TAB 8

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

Petition of BNE Energy Inc. for a Declaratory Ruling for the Location, Construction and Operation of a 3.2 MW Wind Renewable Generating Project on New Haven Road in Prospect, Connecticut	**Docket/Petition No. 980** **February 15, 2011**

PREFILED TESTIMONY OF D. SCOTT REYNOLDS, PH.D.

1. Please state your name and business address for the record.

My name is Dr. D. Scott Reynolds. My business address is North East Ecological Services, 52 Grandview Road, Bow, New Hampshire.

2. Please describe your background, training and area of expertise.

I am a biologist that has been working with bats for almost twenty years, and working with the impact of wind turbines on bats for seven years. By training, I am a population biologist and physiological ecologist with a Ph.D. from Boston University. I am currently a Visiting Scholar at Boston University and a Certified Senior Ecologist with the Ecological Society of America.

In addition to teaching at St. Paul's School in Concord, New Hampshire I have an ecological consulting firm named North East Ecological Services ('NEES'). NEES conducts wildlife surveys in relation to endangered species, conservation biology, or impact assessments such as wind development. NEES is contracted by a variety of customers, including state and federal agencies, non-profit organizations, and commercial developers. NEES was the first to design and implement long-term acoustic monitoring at potential wind development sites and many of the designs and methodologies developed by NEES have been incorporated into state and federal guidance documents. As part of this process, I have also been retained as an expert witness in several states to provide testimony and opinion on the impact of wind power on bat populations.

3. Please state by whom you were retained and describe what you were retained to do in this case.

I have been asked by Save Prospect Corp to provide perspective on BNE Energy, Inc.'s Petition for siting and operation of a 3.2 MW wind facility in Prospect, Connecticut, in regard to wildlife issues in general, and bat impacts in particular. I have reviewed and commented upon the Western EcoSystems Technology, Inc. ('WEST') interim report (attached to the petition as Exhibit L) (the "Interim Report").

4. Please summarize your findings and comments with respect to the WEST Interim Report.

WEST is a highly reputable ecological consulting group, but this Interim Report does not represent the best science that is available. The acoustic monitoring outlined in this report was characterized as a 'maternity season' survey despite the fact that they did not sample almost half of the recognized summer maternity period. The acoustic monitoring locations lacked adequate spatial, temporal, and vertical variation to properly assess the bat activity across the PWRA project site, and none of the monitoring was done within the rotor swept area of the proposed turbine despite the presence of a meteorological tower at one of the sampling locations. The timing and lack of vertical sampling suggest that the monitoring survey was not adequately prepared, designed, or funded by the developer.

The data analysis approach used to categorize and interpret the bat activity at the PWRA is not ecologically or statistically sound, resulting in the paradoxical conclusion that the two most likely impacted migratory bat species (the red bat and hoary bat) represent only 4% of the total bat calls despite the fact that the sampling groups that contained them represented over 80% of the total bat activity. In total, the interim report does not provide adequate information to reach any conclusion about bat activity at the PWRA project site during the period of peak mortality risk and therefore it would be difficult to make any conclusion as to the likely impact of wind developent at the PWRA site on bats in this region. If the siting council is concerned about the impact of the construction and operation of the PWRA on regional bat populations, it must find that the Interim Report fails to properly address this concern.

5. Please provide some background with respect to the development of our knowledge concerning the impact of commercial wind turbines on bat populations.

Commercial wind development is the fastest growing source of energy in the United States (Martinot & Sawin 2009). The potential for large-scale commercial wind turbines to have a negative impact on bat populations first became apparent when post-construction bird surveys at the Mountaineer Wind facility in West Virginia found large numbers of dead bats during the fall migratory season (Kerlinger & Kerns 2004).

Since 2004, it has become apparent that wind turbines are killing large numbers of migratory bats throughout North America. In particular, serious concerns have been raised over the level of bat mortality at wind sites in the eastern United States, with mortality rates as high as 63.9 bats/turbine/year (Fiedler et al., 2007).

In response to these concerns, the United States Fish and Wildlife Service ('USFWS') released an interim guidance document in May 2003 that identified ten recommendations for pre- and post-construction monitoring for wildlife impacts (USFWS 2003). The pre-construction recommendations were focused on a variety of potential research methodologies (acoustic, infra-red camera imaging, and radar). They also outlined recommendations for post-construction mortality surveys using many of the same technologies. Although the document was both voluntary and interim in nature, it has been used by several state wildlife agencies to represent the recommended methodology for wildlife surveys during the permitting phase of a wind development project.

6. What has the data collected since 2004 shown with respect to the impact of wind turbines on bat populations?

Data collected over the last several years has shown that the migratory bats (hoary bats, red bats, silver-haired bats) are more susceptible to wind turbine mortality than are hibernating bats (the *Myotis* bats and big brown bat). Specifically the hoary bats, red bats, and silver-haired bats usually account for over 80% of all bat mortalities (Johnson 2005).

Temporal analysis of the mortality data show that most of this mortality occurs in the month of August when these bats would be in the process of migrating. Therefore, the distribution and timing of mortality seems to be biased toward non-hibernating migratory bats in the process of migrating. The reason for these species being at higher risk of collision mortality is uncertain, although it may be related to their broad geographic distribution and unique aspects of their mating behavior (Cryan 2008; Cryan & Barclay 2009).

It is likely that these large geographic ranges and the long-distance migratory behavior of these species expose them to a higher risk of turbine-related collision mortality. Although none of the migratory bats are protected by federal statute, the cumulative impact of their mortality is likely to be substantial. The only federally endangered bat in the northeastern United States (the Indiana myotis) is relatively unimpacted by wind development, even when projects have been built within ten miles of known hibernacula.

It is difficult to identify the key physiogeographic features that increase bat mortality at any proposed wind turbine project. However, the data are consistent in several regards. First, projects located in the eastern United States appear to have higher mortality rates than projects in the midwest or western regions of the country. Second, many of the high mortality sites are located along mountain ridgelines; although some lower elevation sites also have high mortality, there appears to be a correlation between topography and bat mortality. Third, within the eastern projects, bat mortality tends to be higher in the southern projects relative to the northern projects. It is likely that southern sites are causing significantly more mortality because bats are more abundant in this region. Lastly, wind development does not appear to be a major factor for threatened and endangered species in the eastern United States; to date, there has only been one documented mortality event of an Indiana myotis at a wind development site (Fowler Ridge Wind Project, Indiana: USFWS 2010).

7. Are there commonly accepted mechanisms for evaluating the potential impact of a wind development site on bat populations? If so, please describe.

The primary mechanism for evaluating the potential impact of a wind development site is a site risk assessment which includes site-specific data. This review, commonly called a 'Phase I Risk Assessment' generally characterizes what is known about the project site based on published data and a site visit.

The Risk Assessment for bats would then characterize what is known about bat populations regionally with as much detail as can be reasonably obtained through published literature and consultation with state and federal wildlife agencies. For bats, this would, at a minimum, include information about known summer and winter populations of endangered or threatened bats within some distance of the project site (usually somewhere on the order of 100 miles), information about landscape characteristics that attract bats, and if forests are present at the project site, the type, age, and snag density of the forested habitat.

Typically, Risk Assessments identify knowledge gaps that exist relative to the project site and outline potential methodologies to fill those gaps. This often involves a recommendation to collect data on bat use at the project site through one of three methodologies: radar, acoustic monitoring, and mist-net capture. Each of these techniques has advantages and limitations that are widely recognized by biologists. Although the information gained from such research is often very informative, to date these data have not been strongly predictive of post-construction mortality.

Let me address each of the three techniques and summarize why I recommend and still believe that acoustic monitoring is the single best method for pre-construction surveys:

Mist-net Capturing. Mist-net capturing is usually done during the summer months (May through August) in a manner that is consistent with the capture guidelines for the Indiana myotis (USFWS 2007). This technique, in my experience, is not very informative for wind development. First, mist nets sample only a very small portion of the habitat. Although small sampling area has been raised as a concern for acoustic monitoring surveys, it is even more relevant for mist netting. Second, the failure to capture endangered species does not preclude their presence at the project site because rare bats are often under-represented in mist net surveys; as a result, the failure to capture an endangered species is often not considered evidence that they are not present at a project site. Third, the presence of any bats in mist nets on the project site provides very little information about the risk of mortality, given that the mist nets are at least 30m below the bottom of the turbine rotors. Therefore, mist-netting can confirm the presence of endangered species on the project site and it may provide some information about microhabitat use (such as wooded trails or perennial water) by bats. However, it is unlikely to provide either a spatially and vertically representative sample of bat activity across the project site.

Acoustic Monitoring. Acoustic monitoring has a larger sampling volume than mist nets and should be done throughout the entire active season (spring through fall). A well-designed acoustic monitoring survey characterizes the project site in three dimensions by sampling in multiple habitats and at multiple altitudes over long periods of time. When interpreted accurately, such surveys are currently the best method of obtaining general information on the bat utilization of the project site, and consequently the best method of determining the significance of project development on bat activity and mortality. This view is shared by most bat biologists, including Bat Conservation International and the Bats and Wind Energy Cooperative.

Radar. Radar has been used at many wind development sites to document the pattern and intensity of migratory activity across a project site. In terms of sampling volume, radar has no equal; depending on the technology, radar can sampling multiple miles around a project site and across the entire vertical space of the rotor swept area. Unfortunately, radar is only capable of documenting moving targets and can't reliably distinguish between birds, bats, and even some insects. As a result, radar has not been shown to be a reliable measure of bat activity or bat mortality at wind development sites

8. Did you evaluate the baseline site-specific bat data that BNE's contractor, WEST, collected at the Prospect wind resource area?

Yes. Based on concerns about the quality and quantity of site-specific bat data available with BNE's Siting petition, NEES was contracted to review the WEST Interim Report.

As far as I can tell, WEST was contracted by BNE Energy, Inc. ('BNE') to design, conduct, and generate a report for a pre-construction bat acoustic survey at the PWRA. The interim report contains methods, results, and analysis of data collected from 25 June through 31 August, 2010, although according to WEST, additional data were collected through 31 October, 2010; these data have not been reviewed by NEES as they have yet to be made available at the time of this review.

The Interim Report provides a basic overview of the project site, including an aerial photographic map that identifies key habitats, potential turbine locations, and acoustic monitoring sampling points. According to the Interim Report, the site is located in Prospect, Connecticut on the Southwest Hills (elevation of 168m - 247 m asl), a glacial till deposit located north of the Coastal Plain physiographic region and just west of the lower Connecticut River Valley. The report characterizes land use in the PWRA region as a mixture of heavy development (Waterbury, CT), suburban development, small second-growth deciduous forests, and occasional agricultural plots (Tidhar et al. 2010). The map also identifies the New Naugatuck Reservoir located in a valley approximately 400 m to the west of the PWRA, several forested wetlands, and approximately 10 acres (4.0 ha) of meadow habitat.

There are no data on the potential for bat roosting habitat on the project site. What the report fails to mention, however, is that river valley systems such as the Champlain and Connecticut River have been a regional 'hotspot' for Indiana myotis and eastern small-footed myotis (Chenger 2004; Britzke et al. 2006; Waltrous et al. 2006); this is particularly true near reservoirs (Chenger 2004).

Consequently, additional effort should have been made to characterize the project site and adjacent areas for these species; such efforts have been made by WEST at other project sites in the east, including the NedPower Mount Storm site in Virginia (Johnson & Strickland 2003). This would have included, at a minimum, providing data on tree roosting habitat within the PWRA.

Data on snag density, average tree size, species composition, and other commonly measured forest descriptors would have been useful to estimate the likelihood of Indiana myotis using the PWRA project site during the summer months. It may also have been useful to know whether there were any local maternity colonies near the PWRA since their acoustic analysis suggests that big browns and little brown myotis (the primary house-roosting bats) represent 75% of the total bat activity.

Given the failure to collect these data, it is unclear how WEST reaches the conclusion that "as demonstrated, the PWRA is not in the vicinity of any known bat colonies or features likely to attract large numbers of bats" (BNE Petition, page 23).

8. Did you review the acoustic monitoring methodology, equipment and protocols employed by WEST? If so, please compare the methodology used by WEST to standard and accepted methodology, equipment and protocols.

The methodology for acoustic monitoring has become relatively standardized over the last several years as state agencies have developed guidelines and recommendations for wind developers and their consultants. Variation in the monitoring protocol usually focuses on 1) equipment, 2) analysis methodology, 3) study duration, 4) study intensity, and 5) sampling altitude.

For equipment, most states recommend, implicitly or directly, the use of acoustic detectors such as the Anabat SD1 used by WEST at the PWRA site; the Anabat system is a very popular and reliable sampling platform used by bat biologists across the world.

The total potential sampling effort by WEST at the PWRA was 68 nights (25 June -31 August, 2010: 136 detector-nights). Due to the nature of long-term monitoring, researchers seldom collect data throughout the entire sampling period. WEST achieved a total of 123 detector-nights, with the loss of 13 detector nights due to equipment failure during the last week of the sampling period. Although WEST states that this is a 94.6% survey rate, I calculate this as a 90.4% survey rate. In either event, this is fairly consistent with projects I have conducted throughout the northeast (88% - 100%).

During the acoustic survey, WEST identified a total of 1,751 bat calls at the PWRA site, for an overall activity rate of 14.2 calls/detector-night (c/dn). They also stated that the noise files (files that contain ultrasonic noise but no evidence of bat calls) in a given week ranged from 8.77

- 567.3 files (Tidhar et al. 2010). They present this as a potential concern because the noise "may have interfered with overall data collection". Although WEST does not provide an estimate of the total number of noise files, it appears to be approximately 50% of the total data (based on Figure 3).

In my experience running long-term acoustic monitoring that extends throughout the night, this is a very low number of noise files. Given that these systems were running from 17:00 - 09:00, and that they were ground-based systems placed in a meadow and at a site which by its very nature is windy, a high number of noise files should have been expected due to wind noise and insect activity.

The lack of noise files makes me concerned about the sensitivity settings of the Anabat systems and the calibration of the microphones. In projects that I have conducted in similar habitats, the percentage of usable calls (calls with clear bat activity) usually falls within the range of 0.3% - 4.5% of the total files. Given that the linear scale on the Anabat sensitivity dial (1 - 10) is an approximation of a logarithmic decay function for sampling volume, even small changes in sensitivity (from 7 to 6) can represent a large decrease in total sampling volume. The ten-fold higher collection rate (calls : noise ratio) from the PWRA site suggests that these microphones where not set at maximum sensitivity (typically about 7), and therefore the sampling distance they report (30 m: Fenton 1991) was not obtained.

9. Did you review WEST's evaluation of the collected data? Please describe.

Once collected, these data are typically analyzed using quantitative or qualitative methods. Quantitative methods rely on statistic analysis of key call parameters to categorize calls by group, genus, or species; the underlying methodology is usually a discriminant functions analysis that compares the bat calls collected at the project site with a set of known reference calls for each species that could potentially be found within the project site. Qualitative analysis relies on the experience of an analyst to manually identify individual bat calls based on a dichotomous key created using a similar reference library of calls.

Several state agencies have suggested that quantitative analysis (such as performed by Britzke et al. 1999 or Robbins and Britzke 1999) is the preferred method for analyzing bat data. However, they fail to acknowledge that quantitative methods have not been well-received within the bat research community because species call structure is so highly variable and proper reference calls are extremely difficult to obtain. As a result, many consultants rely on objective criteria to 'filter' calls into clusters and then a qualitative approach to identify calls within each cluster.

This semi-qualitative analysis represents a compromise between efficiency (automated clustering does not take long) and accuracy that is generally well-received by state and federal agencies; this appears to be the approach used by WEST. Although the details of their filter were not clearly stated in the Interim Report, they are experienced with Anabat and this is a point of clarity, not concern. However, the clusters used in this particular survey are unique in my experience.

Whereas many groups use low frequency (LF) and high frequency (HF) call groups (Arnett 2005; Arnett et al. 2006; Redell et al. 2006), I have never seen a mid-frequency (MF) group used in the eastern United States. This is primarily because this group does not really exist; it is merely a subgroup of the HF category. In my experience, the two bats in the MF group (the little brown myotis and the eastern red bat) regularly produce calls above 40 kHz. This is consistent with WEST's own statement that "that "eastern red bats typically emit calls with minimum frequencies between 30 and 43 kHz" (Tidhar et al. 2010).

As a result, it is clear that there is overlap between the HF and MF call groups that may explain the low percentage of HF bat activity. In any event, it makes interpretation of the data extremely ambiguous.

Furthermore, WEST justifies their "conservative approach" to call identification because of the "high overlap between some species" (Tidhar et al. 2010); in particular, they cite the "high intraspecific variability of *Lasiurus* calls" (which includes the eastern red bat) that make proper identification difficult, particularly using automated methods. As they state twice in the Interim Report (pg 6 and pg 10), "it is likely that more hoary and eastern red bat calls were recorded than were positively identified".

However, WEST then states that "two species with distinctive call sonograms are the hoary bat and the eastern red bat" and then generate tables and figures (Figures 6 and 7) that analyze these species separately and conclude that these bats comprised only 2.7% and 1.2% of the total bat calls in the project area.

Without continuous reinforcement of the caveat that these species have high overlap, the reader is left with the impression that these bats are uncommon at the project site (less than 4% of the total bat population), even though the call groups they belong to represent 81% of the total bat activity. In my opinion, one should not justify and use a conservative approach (such as species grouping) and then focus the majority of the analysis and interpretation using a non-conservative approach.

10. Do you have comments on the study duration reflected in WEST's report? If so, please describe.

Acoustic sampling is typically conducted for the entire active season, which extends from spring (early to mid-April) through fall (late October). Surveys that I have conducted for this entire duration (in Vermont, New York, Pennsylvania, Massachusetts, and Virginia) usually show very little bat activity during the first and last weeks of the study, suggesting they do in fact capture the vast majority of the seasonal bat activity.

The study period identified in the WEST Interim Report (25 June -31 August, 2010) is characterized as representing "the majority of the maternity season in central Connecticut" (Tidhar et al. 2010). However, this is inaccurate.

The maternity season usually begins in late May when female bats return to their maternity roost areas and form colonies. By mid- to late-June, most bats would have already given birth to their young. By the end of July, most of these colonies would begin to disband as the bats prepare for migration or hibernation. For the Indiana myotis, the USFWS characterizes the maternity season as May 15 - August 15. The WEST survey missed 41 days (44%) of this sampling period, although it extended 15 days into what would be best identified as the fall migratory period.

WEST characterizes the temporal variation in bat activity between the three frequency groups and states that both the HF and MF groups peaked simultaneously in mid-July; this would be consistent with the addition of newly volant young into the bat population. The LF group, however, peaked during the last week of the survey period (late August). Specifically, there was a 440% increase in LF bat activity in the final week of the survey; this was the single most active period of any frequency group and the most active week of the entire survey. This is despite the fact that this period coincided with a failure of one or both of their monitoring systems.

Given that the majority of bat activity documented at the PWRA occurred outside the accepted maternity season, it seems unwarranted to characterize in the manner outlined in the Interim Report. Furthermore, given the huge increase in bat activity seen during the last week of the survey, despite the failure in the equipment, it is unclear how any overall usage pattern could be obtained without more extensive monitoring into the fall season.

Although the fall monitoring report may help clarify the overall bat activity at the PWRA project site, it is still not available for review. Given the highly episodic nature of bat migratory activity, and the ultimate goal of correlating bat activity with meteorological conditions, I hope WEST will analyze these data with greater temporal resolution than they used in the Interim Report; specifically, they should show nightly bat activity, not weekly summaries.

11. Do you have comments on the study Intensity and sampling locations? If so, please explain.

The total study effort of a project is typically dictated by the size of the project, the heterogeneity of the habitat types within the project area, and the degree of anticipated habitat modification following construction of the project. Wind development sites that I have been involved in have typically used from 1-5 elevated sampling platforms and up to 45 ground-based sampling points. Elevated sampling platform are advantageous because they sample near or within the rotor swept area of the turbines; unfortunately they are difficult to relocate and therefore are often used as stationary long-term monitoring platforms.

Ground-based sampling platforms have the advantage of portability and the capability of sampling in a variety of habitats but do not sample the altitudes that are responsible for wind turbine collisions and mortality. Ideally, an acoustic monitoring survey will take advantage of both systems by deploying both elevated and ground-based monitoring; this is the approach I generally encourage developers to pursue, and the approach I have employed at wind sites in Pennsylvania, Maryland, New York, and Massachusetts.

The Massachusetts project, for example, was a two turbine project similar to the PWRA; it was located in a suburban landscape, contained second-growth forest with nearby wetlands, and even had a nearby reservoir. At that site, we used an elevated sampling platform (an existing meteorological tower) as well as two ground-based systems to monitor bat activity at the wetlands. The protocol used at the PWRA relied strictly on stationary ground-based acoustic monitoring. With this protocol, you fail to capture any of the spatial heterogeneity of the project site and the vertical variation in bat activity that would be indicative of collision risk with the wind turbines. When project sites do not have elevated platforms to sample from, it is sometimes necessary to rely on ground-based monitoring.

However, placing ground-based monitors next to a meteorological tower would appear to be unjustifiable. If there were reasons for doing this, BNE or WEST should have made them explicit in the Interim Report. Given the normal quality of their work, I am confident that this was not a decision made by WEST.

Given the reliance on ground-based sampling, it is unclear why WEST chose to sample at the designated locations; one site was in an open meadow (PA1) and one site was within a closed canopy forest (PA2); both sites were within 0.5 km of each other in the center of the project area. Given that there are five wetland areas on the project site, one within the blade zone of a proposed turbine, it is unclear why no acoustic monitoring occurred at these locations. Furthermore, it is unclear why all three monitoring systems (including the Songmeter system used in the fall) are so close to each other and none of them sample the western section (near two wetlands and the reservoir) or the northern section (near the three remaining wetlands) of the project area given that bats are known to use wetland habitat for foraging.

12. Do you have additional comments on the interpretation of the data collected and deficiencies in the WEST Interim Report? If so, please explain.

The Interim Report has many deficiencies. Although some of them (identification of detector sensitivity and microphone orientation) will presumably be addressed by the final report, there are basic fundamental design issues that can't be easily resolved.

Given that the original intent of the study was "to characterize seasonal and spatial activity by bats within the PWRA during the maternity season", the timing and lack of spatial variation in the sampling locations preclude a successful result. Missing almost half of the maternity season and failing to sample at the sites likely have high bat activity (the reservoir and the forested wetlands) prevents an accurate characterization of the site.

Failure to utilize the existing meteorological tower as an elevated platform also results in a lack of understanding of how these bats are using the airspace that puts them at greatest risk of mortality. Therefore, it is difficult to interpret the level of bat activity that WEST calculated (14.11 passes per detector-night: calls/dn) given that many of the comparison sites cited by WEST (Table 4) were post-construction surveys (after the habitat had been altered), based on fall acoustic monitoring, and used elevated sampling platforms.

NEES conducted the pre-construction (Maple Ridge, Dutch Hill) and post-construction (Ellenburg, Clinton, Bliss, Maple Ridge) acoustic monitoring at several of the locations cited by WEST in Table 4; all of these sites used elevated sampling platforms except the Noble Ellenburg site (which lacked a meteorological tower). Based on identical sampling periods and limiting the comparison to the ground-based microphones, all the projects had lower activity rates (2.3 - 11.90 calls/dn) than the PWRA except for Ellenburg (20.0 calls/dn). In addition to these sites, the Buffalo Mountain site also used both ground-based and elevated sampling (Fiedler et al. 2007).

BNE's Petition concludes that:

bat fatality patterns observed at facilities within the region in similar forest-dominated landscapes have been low to moderate based on regional study results. If latitudinal, landscape and patterns of bat activity rates relative to fatality rates for the PWRA are consistent with regional study results, predicted fatality rates for bats will be low to moderate."

BNE Petition, page 24.

It is unclear, however, what the basis is for this statement given that the highest documented bat mortality rates are found in forest-dominated landscapes in the eastern United States. Although the project site has features that distinguish it from these other sites, none of these features were identified or incorporated into the design of the acoustic monitoring survey.

Given that no data have been provided relative to the fall migratory period, when the majority of bat mortality is known to occur, and given that most of the bat activity at the PWRA project site comes from LF and MF bats (which contains all the migratory bats), and given that the activity rates documented at the PWRA project site are relatively high compared to other sites in the northeast, the Petition's conclusion is unsubstantiated. In light of the fact that the study outlined in the Interim Report does not meet the minimum pre-construction monitoring guidelines of many regulatory bodies (Table 1) in terms of design or duration, it would appear to be inadequate to characterize the potential impact of wind development on bats at the project site.

Table 1. Summary of state, federal, and international guidelines for conducting pre-construction acoustic monitoring surveys for wind development

	On-Site Habitat Evaluation	Full Season Activity	Elevated Sampling	Ground Sampling	
Maine		XX	XX	XX	Jones 2006
New York	XX	XX	XX		NYDEC 2007
New Jersey	XX	XX	XX		NJDEP 2009
Pennsylvania	XX	XX	XX		PA Game Commission
California	XX	XX	XX		Hogan 2006
USA (NRC [a])	XX	XX	XX	XX	NRC 2007
USA (BWEC [b])	XX	XX	XX		Kunz et al. 2007
Canada	XX	XX		XX	Ontario MNR 2007
Australia	XX	XX		XX	AUSWind 2006
Germany	XX	XX	XX	XX	Harbusch & Bach 2005
Europe	XX	XX	XX	XX	Rodriques et al 2008

a. recommendations of the National Research Council

b. recommendations of the Bats and Wind Energy Cooperative research group

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