the population and where half of the total project take, or 26.5 bats, occurs during fall migration and these dead bats originate from Hellhole.

26.5 bats taken over 25 years in fall or
1.06/year on average

Starting population = 2,540 bats	**WITHOUT project take (Scenario 2)**	**WITH project take (Scenario 1)**	**% Difference[a]**
Median population size at year 50	27,836	27,836	0
Median population size at year 25	4647	4724	1.6
Cumulative percent of model runs with pop. Size being > 5,000 through year 50	47.4	47.2	-0.3
Cumulative percent of model runs with pop. size being >5000 through year 25	7.2	7.3	0.4
Median growth rate at year 50	1.05	1.05	-0.002
Median growth rate at year 25	1.03	1.03	0.045
Cumulative percent of all model runs with pop. size being > 0 through year 50	100	100	0
Cumulative percent of all model runs with pop. size being > 0 through year 25	100	100	0

[a] % Difference = (WITH – WITHOUT)/WITH X 100

Conclusion: Model projections of a hibernacula population that begins with 2,540 bats and loses 26.5 bats during fall migration spread equally across 25 years (13.25 females, or 0.53 females per year) are essentially the same, with or without the estimated take from the project. These model projections predict no difference in the median population size at years 25 and 50 and in fact predict substantial population growth for this sized population. Because none of the model runs went to zero, the probability of the population being extirpated by year 25 or 50 is zero. There is no change in the median growth rate, with or without take from the project, at years 25 or 50. Overall, there is no real difference seen in the population projections with and without the estimated take from the project.

Based on these modeling results, there is no effect on the population projections predicted when adding the estimated take from the project.

Table 3. Non-local maternity colony scenario- Comparison of model results for non-local maternity colony populations without the estimated project take and with the estimated project take under the scenario where white nose syndrome has already affected the population and where half of the take of 53 bats are females during fall migration and the take is equally distributed among 2 non-local maternity colonies; thus each colony experiences loss of 0.53 females per year for 25 years.

26.5 female bats over 25 years at two colonies, or 0.53 females/colony/year

It should be noted that the Thogmartin model does not explicitly address maternity colonies. So in this case a theoretical maternity colony population was simulated. For this model run it was assumed that population growth and extinction dynamics for maternity colonies are identical to those for hibernacula.

Starting population size: 120 (60 females per colony)	**WITHOUT project take (Scenario 2)**	**WITH project take (Scenario 1)**	**% Difference[a]**
Median population size at year 50	120	120	0
Median population size at year 25	103	101	-1.9
Median years to extirpation (of the runs that went to 0)	19	13	-46
Median growth rate at year 50	1.02	1.02	0
Median growth rate at year 25	1.03	1.03	-0.02
Cumulative percent of all model runs with pop. size being >0 through year 50	99.1	98.1	-1.03
Cumulative percent of all model runs with pop. size being >0 through year 25	99.3	98.3	-0.95

[a] % Difference = (WITH – WITHOUT)/WITH X 100

Conclusion: Model projections of a population of two maternity colonies that begin with a total of 120 female bats (60 females per colony) and lose 26.5 female bats during fall migration spread equally across 25 years (13.25 females per colony, or 0.53 females/colony/year) are essentially the same, with or without the project for several metrics. Under this model there was a predicted decrease in the maternity colony populations by year 25 (median population size went from 120 down to 103 or 101) but recovery of the two maternity colonies back to the original size (120) was seen by year 50. These model projections predict little to no change in median population growth rates at years 25 and 50.

For those model runs where the population went to extirpation, the median time to extirpation was 13 years with the take from the project versus 19 years without the take from the project. The formula to calculate median time to extirpation only includes runs that predicted extirpation, so the calculation gives the median time to extirpation for only a subset of all model runs (< 2%). Over 98% of all model runs predicted populations greater than zero at years 25 and 50, thus the risk of extirpation is low, without or without the project.

Based on these modeling results, there is a discountable effect on the population projections predicted when adding the estimated take from the project.

Appendix B: Consultation History

June 28, 2005. Beech Ridge Energy's (BRE) consultant (BHE) calls the Fish and Wildlife Service (Service) and the West Virginia Division of Natural Resources (WVDNR) regarding presence of bats in the project area.

July 7, 2005: BHE sends the Service and WVDNR a written request for technical assistance describing the proposed project and requesting agency coordination and comment on potential effects to bats.

Mid July 2005. E-mail exchanges between BHE, Service, and WVDNR requesting approval of a bat mist-net survey plan

November 15, 2005: BHE sends a report (dated August 2005) to the Service and WVDNR documenting results of the July 2005 bat survey in the project area.

September 20, 2005. BHE letter to the Service and WVDNR regarding West Virginia northern flying squirrel (WVNFS) potential habitat, quality of habitat, and failure to capture WVNFS during 3 years of nest box surveys (Jan 1998-August 2000, spring and fall checks) on land adjacent to the project area.

November 9, 2005: BHE sends draft bat risk assessment to the Service and WVDNR.

November 10, 2005: Conference call between BRE, BHE, Service, and WVDNR regarding the project, timeline, and results of bat mist net surveys during summer 2005, the bat risk assessment, and WVNFS. Service requests additional information on the WVNFS. Service and WVDNR express concern about risk of high bat mortality and need for more surveys. Also recommend feathering or shutting down turbines during migration.

November 23, 2005: BHE sends transmission line information to the Service.

December 2, 2005: WVDNR comments on draft bat risk assessment.

December 2, 2005. Letter from Potesta Consulting to the Service transmitting for review a phase I spring and fall avian migration study and preliminary phase I risk assessment. Notifies the Service that the fall bird migration study is ongoing and when competed will be compiled with spring data into a final phase 1 avian risk assessment.

February 6, 2005: WVDNR e-mail to BHE regarding known bat occurrences near the project site.

March 7, 2006: Service letter responding to July 5, 2005 letter from BRE's consultant regarding Service concerns about potential project adverse impacts to the endangered Indiana bat, Virginia big-eared bat, WVNFS, migratory birds, and unlisted bats. Service recommends further coordination with regard to the Endangered Species Act through section 7 consultation or section 10 incidental take permitting if federally listed species may be taken.

March 7, 2006: Service letter responding to January 10, 2006 letter from BRE's consultant regarding potential project impacts to WVNFS. Service determines the project is not likely to adversely affect the WVNFS based on results of a habitat assessment, review of aerial photographs, and lack of capture of WVNFS near the project area for 3 consecutive years.

April 6, 2006: Letter from BHE to BRE transmitting results of cave surveys conducted in March 2006 within 5 miles of the proposed Beech Ridge Wind Energy site. No listed bats found.

April 18, 2006: E-mail exchange between BHE and FWS approving a mist-net survey plan for spring 2006.

June 14, 2006: Letter from BHE to Service transmitting revised bat risk assessment dated June 19, 2006.

August 10, 2006: Service letter responding to June 14, 2006 letter from BRE's consultant transmitting a bat risk assessment for the proposed project reiterating concern about adequacy of surveys and potential for the project to harm or kill Indiana and Virginia big-eared bats.

August 28, 2006: The West Virginia Public Service Commission (WVPSC) issues a citing certificate to Beech Ridge Energy, LLC for construction and operation of a 124-turbine, 186-megawatt (MW) wind energy facility and a related 138-kilovolt transmission line in Greenbrier and Nicholas Counties.

September 5, 2006: The WVPSC reopens the case to consider petitions by interveners to reconsider the case.

September 27, 2006. Mist-net report completed for bat surveys done during spring 2006.

January 11, 2007: The WVPSC denies the petitions by intervenors to reconsider the case.

June 5, 2007: BHE letter to the Service requesting written confirmation that BRE is in full compliance with rules or laws under jurisdiction of the Service (per WVPSC citing certificate issue #11). Also indicating that BRE intends to form a Technical Advisory Committee. Further stating that BRE does not anticipate take of federally listed species; they will monitor and report it in the unlikely event that it occurs. BRE considers the post-construction monitoring plan and adaptive management plan to be outside the regulatory purview of the FWS. Requests FWS written concurrence.

July 31, 2007: Service letter responding to June 5, 2007 letter from BRE's consultant. Service clarifies it is BRE's decision on whether to apply for an Incidental Take Permit; reiterates concerns about lack of multi-year preconstruction surveys and impacts to migratory bats and birds; requests opportunity to review a draft Technical Advisory Committee charter before determining if the Service will serve on the Committee; expresses desire to maintain the Service's independent regulatory authority.

October 6, 2008: Plaintiffs (Mountain Communities for Responsible Energy, John Nathan Stroud, and Alicia and Jeff Eisenbeiss) send BRE, the Service, and the Department of the Interior (DOI) a 60-day notice of intent to sue alleging violations of the Endangered Species Act.

February 13, 2009: The WVPSC determines BRE has satisfied all pre-construction conditions set forth in its August 28, 2006 order granting BRE a citing certificate. The WVPSC authorizes project construction to begin.

Match 5, 2009: Plaintiffs (Mountain Communities for Responsible Energy, the Animal Welfare Institute, John Nathan Stroud, and Alicia and Jeff Eisenbeiss, and David Cowan) send BRE, the Service and DOI a supplemental 60-day notice of intent to sue alleging violations of the Endangered Species Act. Incorporates concerns about spread of white nose syndrome. Recognizes BRE actions to move forward with construction and alleges lack of section 7 consultation with the Corps of Engineers, and lack of an Incidental Take permit from the Service.

June 10, 2009. Plaintiffs (Animal Welfare Institute, Mountain Communities for responsible Energy, and David Cowan) file a lawsuit in the District Court of Maryland against BRE alleging BRE will take Indiana bats in violation of the Endangered Species Act and requesting the court enjoin BRE from violating the Act and require BRE to obtain an Incidental Take Permit from the Service.

December 2009: The U.S. District Court of Maryland rules in favor of plaintiffs that Beech Ridge Energy LLC was in violation of the Act for its potential to take Indiana bats and its failure to file an application for an ITP related to this project (case no. RWT 09cv 1519).

January 23, 2010: The Court approves a settlement agreement between Beech Ridge Energy LLC and the plaintiffs, including reducing the # of turbines, location of the phase II project, and operating restrictions while the ITP is under development.

Early February 2010: First meeting of BRE and the Service to initiate development of a Habitat Conservation Plan (HCP).

May 11, 2010: Service and BRE meet to discuss the HCP and the Environmental Impact Statement (EIS): status of Service decision on contractor selection, developing a Memorandum of Understanding for EIS preparation, initiating public scoping, etc..

May 18, 2010: Kick-off meeting on EIS preparation between the Service, BRE, and Stantec to discuss expectations for the EIS, scope, roles, responsibilities, record keeping, deliverables and project management, data needs, points of contact.

June 7, 2010: Service, BRE, and Stantec sign a Memorandum of Understanding describing roles and responsibilities for EIS preparation.

July 22, 2010: Service publishes in the Federal Register a notice of intent to prepare an EIS and a 30-day scoping period (75 FR 42767).

August 4, 2010: Service receives first draft of HCP from BRE.

August 6, 2010: Service letter to BRE responding to scope of work for additional bat mist-netting and acoustic surveys.

August 9, 2010: Service and BRE meet at the project site. Service, BRE, and Stantec also host a public scoping meeting in Rupert, WV.

August 10, 2010: BRE and Service conduct a project site visit.

August 27, 2010: Service reopens and extends the scoping period 30 days (75 FR 52778).

September 9, 2010: Service provides comments to BRE on the first draft of its HCP.

October 6-7, 2010: Service and BRE meet to discuss permit issuance criteria, the proposed curtailment strategy, the research, monitoring and adaptive management plan, and other HCP comments.

November 2, 2010: BRE provides second draft of HCP to Service.

January 21, 2011: Service provides written comments to BRE on the second draft of its HCP.

March 1, 2011: BRE provides Service 3rd draft of HCP.

March 17, 2011: Service and BRE meeting to discuss acoustic data, biological goals, curtailment plan, habitat impact assessment, funding assurances, and monitoring.

March 29, 2011: Service provides comments to BRE on specific sections of the 3rd draft of the HCP.

April 4, 2011: Service provides written comments to BRE on all sections the 3rd draft of HCP.

April 7-8, 2011: Service and BRE meet to continue discussions and resolve outstanding substantive issues on the HCP.

May-June 2011: BRE sends individual chapters of the HCP to the Service for review as each chapter is revised.

June 27, 2011: BRE submits to Service the first draft of an Avian Protection Plan.

June 30, 2011: BRE submits to the Service an application for an Incidental Take Permit.

July 26, 2011: Service sends a letter to BRE indicating the application is incomplete and identifies key outstanding issues that need to be resolved.

July 27, 2011: Conference call between the Service and BRE to go over the July 26, 2011 letter, discuss and resolve issues, and chart a path forward.

August 3, 2011: BRE submits 5th draft of HCP to Service.

August 5, 2011: Conference call between BRE and Service to discuss changes to the HCP.

September 14, 2011: Service sends BRE consolidated Service and Solicitor comments on the August 2011 draft of the HCP.

October 5, 2011: BRE sends Service 6th draft of HCP.

November 15, 2011: BRE receives court approval of a revision to the settlement agreement to include new areas proposed by BRE for the phase II turbines, further away from known bat hibernacula.

November 16, 2011: Service provides written comments to BRE on 6th draft of HCP.

November 29, 2011: BRE submits 7th draft of HCP to the Service.

December 15, 2011: Service provides BRE written comments on 7th draft of HCP.

Fall 2011: Service and BRE attend a field trip to meet see the proposed off-site conservation area and discuss the acquisition process with the landowner.

January 10, 2012: BRE resubmits to the Service an application for an Incidental Take Permit with a revised HCP (8th draft).

January 23, 2012: BRE submits to the Service a proposal for extended turbines operations at a 6.9 m/s cut-in-speed from April 1, 2012 until November 15, 2012, that it believes would avoid take.

January 24, 2012: West Virginia Field Office sends a certification memorandum to the Northeast Regional Office of the Service indicating its preliminary review of the completeness of the ITP application.

January 30, 2012: Service responds to BRE's January 23, 2012 request for technical assistance, concluding the proposed interim operations are not likely to adversely affect Indiana and Virginia big-eared bats. Service requests monitoring of all turbines every 2 days and submittal of monthly fatality reports. Service notes the changes will need to be reflected in the public review draft of the HCP, and will result in modifications to the DEIS, delaying its completion for the public comment period.

March 30, 2012: BRE submits 9th draft of HCP to the Service, incorporating information on interim operations from April 1 to November 15, 2012.

April 20, 2012: Service submits comments to BRE on 9th draft of HCP.

May 10, 2012: BRE submits final public review draft of the HCP to the Service.

Late May and early June 2012: BRE notifies known interested parties that its HCP is available for review on its Web site prior to the Service announcing the official opening of the public comment period.

August 24, 2012: Service publishes in the Federal Register a Notice of Availability and Receipt of Application for the Beech Ridge Incidental Take Permit, HCP, and draft EIS, opening a 60-day comment period (77 FR 51554).

November 8, 2012: BRE and Service meet to go over comments received and initiate discussion on responses to HCP comments.

November 28, 2013: BRE sends Service its proposed HCP changes in response to comments

December 6, 2012: BRE meets with Service to discuss responses to HCP comments on goals and objectives, changed circumstances, and maximum extent practical.

December 14, 2012: Service call with BRE to discuss preliminary Indiana bat population modeling results and the need to revise the goal for percent fatality reduction.

January 4, 2013: BRE submits its APP to Service revised in response to public comments.

January 6, 2013: BRE resubmits a revised HCP to the Service in response to public comments.

January 31, 2013: Service and BRE hold a Web-X to resolve responses to comments.

February 12, 2103: BRE submits request for technical assistance to Service to implement in 2013 the same interim operating strategy and monitoring regime conducted during 2012 until an ITP is issued.

February 15, 2013: The Service approves for 2013 the same the same interim operating strategy and monitoring regime conducted during 2012 until an ITP is issued.

February 18, 2013: BRE submits to the Service a revised HCP in response to comments.

March 20, 2013: BRE e-mail transmitting revised HCP, following a meeting with the Service on March 19, 2013 to discuss responses to comments.

March 26, 2013: Web-X to discuss revisions to HCP in responses to comments.

March 27, 2013: BRE submits it's updated HCP responses to comments matrix to the Service.

March 29, 2013: Service Web-X with BRE to discuss WNS as a changed circumstance.

April 2, 2013: BRE submits HCP to Service, revised in response to public comments.

April 3, 2013: BRE e-mail transmitting support for sunset to sunrise curtailment at Beech Ridge based on an analysis of site-specific bat activity.

April 29, 2013: BRE submits to Service revised APP (to address public comments about bird species of concern) and information on status of other state, federal, and local approvals for the phase II project.

May 20, 2013: BRE submits revised section of HCP on WNS as a changed circumstance.

May 28, 2013: Service call with BRE to discuss WNS as a changed circumstance and revising the Indiana bat take estimate using post-WNS data.

May 31, 2013: BRE submits revised permit application from Beech Ridge Energy, LLC and Beech Ridge Energy II, LLC, with a revised HCP, including agreed to reduced take estimate and revised threshold and response to WNS.

June 19, 2013: BRE receives a citing certificate from the WVPSC for construction and operation of the phase II project.

June 26, 2013: BRE e-mails to Service information needed to finish responses to comments regarding phase II turbine sizes, and the experimental study design and samples sizes in the RMAMP.

August 14, 2013: BRE submits revised APP, recognizing formation of BRE II LLC.

August 19, 2013: Service e-mails draft Responses to Comments to BRE for review.

August 21, 2013: In a Web-X, BRE provides comments on draft Responses to Comments documents.

August 23, 2013: BRE e-mail providing a status update on the option agreement to purchase the off-site mitigation area.

September 13, 2013: Service publishes Federal Register Notice (78 FR 56729) announcing availability of final HCP, FEIS, and responses to comment (initiating a 30-day review period).

October 27, 2013: BRE amends its APP with an appendix clarifying lighting commitments.

November 4, 2013: Service shares draft biological opinion with Beech Ridge Energy.

November 7, 2013: BRE submits an errata to the HCP.

November 13, 2013: BRE e-mail updating the status of other state, Federal, and local approvals for the phase II project

November 27, 2013: Service shares revised biological opinion and draft permit terms and conditions with BRE.