Exhibit 12A
Wildlife Habitat Report

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

1.0 Introduction

Champlain Wind, LLC, has proposed construction of the Bowers Wind Project (project), a utility-scale wind energy facility to be located in Carroll Plantation, Penobscot County, and in Kossuth Township, Washington County. The project will include up to 27 turbines, associated access roads, up to four permanent 80-meter meteorological towers, a 34.5-kilovolt electrical collector system, an electrical collection substation, and an Operations and Maintenance building.

The project will be constructed on three ridges in the project area: Bowers Mountain and an unnamed ridge to the south (“South Peak”) in Carroll Plantation, and Dill Hill in Kossuth Township. Access roads will connect each turbine location and will provide construction and maintenance access from Route 6. The electrical collector line will connect each turbine location and will then travel north for approximately 5 miles towards a proposed substation located adjacent to Line 56, an existing transmission corridor owned by First Wind.

The project is anticipated to affect wildlife species in various ways. Temporary and permanent changes as a result of the proposed project have the potential to impact wildlife habitat. Impacts to habitats will consist of clearing land for turbines, associated roads and collector lines, as well as the proposed O&M building and collector substation. The majority of the project area has been actively harvested for timber products and includes several unimproved logging roads.

The potential for avian and bat mortality through direct collisions with the turbines is one of the primary wildlife impacts expected from this project. In addition, direct and indirect impacts to wildlife such as injury, mortality, or displacement are possible during clearing, construction, and operation of wind turbines, access roads, and electric lines and poles. Once constructed, the turbines and associated facilities are anticipated to pose little threat to terrestrial wildlife.

Prior to permitting activities for the project, Stantec Consulting (Stantec) conducted a variety of wildlife surveys in the project area. These surveys provided data to help assess the project’s potential to impact birds and bats, rare, threatened and endangered (RTE) plants and animals, breeding amphibians, and wetlands. The scope of the surveys was based on evolving standard pre-construction survey methods within the wind power industry (i.e., guidelines outlined by the U.S. Fish and Wildlife Service [USFWS] and Maine Department of Inland Fisheries and Wildlife [MDIFW]) and is consistent with other studies conducted recently in the State and the Northeast. The scope and methodology for these surveys was confirmed through development of a natural resources work plan developed in consultation with MDIFW and USFWS. Stantec met with MDIFW and USFWS biologists on July 30, 2009 to discuss the work scope and methods for conducting project surveys and met again on February 11, 2010 to discuss the results of fall 2009 surveys and appropriate effort for spring 2010 surveys.

Field surveys were conducted between September 2009 and August 2010. Fall 2009 migration surveys were conducted between September 8 and November 4, 2009 and included radar surveys for nocturnal migration, bat acoustic surveys, diurnal raptor migration surveys, and aerial nest surveys for bald eagle (*Haliaeetus leucocephalus*) and great blue heron (*Ardea herodias*). The spring/summer 2010 migration field surveys occurred between April 15 and August 31, 2010 and included nocturnal radar; acoustic bat; raptor; and aerial nest surveys. For a complete description of these surveys, refer to Exhibit 12B. Other site-specific surveys included wetland delineations and RTE surveys conducted in fall 2009 and spring-summer 2010, as well as vernal pool surveys in April and May 2010. For a complete description of these surveys, refer to Exhibit 11A.

In addition to field surveys, publicly-available information about the existing natural communities in the project area was reviewed. Information used to characterize the existing wildlife communities and their habitats included consultation with state agencies and review of available wildlife habitat databases and published natural resource classification systems.

Consultations were initiated with natural resource review agencies (Exhibit 12C) including MDFIW; USFWS, as well as Maine Department of Conservation Maine Natural Areas Program (MNAP; Exhibit 13); and Maine Department of Environmental Protection (MDEP).

Available databases of ecological resources and classification systems were also reviewed during this characterization and assessment including Database of Essential Habitats and Sensitive Natural Areas, as categorized by the MDIFW (http://megisims.state.me.us); LURC Land Use Maps (http://www.state.me.us/doc/lurc); and Natural Landscapes of Maine – the MNAP natural community classification system (Gawler and Cutko 2004).

The following sections describe the dominant cover types found in the project area, the wildlife species that are likely to occur within the project area, as well as the potential for adverse impacts to wildlife and measures to minimize these impacts. Similar discussion for wetland resources and unusual natural areas can be found in application Sections 11 and 13, respectively.

2.0 Ecological Setting of the Project Area

The project area is located in Carroll Plantation, Penobscot County and Kossuth Township, Washington County. The project is approximately 8 miles south of the Stetson Wind Project. The project area consists of a series of hills, which range in elevation from 750 to 1120 feet above sea level, and consist of moderately steep to gently sloping sides. There is existing access to each of the proposed turbine strings, primarily along unimproved logging roads. Most of the turbine area has been harvested over the last 10 to 20 years. The proposed “express” electrical collector line runs north from the turbine areas through primarily undeveloped forest. Topography along the route consists mostly of rolling hills. Several unimproved logging roads provide access to the collector line corridor.

The project is located in the Eastern Lowlands biophysical region.[1] This region is characterized by extensive lowlands with elevations generally below 600 feet, except for several hills within the project area. Natural communities in the general vicinity of the project area include forested uplands and wetlands, scrub-shrub wetlands, emergent wetlands, and stream systems. Most of these wetland communities are found in low-lying areas and generally at lower elevations, with forested upland communities dominating higher elevations within the project area.

3.0 Existing Vegetation Types and Wildlife Habitat

The dominant land cover types dictate the wildlife communities in the project area. Climate conditions, geology, and past land use (i.e., forest harvesting) are the most significant factors affecting the type and structure of the available habitats. Field surveys conducted in 2009 and 2010 indicate that the project area is characterized primarily by regenerating upland hardwood forests with pockets of forested, scrub-shrub, and emergent wetlands.

The project layout was designed to utilize existing roadways where possible and to avoid and minimize impacts to wetlands. As a result, the proposed turbines are primarily sited in previously disturbed upland hardwood forest areas. The proposed collector corridor has been sited to minimize impacts to wetlands and vernal pools. The following are descriptions of the natural communities that occur in the project area:

3.1. Upland Hardwood Forest

The upland forest habitat is primarily dominated by a regenerating Beech-Birch-Maple Forest, which is the dominant hardwood forest type in the State and is ranked by MNAP as S5. The entire Project area has been heavily logged in the past, with harvesting activities occurring largely between 10 and 20 years ago. Dominant canopy species include sugar maple (*Acer saccharum*), gray birch (*Betula populifolia*), yellow birch (*Betula alleghaniensis*), and green ash (*Fraxinus pennsylvanica*), with occasional white pine

[1] McMahon, Janet. 1998 (July). An Ecological Reserves System Inventory. Augusta, ME. ME State Planning Office. 122 pp.

(*Pinus strobus*) scattered throughout. Common shrub species include the aforementioned tree species, along with American beech (*Fagus grandifolia*), striped maple (*Acer pensylvanicum*), hobblebush (*Viburnum lantanoides*), and red raspberry (*Rubus idaeus*). Dominant herbaceous species include wild sarsaparilla (*Aralia nudicaulis*), evergreen wood fern (*Dryopteris intermedia*), and starflower (*Trientalis borealis*). Areas of timber harvesting disturbance are largely dominated by herbaceous and shrub species, including red raspberry, Canada goldenrod (*Solidago canadensis*), and fireweed (*Epilobium angustifolium*).

3.2. Wetlands

Wetlands in the project area were identified and delineated in the fall of 2009 and throughout 2010. The complete report is included as Exhibit 11A. The landscape along the summit and the express collector corridor contains various wetland habitats, including forested, scrub-shrub and emergent wetlands, and small brooks and streams. Wetlands that occur on the summit are located primarily in the low lying areas between the hills and along the existing access roads. With more moderate topography along the proposed collector line, wetland areas are generally larger and more complex than in the ridgeline areas. Wetlands surrounding the collector line corridor often contain multiple wetland types (forested, scrub-shrub, emergent) and often include jurisdictional streams. Impacts to these resources have been avoided, where possible, by rerouting the corridor around large wetlands, careful placement of poles, and reduced clearing around regulated resources.

4.0 Wildlife Communities

Following are brief descriptions of the predominant wildlife species known or suspected to occur in the project area. The information presented here was derived from extensive environmental field surveys conducted in the project area in 2009 and 2010.

Appendix A, Table 1 lists the wildlife species incidentally observed during extensive field surveys conducted at the project area in 2009 and 2010. This list was used to develop a matrix identifying those species documented or suspected to occur in the project area based on the habitats they would use, and the timing of that use (Appendix A Table 2). This matrix should be referred to for a more complete listing of the major taxonomic groups of wildlife anticipated to occur in the project area.

4.1. Birds

Birds are among the most abundant and diverse wildlife communities in the region, and the project area provides habitat for a variety of species that were observed and/or are likely to occur. Bird species that frequent upland hardwood forests, and are likely present in the project area, include black-capped chickadee (*Parus atricapillus*), golden-crowned kinglet (*Regulus satrapa*), white-breasted nuthatch (*Sitta carolinensis*), ruffed grouse (*Bonasa umbellus*), and numerous species of woodpeckers, thrushes, warblers, and vireos. Raptors that inhabit upland hardwoods, and could be present in the project area, include great-horned owl (*Bubo virginianus*), barred owl (*Strix varia*), northern goshawk (*Accipiter gentilis*), broad-winged hawk (*Buteo platypterus*), and red-tailed hawk (*Buteo jamaicensis*). Open areas dominated by early successional habitat provide suitable habitat for a number of ground and shrub dwelling birds; common species include northern flicker (*Colaptes auratus*), eastern wood-pewee (*Contopus virens*), American robin (*Turdus migratorius*), dark-eyed junco (*Junco hyemalis*), rose-breasted grosbeak (*Pheucticus ludovicianus*), and multiple species of sparrows and warblers. Red-tailed hawks regularly hunt from perches in this habitat. Wetland habitats may provide habitat for a subset of species that specialize in these habitats, such as alder flycatcher (*Empidonax alnorum*), gray catbird (*Dumetella carolinensis*), and northern waterthrush (*Seiurus noveboracensis*). For a list of bird species incidentally observed in the project area during environmental field surveys, refer to Appendix A Table 1.

Stantec conducted radar surveys of nocturnal migration in fall 2009 and spring 2010. Passage rates and flight heights were consistent with the results of surveys conducted at other locations in Maine. For a complete description of these surveys, refer to Exhibit 12B.

Stantec conducted raptor migration surveys in fall 2009 and spring 2010. A total of 10 species of raptor were documented in the vicinity of the project area during raptor migration surveys; some of these species could potentially breed in the project area. Species observed during the surveys include American kestrel (*Falco sparverius*), bald eagle, broad-winged hawk, Cooper's hawk (*Accipiter cooperii*), merlin (*Falco columbarius*), northern harrier (*Circus cyaneus*), osprey, red-tailed hawk, sharp-shinned hawk (*Accipiter striatus*) and turkey vulture (*Cathartes aura*). The use of the project area by state-listed species of special concern (northern harrier and bald eagle) is anticipated to be largely during migration. For a complete description of these surveys, refer to Exhibit 12B.

Stantec also conducted aerial surveys for bald eagle nests. No bald eagle nests were located within four miles of the proposed turbine locations. In addition, no osprey nest sites or heron rookery sites were identified in the search area. For a complete description of these nest surveys, refer to Exhibit 12B.

4.2. Mammals

Large mammals observed in the Project area during on-site 2009 and 2010 environmental surveys include white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), bear (*Ursus americanus*), and coyote (*Canis latrans*). Common medium-sized mammals expected to occur in the area include porcupine (*Erethizon dorsatum*), snowshoe hare (*Lepus americanus*), beaver (*Castor canadensis*) and striped skunk (*Mephitis mephitis*). The small mammal community likely includes masked shrew (*Sorex cinereus*), pygmy shrew (*Sorex hoyi*), northern short-tailed shrew (*Blarina brevicauda*), eastern chipmunk (*Tamias striatus*), red squirrel (*Tamiasciurus hudsonicus*), deer mouse (*Peromyscus maniculatus*), and southern red-backed vole (*Clethrionomys gapperi*).

Eight species of bat also could occur in the area based upon their normal geographical range. These include the little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*), eastern small-footed bat (*Myotis lebeiii*), silver-haired bat (*Lasionycteris noctivagans*), big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and tri-colored bat (*Perimyotis subflavus*).[2] Stantec conducted acoustic surveys in fall 2009 and spring-summer 2010 to characterize bat activity in the project area. Bat detectors recorded calls of migrating or foraging bats in the vicinity of the project area. Of the calls that were identified to species guild, bats of the Genus *Myotis* were the most abundant bats documented during both the fall 2009 acoustic survey and the spring-summer 2010 acoustic surveys. Other bat guilds that were documented include big brown /silver haired bat, hoary bat, and eastern red bat/tri-colored bat guilds. For a complete description of these surveys, refer to Exhibit 12B.

4.3. Amphibians and Reptiles

Amphibians and reptiles observed in the project area include spotted salamander (*Ambystoma maculatum*), wood frog (*Rana sylvatica*), two-lined salamander (*Eurycea wilderae*), northern redback salamander (*Plethodon cinereus*), and eastern garter snake (*Thamnophis sirtalis*). Other common species likely to occur in the project area include American toad (*Bufo americanus*), gray treefrog (*Hyla versicolor*), northern redbelly snake (*Storeria occipitomaculata*), and northern ringneck snake (*Diadophis punctatus*). For a complete description of vernal pool surveys, refer to Exhibit 11A. For a list of amphibian/reptile species incidentally observed in the project area during environmental field surveys, refer to Appendix A Table 1.

4.4. Significant Wildlife Habitat

Under Chapter 10, the Land Use Regulation Commission regulates activities that would impact Significant Wildlife Habitat. Two project roads are located near Inland Wading Bird and Waterfowl Habitat (IWWH). There are no other Significant Wildlife Habitats within the project area, such as habitats of state or

[2] Formerly known as the eastern pipistrelle (*Pipistrellus subflavus*).

federally-listed[3] threatened or endangered animal species; Deer Wintering Areas (DWAs); shorebird nesting, feeding, and staging areas; seabird nesting islands; or significant vernal pools.

5.0 Potential Project Impacts to Habitat and Wildlife

The construction and operation of wind turbines at the project will result in some direct and indirect impacts to local wildlife communities and their habitats. In general, the impacts could include habitat conversion as well as collision-related fatalities. The following discusses the potential project impacts based on the findings of on-site field surveys that could affect the natural resources and wildlife groups that are known to occur in vicinity of the project area.

5.1. Habitat Conversion

The project was designed to avoid wetlands to the greatest extent possible and, therefore, the proposed turbines and associated access roads will largely occur in previously disturbed upland hardwood forest. The overall result of project construction will be the direct loss of some forested upland areas and the conversion of some forested habitat areas to early-successional habitat.

The development of the project will require the construction of turbine structures, new roads, and an electrical collector system. Each wind turbine will be located in an opening that will be graded relatively flat and, after construction, all but 0.43 acres will be allowed to revegetate to herbaceous and shrub covers. The road system needed to construct the project requires that roads have a travel surface of 35 feet wide on the summit for the passage of the crane needed to erect the turbines. All other roads will include a travel surface of up to 20 feet.

For local wildlife, the direct loss of habitat could occur from the conversion of vegetated habitats to permanent roads and turbine clearings. Potential indirect effects could also include disturbance effects during and following construction of the project, which could result in short-term avoidance of the area by some species and targeted use of the project area by others, possible longer-term avoidance of the area by certain species, and the conversion of some forested habitats to early successional habitats. The potential impact to wildlife communities due to habitat conversion is not expected to adversely affect those populations since local wildlife populations have already adapted to the occasional rapid changes in the distribution of habitats along the ridge from harvesting activities.

5.2. Collision Risk

5.2.1. Review of Known Collision risk

Birds
Birds are known to collide with tall structures, such as buildings, communications towers and wind turbines. Collisions are more likely to occur in periods of low visibility mainly at night during inclement weather. Because wind turbines are large, have moving parts, and extend above the surrounding landscape, the potential exists for wildlife collisions to occur. However, at existing wind farms in the United States where mortality studies have been conducted, collision risk is generally considered low relative to other sources of bird mortality. Table 1 provides a summary of estimates of known sources of bird mortality.

---

[3] The project area is located within two watersheds, Baskahegan Stream (HUC-10 0102000304) and West Grand Lake (HUC-10 0105000103). Although the Baskahegan Stream watershed is part of the Gulf of Maine Distinct Population Segment (GOM DPS), it is not listed as critical habitat. West Grand Lake is outside the GOM DPS and is not listed as critical habitat.
The project area is outside the listed critical habitat for Canada lynx.
Based on the results of aerial nest surveys (Exhibit 12B), there are no bald eagle nest locations within four miles of the proposed turbines.

Table 1. Summary of Nation-Wide Bird Mortality Estimates

Structure/Cause	Total Bird Fatalities	Reference
Building and Windows	98 - 980 million	Klem 1991
Power Lines	10,000 - 174 million	Erickson *et al.* 2001
Housecats	100 million	Coleman and Temple 1993
Vehicles	60 - 80 million	Erickson *et al.* 2001
Agricultural Pesticides	67 million	Pimentel and Acquay 1992
Communication Towers	4 - 50 million	Erickson *et al.* 2001
Wind Generation Facilities	10,000 - 40,000	Erickson *et al.* 2001

The original concern that wind farm-induced fatalities could pose biologically significant impacts to bird populations arose from a few facilities located along migratory 'bottlenecks' or sites where birds were seasonally very active. A large number of hawk and eagle fatalities were observed at the Altamont Pass and Solano County Wind Resource Areas in California (Altamont Pass; Orloff and Flannery 1992, Hunt 2002). Estimates of raptor and other bird fatalities at Altamont Pass are variable. However, using more recent data, it is estimated that thousands of raptors strike turbines every year at Altamont Pass (Erickson *et al.* 2002, Sterner 2002, Smallwood and Thelander 2004, GAO 2005). In 2004 raptor mortality estimates at Altamont Pass were found to be 0.24 fatalities per turbine per year (fatalities/turbine/year) (1,296 raptor fatalities) (GAO 2005).

Further studies conducted at those California facilities that experienced high fatality rates found significant contributing factors to the high mortality observed: the number, density, and physical characteristics of turbines (over 5,000 turbines present at Altamont Pass alone); high raptor wintering density; high prey densities within the wind resource areas; and the funneling of migrants through these areas by topographical features. Additionally, the turbines are predominantly older generation turbines that are smaller, lower to the ground, with blades that spin faster as wind speed increases. The turbines at these sites are also spaced very close together in comparison to more modern facilities with larger turbines. Finally, most turbines are placed on lattice type towers, which could provide perch locations in close proximity to spinning blades.

Raptor mortality in the United States, outside of California, has been documented to be very low. For example, mortality rates found at onshore wind developments outside of Altamont Pass have documented 0 to 0.07 fatalities/turbine/year from 2000-2004 (GAO 2005). Several recent studies conducted in the U.S., outside of California, have documented relatively low raptor mortality more than 50 total raptor and owl fatalities documented by over 25 studies at over 20 different locations throughout the U.S. (Appendix B Table 1). This compares with more than 100 raptor mortalities documented per year at Altamont Pass and overall estimates of thousands killed annually at that facility. The relatively low flight heights of raptors migrating through the project area does not correlate to collision risk, particularly since raptors frequently exhibit avoidance behavior, probably due to their propensity to migrate during clear weather conditions during daylight hours. Studies have documented high raptor collision avoidance behaviors at modern wind facilities (Whitfield and Madders 2006, Chamberlain *et al.* 2006). As most raptors are diurnal, raptors may be able to visually, as well as acoustically detect turbines during periods of fair weather. Foraging raptors that may become distracted by prey, or migrant raptors flying during periods of reduced visibility, may be at increased risk of collision with wind turbines.

Songbirds (e.g., warblers, vireos, thrushes, sparrows) account for up to 80 percent of known fatalities reported at wind facilities (Johnson *et al.* 2000, Erickson *et al.* 2002). Mortality of these species has included both daytime and nocturnal fatalities (Erickson *et al.* 2001). A wide variety of songbird species have been found during mortality surveys but, to date, no large fatality events, as have been occasionally observed at tall communications towers, have been reported. Publicly available results of recent studies at 12 wind projects in the Northeastern United States estimate fatality rates between 5.67 to 6.31 birds/turbine/year to 0.44 to 2.5 birds/turbine/year (Appendix B Table 2). Using comparable methodologies, avian fatality monitoring in 2007 and 2008 at the Mars Hill Wind Project estimated 0.44 to

1.04 bird fatalities/turbine/year and 2.4 to 2.65 birds/turbine per year, respectively; fatality monitoring in 2009 and 2010 at the Stetson Wind Project estimated 4.03[4] to 2.14 bird fatalities/turbine/year, respectively.

Bats
Wind projects have been cited as a potential threat to migrating bats for a number of years, and emerging evidence suggests that migratory bats could be at a greater risk of collision than birds. This concern arose mainly from a study at the 44-turbine Mountaineer Wind Energy Facility in Tucker County, West Virginia where 475 dead bats (47.5 bats/turbine/year) were documented between April 20 and November 9, 2003 (Johnson and Strickland 2004). A 2009 post-construction study at the Blue Sky Green Field project in Wisconsin documented an unprecedented, high mortality rate for the Midwest, with total estimated mortality of 40.5 bat fatalities per turbine (Gruver 2009). At a 56-turbine facility southeast of Lubbock, Texas, observers found 47 Brazilian free-tailed bats, an abundant species, from September 2006 to September 2007 (Miller 2008). At a 68-turbine facility in northwestern Oklahoma, 95 Brazilian free-tailed bats were found (Piorkowski 2006). These and similar subsequent studies have raised concerns that bat mortality associated with wind turbine collisions could adversely impact bat populations (Williams 2003; GAO 2005; Arnett *et al*. 2008; Kunz et al. 2007a).

Mortality of eight bat species has been documented at wind energy facilities in the eastern United States (Kunz et al. 2007b), with most fatalities occurring during what is generally considered the fall migration period (August to November; Arnett et al. 2008, Cryan 2003, Cryan and Brown 2007, Johnson et al. 2005). Species documented under turbines in the East include little brown myotis, northern myotis, tri-colored bat, seminole, silver-haired, hoary, red, and big brown bats. Two post-construction surveys conducted at wind projects in Maine estimated far lower bat mortality rates than those documented at projects in the East and in other regions of the United States: post-construction surveys at Mars Hill in 2007 and 2008 estimated 0.43 to 4.4 bat fatalities/turbine/year and 0.17 to 0.68 bats/turbine/year, respectively; monitoring at the Stetson Wind Project in 2009 estimated 2.11 bat fatalities/turbine/year and monitoring at the Stetson II Wind Project in 2010 estimated 2.48 bat fatalities/turbine/year (Appendix B Table 2). While bat collision rates in Maine have been lower than those documented elsewhere in the East and in other regions of the United States, little is known about the migration patterns and numbers of migratory bats in Maine and the factors contributing to levels of risk.

Researchers currently have a limited understanding of the actual mechanism of bat collisions, although evidence from the timing of fatalities documented at existing wind facilities and other structures suggests that migrating bats are most at risk, whereas resident bats during the summer feeding and pup-rearing period are considered low risk (Johnson and Strickland 2004, Johnson *et al*. 2003, Whitaker and Hamilton 1998). Additionally, only certain species of bats appear to be at risk. Of the 45 species of bats that occur in the United States, only approximately 11 species have been found during mortality searches (Arnett *et al* 2008).

5.2.2. Summary of Collision Risk at the Bowers Wind Project

Fatality rates from other projects can be used to determine a possible level of impact at the proposed project. The rates observed at other facilities can be considered comparable to a proposed wind farm if those projects are representative of the site being assessed (i.e., in the same region with similar landscape and project design characteristics). As described above, relative mortality estimates from post-construction monitoring conducted at the Mars Hill Wind Project in Maine, Stetson Wind Project in Maine, and Lempster Wind Project in New Hampshire, were low.

For raptors, only one owl fatality was found at Mars Hill in two years of post-construction monitoring (one red-tailed hawk was found at Stetson in 2009 however this fatality was the results of electrocution of the bird which perched on a riser pole of the electrical collection system; Appendix B Table 1).

---

[4] Results of the Stetson study are likely influenced by the proportion of avian carcasses found at turbine number 1 which is lit by FAA lighting and is situated next to a lit operations and maintenance building. When excluding data from turbine 1, the average number of fatalities at lit turbines at the Stetson project was 2.4

For birds and bats, at Mars Hill, a total of 27 bats and 36 birds were found during two years of monitoring. At Stetson Wind (Stetson I), 5 bats and 30 birds were found in one year of monitoring. At Stetson Wind (Stetson II), 14 bats and 11 birds were found in one year of monitoring. At Lempster, 10 bats and 9 birds were found during one year of monitoring (Appendix B Table 2). As mortality rates are typically described as fatalities per turbine per year, the overall mortality expected at a given project is proportional to the size (i.e., number of turbines) of the proposed wind facility. Bowers would include 27 turbines, which is fairly small compared to most wind projects already operating in the eastern United States.

Different taxonomic groups of birds and bats exhibit different habitat use and flight behaviors and, consequently, the level of risk for colliding with the proposed turbines is expected to vary among groups. For example, since most songbirds migrate at night, this species group is considered more at risk of collision than raptors and other birds that typically migrate during the day.

The results of site-specific surveys are consistent with the results of surveys conducted at other proposed wind developments, as summarized below and further described in the seasonal Avian and Bat Migration Survey Reports (Exhibit 12B). In addition, during fall 2009, pre-construction surveys at Bowers were conducted during the same timeframe as post-construction surveys at the nearby Stetson project, and documented similar results (Exhibit 12B).

> The results of the radar surveys in the project area are consistent with results documented at other proposed wind projects in the region, as well as post-construction radar surveys conducted during the same timeframe during fall 2009 at the operational Stetson project. The results of this and other radar studies conducted in the eastern United States suggest that the vast majority of nocturnal migrants fly at altitudes well above the rotor swept zone of proposed turbines. Based on the flight heights documented during radar surveys in the project area, as well as emerging evidence from other studies that indicates flight height is more important in determining potential collision risk than factors such as passage rate or flight direction, there appears to be limited collision risk for nocturnal migrants.
>
> The results of the raptor surveys in the project area are within the range of results documented at other proposed wind projects in this region, as well as post-construction raptor surveys conducted during the same timeframe during fall 2009 at the operational Stetson project. Pre-construction raptor survey results do not correlate to post-construction mortality of raptors. The risk of collision of raptors at facilities aside from those facilities at migration bottlenecks or high use areas is low. Due to most raptors' day-time habits in combination with the slow moving blades of modern industrial turbines, raptors are aware of the spinning blades and rotor structures and avoid them. The turbines at the project will consist of this modern design, lacking the features believed to present a greater risk of collision. Additionally, most raptors migrate during periods of good visibility when conditions are favorable for long-distance flight. Therefore, the risk of migrant raptors colliding with the proposed turbines is anticipated to be low. Some resident raptors engage in flight behaviors that could put them at a greater risk of collision. Owls primarily forage during nocturnal and crepuscular periods. Some raptors engage in elaborate courtship aerial displays. Despite these behaviors, mortality surveys at existing wind farms, outside of the California facilities that observed high fatalities due to local circumstances, have indicated low raptor mortality. This trend of low raptor mortality is expected at the project.
>
> The acoustic bat surveys in the project area documented results similar to other pre-construction surveys. The results of these surveys, including variability in bat activity and generally low detection rates above canopy height, are consistent with other publicly available acoustic surveys conducted at proposed wind projects in the region. Although some species of bats are present in the project area, the activity levels are within the range documented at other sites with acoustic bat detectors at the forest-edge, including Mars Hill, Lempster, and Stetson.

First Wind has committed to perform at least one year of post-construction mortality surveys to identify the level of project impact on avian and bat species (Exhibit 18).

To the extent practicable, the project has been designed to reduce potential detrimental effects to local wildlife. Examples of strategies to reduce impacts include minimizing lighting on the turbines[5] and maximizing use of the existing road network to minimize new roads in the area, and avoiding wetland areas to the maximum extent possible. In addition, the electrical collector system has been designed to comply with the Avian Power Line Interaction Committee's (APLIC) Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 and APLIC's Manual for Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. These manuals were developed to mitigate and avoid avian collision and electrocution with overhead electrical lines.

6.0 Literature Cited

Arnett, E.B., W.P. Erickson, J. Kerns, and J. Horn. 2005. Relationships between bats and wind turbines in Pennsylvania and West Virginia: an assessment of fatality search protocols, patterns of fatality, and behavioral interactions with wind turbines. Bats and Wind Energy Cooperative.

Arnett, E.B., W.K. Brown, W.P. Erickson, J.K. Fiedler, B.L. Hamilton, T.H. Henry, A. Jain, G.D. Johnson, J. Kerns, R.R. Koford, C.P. Nicholson, T.J. O'Connell, M.D. Piorkowski, and R.D. Takersley Jr. 2008. Patterns of bat fatalities at wind energy facilities in North America. Journal of Wildlife Management 72:61-78.

Arnett, E.B., M. Schirmacher, M. M. P. Huso, and J. P. Hayes. 2009. Effectiveness of Changing Wind Turbine Cut-in Speed to Reduce Bat Fatalities at Wind Facilities, 2008 Annual Report. Prepared for the Bats and Wind Energy Cooperative and the Pennsylvania Game Commission.

Avian Power Line Interaction Committee (APLIC). 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute. Washington, DC.

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.

Chamberlain, D.E., M.R. Rehfisch, A.D. Fox, M. Desholm, and S.J. Anthony. 2006. The effect of avoidance rates on bird mortality predictions made by wind turbine collision risk models. Ibis: 148, pp. 198-202.

Coleman, J. and S. Temple. 1993. Rural resident' free-ranging cats: A survey. Wildlife Society Bulletin. 21:381-389.

Cooper, B.A., R.H. Day, R.J. Ritchie, and C.L. Cranor. 1991. An improved marine radar system for studies of bird migration. Journal of Field Ornithology 62:367–377.

Cowardin, L., V. Carter, F. Golet, and E. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Prepared for the U.S. Fish and Wildlife Service. December 1979.

Cryan, P.M. 2003. Seasonal distribution of migratory tree bats (Lasiurus and Lasionycteris) in North America. Journal of Mammalogy 84:579-593.

Cryan P.M. and A.C. Brown. 2007. Migration of bats past a remote island offers clues toward the problem of bat fatalities at wind turbines. Biological Conservation, Vol 139, I-II.

[5] Turbine lighting on turbines is limited to a single flashing red L-864 light placed on a subset of turbine nacelles, which are well below the height at which most migrants fly. See Exhibit 8 for the project Lighting Plan. A recent study found no relationship to avian morality and turbine lighting (Kerlinger, 2010).

DeGraaf, Richard M. and M. Yamasaki. 2001. New England Wildlife: Habitat, Natural History, and Distribution. University Press of New England. Lebannon, New Hampshire.

Erickson W. P., G. D. Johnson, M. D. Strickland, and K. Kronner. 2000. Avian and bat mortality associated with the Vansycle wind project, Umatilla County, Oregon,1999 study year. Pendleton, OR: Technical report prepared for Umatilla County Department of Resource Services and Development.

Erickson, W. 2003. Nine Canyon Wind Power Project Avian and Bat Monitoring Report September 2002 – August 2003. Prepared for Nine Canyon Technical Advisory Committee Energy Northwest, October 2003.

Erickson, W. P. 2004. Bird fatality and risk at new generation wind projects: a review of bat impacts at wind farms. Pages 29–33 in S. Savitt Schwartz, editor. Proceedings of the Wind Energy and Birds/Bats Workshop: understanding and resolving bird and bat impacts. RESOLVE, Washington, D.C., USA.

Erickson, W.P., G.D. Johnson, M.D. Strickland, K. Kronner. 2000. Final Report Avian and Bat Mortality Associated with the Vansycle Wind Project, Umatilla County, Oregon. Prepared for Umatilla County Department of Resource Services and Development, Pendleton, Oregon.

Erickson, W.P., G.D. Johnson, M.D. Strickland, D.P. Young, K.J. Sernka and R.E. Good. 2001. Avian collisions with wind turbines: a summary of existing studies and comparisons to other sources of avian collision mortality in the United States. National Wind Coordinating Committee Resource document.

Erickson, W.P., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, and K. Bay. 2002. Synthesis and comparison of baseline avian and bat use, raptor nesting and mortality information from proposed and existing wind developments. Prepared for Bonneville Power Administration.

Fiedler, J.K., T.H. Henry, R.D. Tankersley, and C.P. Nicholson 2007. Results of Bat and Bird Mortality Monitoring at the Expanded Buffalo Mountain Windfarm, 2005 June 28, 2007. Prepared for Tennessee Valley Authority.

GAO. 2005. Wind Power: Impacts on wildlife and government responsibilities for regulating development and protecting wildlife. Report to congressional requesters. September 2005.

Gawler SC and A.R. Cutco. 2004. Natural Landscapes of Maine: A classification of Vegetated Natural Communities and Ecosystems. Maine Natural Areas Program, Maine Department of Conservation. Augusta, Maine.

Gruver, J., M. Sonnenburg, K. Bay and W. Erickson. 2009. Post-construction Bat and Bird Fatality Study at the Blue Sky Green Field Wind Energy Center, Frond du Lac County, Wisconsin.

Howe, R.W., W. Evans, and A.T. Wolf. 2002. Effects of wind turbines on birds and bats in northeastern Wisconsin. Report to Wisconsin Public Service Corporation and Madison Gas and Electric Company, Madison, WI.

Hunt, G. 2002. Golden Eagle in a perilous landscape: Predicting the effects of mitigation for wind turbine blade-strike mortality. Consultant report, prepared for PEIR-Environmental Area, July 2002.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2007. Annual report for the Maple Ridge wind power project post-construction bird and bat fatality study—2006. Annual report prepared for PPM Energy and Horizon Energy. Curry and Kerlinger, Cape May Point, New Jersey, USA. http://www.wind-watch.org/documents/wp-content/uploads/maple_ridge_report_2006_final.pdf Accessed 1 December 2007.

Jain, A. P. Kerlinger, R. Curry, and L. Slobodnik. 2008. Annual report for the Maple Ridge wind power project post-construction bird and bat fatality study—2007. Annual report prepared for PPM Energy and Horizon Energy. Curry and Kerlinger, Cape May Point, New Jersey, USA.

Jain, A. P. Kerlinger, R. Curry, and L. Slobodnik. 2009a. Annual report for the Maple Ridge wind power project post-construction bird and bat fatality study—2007. Annual report prepared for PPM Energy and Horizon Energy. Curry and Kerlinger, Cape May Point, New Jersey, USA.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Histed, and J. Meacham. 2009b. Annual Report for the Noble Clinton Windpark, LLC. Postconstruction Bird and Bat Fatality Study – 2008. Prepared by Curry and Kerlinger, LLC.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, A. Fuerst, and C. Hansen. 2009c. Annual Report for the Noble Ellenburg Windpark, LLC. Postconstruction Bird and Bat Fatality Study – 2008. Prepared by Curry and Kerlinger, LLC.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Quant, D. Pursell. 2009d. Annual Report for the Noble Bliss Windpark, LLC. Postconstruction Bird and Bat Fatality Study – 2008. Prepared by Curry and Kerlinger, LLC.

Johnson, G.D., and M.D. Strickland. 2004. An assessment of potential collision mortality of migrating Indiana bats (*Myotis sodalis*) and Virginia big-eared bats (*Corynorhinus townsendii virginianus*) traversing between caves supplement to: biological assessment for the federally endangered Indiana Bat (*Myotis sodalis*) and Virginia big-eared bat (*Corynorhinus townsendii virginianus*). Western EcoSystems Technology, Inc. Cheyenne, WY.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, and D.A. Shepherd. 2000. Avian Monitoring studies at the Buffalo Ridge, Minnesota Wind Resource Area: Results of a 4-Year Study. Final Report. Western EcoSystems Technology, Inc. Cheyenne, WY.

Johnson, G., W. Erickson, M. Strickland, M. Shepherd, S. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind-power development on Buffalo Ridge, Minnesota. Wildlife Society Bulletin 20: 879-887.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, and D.A. Shepherd. 2003. Mortality of bats at a large-scale wind power development at Buffalo Ridge, Minnesota. American Midland Naturalist 150:332-342.

Johnson, G. D., M. K. Perlik, W. E. Erickson, and M. D. Strickland. 2005. Bat activity, composition, and collision mortality at a large wind plant in Minnesota. Wildlife Society Bulletin 32:1278–1288.

Kerlinger, P. 2002. An Assessment of the Impacts of Green Mountain Power Corporation's Wind Power Facility on Breeding and Migrating Birds in Searsburg, Vermont. Prepared for the Vermont Department of Public Service Montpelier, Vermont. Subcontractor report for the National Renewable Energy Laboratory NREL/SR-500-28591.

Kerlinger, P. 2006. Supplement to the Phase I Avian Risk Assessment and Breeding Bird Study for the Deerfield Wind Project, Bennington County, Vermont. Prepared for Deerfield Wind, LLC.

Kerlinger, P, J.L. Gehring; W.P. Erickson; R. Curry; A. Jain, and J. Guarnaccia. 2010. Night Migrant Fatalities and Obstruction Lighting of Wind Turbines in North America. The Wilson Journal of Ornithology 122:744-754.

Kerns, J., and P. Kerlinger. 2004. A study of bird and bat collision fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia, USA: annual report for 2003.

<http://www.responsiblewind.org/docs/MountaineerFinalAvianRpt3-15-04PKJK.pdf>. (Accessed 30 September 2007).

Klem, D., Jr. 1991. Glass and bird kills: an overview and suggested planning and design methods of prevening a fatal hazard. Pp. 99-103 *in* Wildlife Conservation in Metropolitan Environments. NIUW Symp. Ser. 2. L.W. Adams and D.L. Leedy (eds). Natl. Inst. for Urban Wildlife. Columbia, MD.

Koford, R., A. Jain, G. Zenner, and A. Hancock. 2004. Avian Mortality Associated with the Top of Iowa Wind Farm Progress Report Calendar Year 2003.

Koford, R., Jain, G. Zenner and A. Hancock. 2005. Avian mortality associated with the top of Iowa wind farm. Progress report calendar year 2004. Iowa Cooperative Fish and Wildlife Research Unit, Iowa State University. Ames, IA.

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. Frontiers in Ecology and the Environment 5:315-324.

McMahon, J. S. 1998. The biophysical regions of Maine: patterns in the landscape and vegetation. M.S. Thesis, Univ. of Maine, Orono. 120 pp.

Miller, A. 2008. Patterns of Avian and Bat Mortality at a Utility-Scaled Wind Farm on the Southern High Plains. Submitted to Texas Tech University in partial fulfillment of a Masters Degree.

NJ Audubon Society. 2009. Post-construction Wildlife Monitoring at the Atlantic City Utilities Authority - Jersey Atlantic Wind Power Facility. Submitted to New Jersey Board of Public Utilities.

Orloff, S. and A. Flannery. 1992. Wind turbine effects of avian activity, habitat use, and mortality in Altamont Pass and Solano County wind resource areas, 1989-1991. Final report prepared for Planning departments of Alameda, Contra Costa and Solano Counties, California, March 1992.

Osborn, R.G., K.F. Higgins, R.E. Usgaard, C.D. Dieter, and R.D. Neiger. 2000. Bird mortality associated with wind turbines at the Buffalo Ridge Wind Resource Area, Manitoba. Am. Midle. Nat. 143: 41-52.

Pimentel, D., and Acquay, H. 1992. The Environmental and Economic Costs of Pesticide Use. BioScience 42:750-760.

Piorkowski, M. D. 2006. Breeding Bird Habitat Use and Turbine Collisions of Birds and Bats Located at a Wind Farm in Oklahoma Mixed-Grass Prairie. Submitted to the Faculty of the Graduate College of Oklahoma State University in partial fulfillment of a Masters Degree.

Smallwood, K. S. and C. G. Thelander. 2004. Developing methods to reduce bird mortality in the Altamont Pass Wind Resource Area. Final Report by BioResource Consultants to the California Energy Commission, Public Interest Energy Research – Environmental Area, August 2004.

Stantec Consulting. 2008. Spring, Summer, and Fall Post-construction Bird and Bat Mortality Study at the Mars Hill Wind Farm, Maine. Unpublished report prepared for UPC Wind Management, LLC.

Stantec Consulting. 2009a. Post-construction Monitoring at the Mars Hill Wind Farm, Maine – Year 2. Unpublished report prepared for First Wind Management, LLC.

Stantec Consulting. 2009b. Stetson I Mountain Wind Project Year 1 Post-Construction Monitoring Report. Prepared for First Wind Management, LLC.

Stantec Consulting. 2009c. Cohocton and Dutch Hill Wind Farms Year 1 Post-Construction Monitoring Report, 2009. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC.

Stantec Consulting. 2009d. Post-construction monitoring at the Munnsville Wind Farm, New York, 2008. Prepared for E.ON Climate and Renewables.

Sterner, D. 2002. A roadmap for PIER research on avian collisions with wind turbines in California. Final report prepared for California Energy Commission, Energy related environmental research, December 2002.

Tidhar, David. 2009. Post-construction Wildlife Monitoring Study; Study Plan and Spring 2009 Interim Report. Lempster Wind Project, Sullivan County, New Hampshire. Prepared for Lempster Wind LLC Lempster Wind Technical Advisory Committee, Iberdrola Renewables. Prepared by Western EcoSystems Technology, Inc. Waterbury, VT.

U.S. Department of Agriculture. 1998. Soil Survey of Penobscot County, Maine and Soil Survey of Washington County, Maine, July 14, 2009 available at http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm (last accessed August 10, 2009).

Whitaker, J.O., and W.J. Hamilton. 1998. Mammals of the Eastern United States. Cornell University Press.

Whitfield, D.P. and M. Madders. 2006. A review of the impacts of wind farms on hen harriers (Circus cyaneus) and an estimation of collision avoidance rates. Natural Research, LTD, Natural Research Information Note 1 (Revised).

Williams, W. 2003. Alarming evidence of bat kills in eastern U.S. Windpower Monthly 19(10):21-23.

Young, D.P., W.P. Erickson, R.E. Good, M.D. Stickland, G.D. Johnson. 2003. Avian and bat mortality associated with the initial phase of the Foote Creek Rim Windpower Project, Carbon County, Wyoming. Prepared for Pacificorp, Inc.

Young, D.P., W.P. Erickson, K. Bay, S. Normani, W. Tidhar. 2009. Mount Storm Wind Energy Facility, Phase 1: Post-construction Avian and Bat Monitoring. Prepared for: NedPower Mount Storm, LLC.

Appendix A
Incidental Wildlife Observations and Wildlife Habitat Use Matrix

Appendix A Table 1. Wildlife Species Incidentally Observed During 2009 and 2010 Field Surveys at the Bowers Wind Project

Birds		
Common Name	**Scientific Name**	**Regulated Status**
American goldfinch	*Carduelis tristis*	
American robin	*Turdus migratorius*	
Barred owl	*Strix varia*	
Black and white warbler	*Mniotilta varia*	State Special Concern
Blackburnian warbler	*Dendroica fusca*	
Black-capped chickadee	*Poecile atricapilla*	
Black-throated blue warbler	*Dendroica fusca*	
Black-throated green warbler	*Dendroica virens*	
Blue jay	*Cyanocitta cristata*	
Chestnut-sided warbler	*Dendroica pensylvanica*	State Special Concern
Chimney swift	*Chaetura pelagica*	
Common grackle	*Quiscalus quiscala*	
Common raven	*Corvus corax*	
Common yellowthroat	*Geothlypis trichas*	
Dark-eyed junco	*Junco hyemalis*	
Double-breasted cormorant	*Phalacrocorax auritus*	
Downy woodpecker	*Picoides pubescens*	
Eastern wood-pewee	*Contopus virens*	
Hairy woodpecker	*Picoides villosus*	
Hermit thrush	*Catharus guttatus*	
Golden-crowned kinglet	*Regulus satrapa*	
Mallard	*Anas platyrhynchos*	
Magnolia warbler	*Dendroica magnolia*	
Mourning dove	*Zenaida macroura*	
Mourning warbler	*Oporornis philadelphia*	
Nashville warbler	*Vermivora ruficapilla*	
Northern flicker	*Colaptes auratus*	
Olive-sided flycatcher	*Contopus cooperi*	
Ovenbird	*Seiurus aurocapillus*	
Phoebe	*Sayornis phoebe*	
Pileated woodpecker	*Dryocopus pileatus*	
Pine warbler	*Dendroica pinus*	
Red-breasted nuthatch	*Sitta canadensis*	
Red-eyed vireo	*Vireo olivaceus*	
Rose-breasted grosbeak	*Pheucticus ludovicianus*	
Ruby-throated hummingbird	*Archilochus colubris*	
Ruffed grouse	*Bonasa umbellus*	
Scarlet tanager	*Piranga olivacea*	
Snow bunting	*Piectrophenax nivalis*	
Swallow (unknown species)	*family- Hirundinidae*	
Veery	*Catharus fuscescens*	
White-breasted nuthatch	*Sitta carolinensis*	
White-throated sparrow	*Zonotrichia albicollis*	State Special Concern
Winter wren	*Troglodytes troglodytes*	
Yellow-rumped warbler	*Dendroica coronata*	
Amphibians		
Northern redback salamander	*Plethodon cinereus*	
Northern two-lined salamander	*Eurycea bislineata*	
Mammals		
Beaver	*Castor canadensis*	
Black bear	*Ursus americanus*	
Coyote	*Canis latrans*	
Moose	*Alces alces*	
Red squirrel	*Tamiasciurus hudsonicus*	
Snowshoe hare	*Lepus americanus*	
White-tailed deer	*Odocoileus virginianus*	
Woodland jumping mouse	*Napaeozapus insignis*	
Invertebrates		
caddis fly (cigar tube)	Order: Trichoptera, Family: Phryganeidae	
caddis fly (log cabin)	Order: Trichoptera, Family: Limnephilidae	

Appendix A Table 2. Species Matrix for the Bowers Wind Project				Status		Habitats				
Common Name	**Scientific Name**	**Special Habitat Requirements**	Likely Relative Abundance in Project Are	Maine	Federal	Beech-Birch-Maple-Forest	Harvested Hardwood Forest	Forested Wetlands	Forested Streams	Vernal Pools
Amphibians										
Blue-spotted salamander	*Ambystoma laterale*	Wooded swamps, ponds or vernal pools for breeding	U	SC		Y			B	B
Spotted salamander	*Ambystoma maculatum*	Mesic woods, semi-permanent water for breeding	U			Y	Y		B	B
Northern redback salama	*Plethodon cinereus*	Wide variety of terrestrial habitats, mostly forested	A			Y			Y	
Northern two-lined salam	*Eurycea bislineata*	Wide variety of habitats, including streams, floodplains, and swamps	C			Y			Y	
Wood frog	*Rana sylvatica*	Vernal pools in woodland setting	A			Y			B	B
Birds										
American goldfinch	*Carduelis tristis*	Spruce and fir forest	A					W		
American kestrel	*Falco sparverius*	Open flat areas, cavity trees	U							
American robin	*Turdus migratorius*	Lawns, fields, agricultural areas, forest openings	A			B	B			
Bald eagle	*Haliaeetus leucocephalus*	Large bodies of fish supporting water, large supercanopy trees for nesting	U	SC			B			
Barred owl	*Strix varia*	Cool, damp lowlands, cavity trees >20" dbh	C			Y	Y	Y		
Black-and-white warbler	*Mniotilta varia*	Deciduous or mixed conifer-hardwood forests	C	SC		B	B	B		
Blackburnian warbler	*Dendroica fusca*	Coniferous forests, mixed woodlands	U					B		
Black-capped chickadee	*Poecile atricapilla*	Cavity trees >4" dbh	A			Y	Y	Y		
Black-throated blue warb	*Dendroica fusca*	Hardwoods with well-developed understory	C			B				
Black-throated green war	*Dendroica virens*	Coniferous forests, mixed woodlands	C			B		B		
Blue jay	*Cyanocitta cristata*	Variety of rural to urban habitats	A			Y	Y	Y		
Broad-winged hawk	*Buteo platypterus*	Extensive woodlands with roads or clearings	U			B	B	B		
Chestnut-sided warbler	*Dendroica pensylvanica*	Brush at wood margins, hardwood seedling stands	A	SC		B	B			
Chimney swift	*Chaetura pelagica*	Chimneys and dead hollow large trees in wetlands	C	SC				B		
Common grackle	*Quiscalus quiscala*	wetlands, open areas and scrub shrub wetlands	A			Y	Y			
Common raven	*Corvus corax*	Cliffs and outcrops in rural areas	U			Y	Y	Y		
Common yellowthroat	*Geothlypis trichas*	Shrublands, dense forest edges, regenerating fields	C			B	B		B	
Cooper's hawk	*Accipiter cooperii*	Undisturbed forests	R			B		B		
Dark-eyed junco	*Junco hyemalis*	Mature conifer forests (often eastern hemlock)	C				Y	Y		
Double-breasted cormora	*Phalacrocorax auritus*	Undisturbed forests, large body of water nearby	A						M	
Downy woodpecker	*Picoides pubescens*	Trees, limbs with decay column >6" dbh	C			Y	Y	Y		
Eastern phoebe	*Sayornis phoebe*	Exposed, streamside perches, sheltered ledges for nesting	C			B	B			
Eastern wood-pewee	*Contopus virens*	Open deciduous and mixed forests, forest edge	C	SC		B	B			
Hairy woodpecker	*Picoides villosus*	Trees, limbs with decay column >10" dbh	C			Y	Y	Y		
Hermit thrush	*Catharus guttatus*	Coniferous woodlands with dense understory	C			B				
Golden-crowned kinglet	*Regulus satrapa*	Conifer and mixed conifer-hardwood forests	U				Y	Y		
Magnolia warbler	*Dendroica magnolia*	Young fir or spruce stands	C				B			
Mallard	*Anas platyrhynchos*	Shallow water for feeding	A					B		
Mourning dove	*Zenaida macroura*	Open land with bare ground	A			Y	Y			
Mourning warbler	*Oporornis philadelphia*	Stands of dense saplings and shrubs, disturbed second	U			B	B			
Nashville warbler	*Vermivora ruficapilla*	Scattered trees interspersed with brush	C			B		B		
Northern flicker	*Colaptes auratus*	Open areas, trees with heart rot	C			B	B			
Northern harrier	*Circus cyaneus*	Open areas or wetlands with low vegetation	U	SC				B		
Olive-sided flycatcher	*Contopus cooperi*	Tall perches near exposed wetland areas	C	SC			B	B		
Osprey	*Pandion haliaetus*	Elevated nesting areas near a body of water	C				B			
Ovenbird	*Seiurus aurocapillus*	Deciduous or mixed conifer-hardwood forests	C			B	B	B		
Pileated woodpecker	*Dryocopus pileatus*	Mature trees >20" dbh with decay	C			Y	Y			
Pine warbler	*Dendroica pinus*	Pine stands	C							
Red-breasted nuthatch	*Sitta canadensis*	Cavity trees in mixed or coniferous woods	C				Y	Y		
Red-eyed vireo	*Vireo olivaceus*	Deciduous forests with continuous canopy	C			B	B			
Red-tailed hawk	*Buteo jamaicensis*	Mature forest-field ecotone	C			Y	Y	Y		
Rose-breasted grosbeak	*Pheucticus ludovicianus*	Forest-field ecotones, thickets, sapling stands	C			B	B			
Ruby-throated hummingb	*Archilochus colubris*	Tubular flowers, especially red	C			B	B		B	
Ruffed grouse	*Bonasa umbellus*	Fallen logs amidst dense saplings	C			Y	Y	Y	Y	
Scarlet tanager	*Piranga olivacea*	Mature deciduous and mixed conifer-hardwood forests	C			B	B			
Sharp-shinned hawk	*Accipiter striatus*	Extensive, undisturbed open mixed woodlands	U					Y		
Snow bunting	*Plectrophenax nivalis*	Open areas	C			W	W			
Turkey vulture	*Cathartes aura*	Forest openings, fields, large dead tree trunks	U			B	B			

Appendix B
Publicly Available Post-Construction Results

Appendix B Table 1. Available raptor mortality data reported at wind farms in the U.S. (outside of California) from 1994-2009

Location	Habitat Type (# Turbines)	Study period	Search Interval	Number of fatalities and species	Dates of carcass discovery	Reference
Buffalo Ridge, MN	agricultural grassland (73)	1994-1995	30-50 weekly	0	n/a	Osborn *et al.* 2000
Buffalo Ridge, MN	agricultural grassland (138)	1996-1999	30 per 14 days	1 red-tailed hawk	n/a	Johnson *et al*. 2002
Searsburg, VT	forested ridge (11)	1997	11 total (4 per search) 2-6 days per month	0	n/a	Kerlinger 2002
Foote Creek Rim, WY	shrub-steppe grassland (69)	1998-2002	35 searched once every 2 weeks	1 northern harrier, 3 American kestrel, 1 short-eared owl	Northern harrier (4/19/99); American kestrel (5/12/99, 10/12/99, 7/19/00); short-eared owl (09/28/00)	Young *et al.* 2003
Vansycle, Umatilla County, Oregon	agricultural grassland (38)	1999	All turbines searched each 28-day period	0	n/a	Erickson *et al.* 2000
Stateline, WA/OR	agricultural grassland (454)	2001-2003	120-150 total	9 red-tailed hawk, 3 American kestrel, 1 ferruginous hawk, 1 Sawinson's hawk, 1 short-eared owl	Total raptor fatalities 2002: 1 in June, 2 in August, 2 in September, and 1 in October; 2003: 1 in May, 1 in June, 3 in July, 2 in October	Erickson *et al.* 2004
Somerset County, PA	agricultural grassland (8)	2000	n/a	0	n/a	Kerlinger 2006
Nine Canyon, WA	shrub-steppe grassland (37)	2002-2003	1 x 2 weeks	1 American kestrel, 1 short-eared owl	American kestrel (11/18/02), short-eared owl (4/7/03)	Erickson *et al.* 2003
Klondike, OR	shrub-steppe grassland (16)	2002-2003	1 x month	0	n/a	Johnson et al. 2003
Mountaineer, WV	forested ridge (44)	2003	2 x per week	1 red-tailed hawk, 2 turkey vultures	each between 04/04/03 - 04/27/03, 06/02/03 -06/24/03, 07/28/03 - 07/29/03, and 08/18/03 - 11/22/03	Kerns and Kerlinger 2004
Mountaineer, WV	forested ridge (44)	2004	22 daily, 22 weekly	1 sharp-shinned hawk, 1 turkey vulture	both between 07/31/04 - 09/11/04	Arnett *et al* 2005
Meyersdale, PA	forested ridgeline (20)	2004	10 daily, 10 weekly	0	n/a	Arnett *et al.* 2005
Top of Iowa, Iowa	agricultural grassland (89)	2004	26 every 3 days	1 red-tailed hawk	red-tailed hawk (4/01/04 - 12/10/04)	Koford *et al*. 2005
Buffalo Mountain, TN	open/shrubland (18)	2005	18 of 18 every week, every 2 weeks, or every 2-5 days	0	n/a	Fiedler *et al*. 2007
Kewaunee County, Wisconsin	agricultural grassland (31)	1999-2001		0	n/a	Howe *et al.* 2002
Maple Ridge, NY	woodland, agricultural grassland (120)	2006	10 every 3 days, 30 7 days, 10 daily	1 American kestrel	American kestrel (7/06)	Jain *et al*. 2007
Maple Ridge, NY	woodland, agricultural grassland (195)	2007	64 weekly	1 American kestrel, 5 red-tailed hawk	red-tailed hawk (1 found 8/07, 2 found 9/07) // (1 sharp-shinned hawk and 2 red-tailed hawk dates not reported)	Jain et al. 2008
Maple Ridge, NY	woodland, grassland, agricultural (120)	2008	64 weekly	1 American kestrel, 2 sharp-shinned hawk, 1 Cooper's hawk	n/a	Jain *et al.* 2009a
Mars Hill, ME	forested ridgeline (28)	2007	2 of 28 daily, 28 of 28 weekly, seasonal dog searches	0	n/a	Stantec 2008
Mars Hill, ME	forested ridgeline (28)	2008	28 of 28 weekly, seasonal dog searches	1 barred owl	barred owl (4/11/08)	Stantec 2009
Mt. Storm, WV	forested ridgeline (82)	2008	18 weekly, 9 daily	2 turkey vulture	9/25/2008 and 10/13/2008	Young *et al*. 2009
Lempster, NH	forested ridgeline (12)	2009*	4 daily	0	n/a	Tidhar 2009
Clinton, NY	agricultural, woodland (67)	2008	8 daily, 8 every 3-days, 7 every 7-days	1 broad-winged hawk	May	Jain et al. 2009b
Ellenburg, NY	agricultural, woodland (54)	2008	6 daily, 6 every 3-days, 6 every 7-days	1 broad-winged hawk	June	Jain et al. 2009c
Bliss, NY	agricultural, woodland (67)	2008	8 daily, 8 every 3-days, 7 every 7-days	3 red-tailed hawk, 1 sharp-shinned hawk	1 fatality in June, 1 fatality in August (2 incidental raptor dates not reported)	Jain et al. 2009d
Stetson, ME	forested ridgeline (38)	2009	19 weekly	1**	red-tailed hawk (7/27/09)	Stantec 2009b
Cohocton and Dutch Hill, NY	agricultural (50)	2009	5 daily, 12 weekly	1	sharp-shinned hawk (7/8/09)	Stantec 2009c
Munnsville, NY	agricultural (23)	2008	12 weely	2	red-tailed hawk (7/16 and 8/14)	Stantec 2009d

*Results of spring interim report, study period April 20 to June 1.

**Fatality was result of electrocution at a riser pole of the electrical collection system

Appendix B Table 2. Comparison of bird and bat mortality at existing wind farms in the northeastern U.S.

Site	Habitat type (# turbines)	Dates surveyed	Search interval	# BATS found during surveys (incidental)	Estimated total BAT fatalities/turbine /year (total)	# BIRDS found during surveys (incidental)	Estimated total BIRD fatalities/turbine /year (total)	Reference
Searsburg, Vermont	forested (11)	30 June - 18 October, 1997	11 total (4 per search) 2 to 6 days per month	0	n/a	0	n/a	Kerlinger 2002
Somerset County, Pennsylvania	agricultural (8)	2000 (12 months)	n/a	0	n/a	0	n/a	Kerlinger 2006
Myersdale, Pennsylvania	forested ridgeline (20)	2 August - 13 September, 2004	10 daily, 10 weekly	262 (37)	25/t/yr (400-660)	13 (4)	n/a	Arnett 2005
Maple Ridge, New York	woodland, grassland, agricultural (120)	June 17 - November 15, 2006	10 every 3-days, 30 7-days, 10 daily	326 (58)	11.39-20.31/t/yr (1367-2437.2)	123 (15)	3.10-9.48/t/yr (372-1138 total)	Jain *et al*. 2007
Maple Ridge, New York	woodland, grassland, agricultural (195)	April 30 - November 14, 2007	64 weekly	202 (81)	15.54-18.53/t/yr (3030-3614)	64 (32)	5.67-6.31/t/yr (1106-1230)	Jain *et al.* 2008
Maple Ridge, New York	woodland, grassland, agricultural (195)	April 15 - November 9, 2008	64 weekly	140 (76)	8.18 - 8.92/t/yr (1595-1739)	74 (23)	3.42-3.76/t/yr (667-733)	Jain *et al.* 2009a
Mars Hill, Maine	forested ridgeline (28)	23 April- 3 June, 15 July-23 Sept 2007	2 of 28 daily, 28 of 28 weekly, seasonal dog searches	22 (2)	0.43/t/yr-4.4/t/yr (12.1-122.5)	19 (3)	0.44-2.5/t/yr (26.8-69.2 total)	Stantec 2008
Mars Hill, Maine	forested ridgeline (28)	19 April- 6 June, 15 July-8 Oct 2008	28 of 28 weekly, seasonal dog searches	5	0.17/t/yr-0.68/t/yr (5-19)	17(4)	2.4/t/yr-2.65/t/yr (57-74)	Stantec 2009
Munnsville, New York	agricultural and forested uplands	April 15-November 15, 2008	12 of 23 weekly, seasonal dog searches	9 (1)	0.70-2.90/t/yr	7 (3)	1.71-2.22/t/yr (39.2-51.12)	Stantec 2009b
Clinton, New York	agricultural, woodland (67)	April 26 to October 13, 2008	8 daily, 8 every 3-days, 7 every 7-days	39 (14)	3.76-5.45/t/yr (252-365)	14 (9)	1.43-2.48 small birds/t/yr (96 -166); 0.88 med-large birds/t/yr (59)	Jain et al. 2009b
Ellenburg, New York	agricultural, woodland (54)	April 28 to October 13, 2008	6 daily, 6 every 3-days, 6 every 7-days	34 (25)	3.37-6.59/t/yr (226-441)	12 (10)	0.92-1.10 small birds/t/yr (62-74); 0.77 med-large birds/t/yr (51)	Jain et al. 2009c
Bliss, New York	agricultural, woodland (67)	April 21 - Nov 14, 2008	8 daily, 8 every 3-days, 7 every 7-days	74 (15)	7.58-14.66/t/yr (508-983)	20 (7)	0.74-4.04 small birds/t/yr (50-271); 0.25-0.66 med-large birds/t/yr (17-44)	Jain et al. 2009d
Lempster, New Hampshire	forested ridgeline (12)	April 20 to June 1**, 2009	4 daily	1	not calculated for interim report	1 (2)	not calculated for interim report	Tidhar 2009
Cohocton/Dutch Hill, New York	agricultural (50)	15 April to 15 November, 2009	17 weekly	62 (7)	13.8/t/yr (691) to 40.04/t/yr (2002)	15 (3)	2.9/t/yr (147) to 4.7/t/yr (235)	**Stantec 2009**
Stetson I, Maine	forested ridgeline(38)	20 April to 21 October, 2009	19 weekly	5 (0)	2.11/t/yr (80)	30 (9)	4.03/t/yr (153)	**Stantec 2009**

*33 birds found on May 23, 2003 at turbines near a substation and at substation associated with sodium vapor lights

**Results of spring interim report, study period April 20 to June 1.