STATE OF MAINE
LAND USE REGULATION COMMISSION

IN THE MATTER OF DEVELOPMENT APPLICATION DP 4889 CHAMPLAIN WIND, LLC BOWERS WIND PROJECT	))))	Pre-Filed Direct Testimony of Adam Gravel, Dale Knapp, and Joy Prescott on behalf of Champlain Wind, LLC

On behalf of Champlain Wind, LLC ("Champlain"), Adam Gravel, Dale Knapp, and Joy Prescott are submitting this pre-filed direct testimony in support of DP 4889 for the Bowers Wind Project ("Project" or "Bowers Wind Project").

I. QUALIFICATIONS AND BACKGROUND

A. Adam Gravel

I am a certified wildlife biologist with nearly a decade of experience. Currently, I am the Director of the Ecological Services Division in the Topsham office of Stantec Consulting ("Stantec"). I am responsible for coordinating and conducting wildlife use and impact assessment surveys, with a specific focus on large-scale avian and bat studies associated with wind power projects. In 2003, I earned my Bachelor of Science in Wildlife Management from the University of New Hampshire. I was hired by Woodlot Alternatives, Inc. (now Stantec) in 2004. I have been a certified wildlife biologist since 2008, a nationally recognized certification process through The Wildlife Society for wildlife professionals.

I have conducted and coordinated environmental studies as part of state and federal permitting requirements at over 60 wind development projects from Maine to Virginia. These studies include daytime raptor migration, nocturnal radar migration, acoustic bat detector, and breeding bird surveys designed to assess potential direct impacts from proposed wind energy projects. I have also assessed the potential indirect (non-collision related) impacts of projects on wildlife, including habitat impacts and fragmentation effects, impacts to rare species, and impacts to local wildlife communities.

My experience in Maine includes managing and conducting several nocturnal radar and acoustic bat surveys, diurnal raptor migration surveys, breeding bird surveys, and winter tracking surveys for federally listed species. I routinely consult with state and federal agencies to identify and discuss potential resources of concern at proposed projects and also have developed field surveys to address agency concerns for wildlife. I have coordinated or conducted these studies at nearly every proposed or permitted wind project in the State of Maine. A copy of my resume is attached as Exhibit "A."

B. Dale Knapp

I am a licensed site evaluator, wetland scientist, and ecologist with over a decade of experience. Currently, I am the Director of the Water Resources Division at Stantec's Topsham office. My primary responsibilities include directing large-scale ecological field surveys. I first began conducting wetland surveys associated with wind farms in the Fall of 2006. Since that time, I have worked on a total of 12 grid-scale wind projects in Maine where I have been responsible for overseeing the completion of associated wetland and natural resource inventories. I hold a B.A. from the University of Maine with concentrations in soil science and geology and will complete degree studies toward an M.S. from Southern New Hampshire University this fall. I am a professional member of the Soil Science Society of Southern New England and the Maine Association of Professional Soil Scientists. I am a past President of the Maine Association of Wetland Scientists and am the current President of the Maine Association of Site Evaluators. I have extensive experience in wetlands, vernal pools, soil mapping, morphology, and subsurface wastewater design. A copy of my resume is attached as Exhibit "B."

C. Joy Prescott

I am employed by Stantec in Topsham as a Project Manager. Since 2005, my work has been primarily focused on coordinating avian and bat fieldwork efforts, providing preliminary site assessments for potential wind project locations, as well as managing state, federal and local permitting for wind power projects. As a project manager, I design and evaluate environmental and other necessary studies, determine regulatory requirements in consultation with regulatory agencies, assemble permit applications, and assist in guiding projects through the regulatory process.

I have a BA from Smith College, and earned a MLA in Sustainable Landscape Planning and Design from the Conway School. A copy of my resume is attached as Exhibit "C."

D. Company Qualifications and Background

Stantec[1] is an environmental consulting company that provides services to a variety of sectors, including the wind industry. From our Topsham, Maine office, these services include wetland and wildlife field surveys as well as associated permitting efforts.

One of Stantec's primary services is to support our clients in developing and implementing pre and post-construction surveys and assist with federal, state and local permitting. These support services include wetland delineations, wetland function-value assessments, vernal pool surveys, and rare, threatened, and endangered species surveys; resource impact analyses; and mitigation design, construction, and long-term monitoring. As an illustration of our capabilities, during the 2009 and 2010 field seasons, scientific staff completed wetland delineations and vernal pool surveys on over 30,000 acres and 425 miles of

[1] On October 1, 2007, Woodlot Alternatives was acquired by Stantec. Unless otherwise noted, references to Stantec include work conducted under either the Woodlot or Stantec company name.

linear corridors, completed several wetland mitigation plans, and developed and submitted state and federal permits for several large-scale development projects across New England.

Stantec has also conducted extensive wildlife studies for a variety of proposed projects. Between 2002 and 2008, Stantec has conducted over 180 distinct seasons of pre-construction avian and bat studies on behalf of proposed wind projects in twelve states, from Texas to Maine. In Maine, Stantec has provided screening analyses or full scale pre-construction avian and bat studies for fifteen utility-scale projects. Based on the results of on-site field surveys, Stantec has also prepared screening-level avian and bat risk assessments for a variety of wind projects and has designed and conducted agency-approved post-construction surveys. These post-construction bird and bat mortality surveys have been conducted at existing wind projects in Maine, New York, Utah and Pennsylvania. The post-construction efforts have allowed Stantec to further refine its survey methodology to provide more comprehensive data sets to the regulatory agencies and the regulated community. Post-construction mortality surveys are particularly helpful to establish relationships between pre-construction and post-construction survey results and overall impacts to bird and bat species.

II. INVOLVEMENT WITH THE BOWERS WIND PROJECT

Stantec has provided environmental impact analysis and permitting support for the Bowers Wind Project. We are responsible for the technical environmental consulting and have been involved in agency consultations, the design of field studies, implementation of field studies, and analysis and reporting associated with the Project. This testimony summarizes the information collected and evaluated to characterize existing environmental conditions of the Project area, and analyses conducted to assess Project-related impacts.

Design and implementation of field studies and environmental impact analyses have involved qualified specialists from Stantec, as well as extensive input from state and federal agencies, including the Land Use Regulation Commission ("LURC") staff, Maine Department of Inland Fisheries and Wildlife ("MDIFW"), Maine Natural Areas Program ("MNAP"), the Maine State Soil Scientist, the DEP, the United States Fish and Wildlife Service ("USFWS"), and the United States Army Corps of Engineers ("USACE"). The following is a description of each witnesses' activities related to the Bowers Wind Project.

Adam Gravel

Under my direction, the Ecological Services Division at Stantec has conducted wildlife field studies for the Project, specifically spring and fall nocturnal radar migration surveys, spring, summer, and fall acoustic bat detector surveys, spring and fall raptor migration surveys, and aerial nest surveys for bald eagle, great blue heron, and osprey. Complete presentations of the methods, analysis, and results of each survey are contained in Exhibits 12A and 12B of the permit application (the "Application").

Dale Knapp

Under my direction, the Water Resources Division at Stantec has performed wetland delineations, vernal pool surveys, threatened and endangered species surveys, ecological community characterizations, soils surveys, and wetland mitigation and compensation for the Project. Complete presentations of the methods, analysis, and results of each survey are contained in Exhibits 11A, 11B, and 13 of the Application.

Joy Prescott

I assisted in the development of the project design and was responsible for development and implementation of the studies, information, and facilitation of the regulatory discussions related to the Application.

III. ENVIRONMENTAL ASSESSMENT

The Bowers Wind Project consists of up to 27 turbines, associated access roads, up to four permanent meteorological towers, a substation and O&M building, as well as a 34.5 kilovolt electrical line that will collect power from each turbine along the summit and travel north in an "express collector" line for 5.2 miles to a proposed substation located adjacent to Line 56. A full description of the Project elements can be found in Section 1 of the Application.

The testimony below addresses two issues: (1) the consultation process that we followed in identifying environmental, habitat, and species impacts, as well as the data we collected regarding the Project area as a result of that process; and (2) our assessment of the impacts of the Project on those resources and species.

As discussed below, Champlain sought input from all appropriate consulting agencies in developing its survey protocols and has collected information regarding all potential environmental impacts within the Project area. In addition, and with regard to impacts, construction and operation of the Project will result in minimal impacts to environmental resources (Table 1 below), and the Project layout and footprint has been designed to optimize engineering and wind resource conditions while minimizing environmental impacts to the maximum possible extent.

Table 1. Summary of Environmental Impacts from Bowers Wind Project	
Environmental Resource	**Project Impact**
Vegetation and Habitat	Common forest community. No impacts to rare plants.
Wetlands	0.10 acre permanent fill and 3.79 acres of clearing
Vernal Pools	No impacts to pools or buffers.
Significant Wildlife Habitat	0.14 acre of clearing within upland IWWH
Raptors	Passage rates low; no bald eagle nests within four miles of Project area
Bats	Passage rates consistent with other Maine sites
Avian	Majority of nocturnal flights above rotor zone
Other Wildlife	No threatened or endangered species or habitats that support these species.

A. Agency Consultation and Data Collection

1. Consultation

Stantec sought information regarding potential environmental impacts in several ways. First, initial agency consultation letters were sent to MDIFW, MNAP, MDEP, and USFWS to request information on any known occurrences of rare, threatened, or endangered species or their habitats located in the Project vicinity. The response letters are included in Exhibit 11A of the Application.

In addition, through an iterative consultation process with MDIFW and USFWS representatives, Stantec developed and implemented an approved work plan for comprehensive natural resource surveys of the Project area. Wildlife studies included nocturnal radar surveys, raptor migration surveys, aerial bald eagle nest surveys, and bat acoustic surveys. Other site-specific surveys included wetland delineations, rare plant and natural community surveys, and vernal pool surveys. Studies were designed to address general concerns of state and federal agencies.

2. Data Collection

The Project is located in the Eastern Lowlands biophysical region. This region is characterized by extensive lowlands with elevations generally below 600 feet, except for several hills within the Project area, which range in elevation from 750 to 1,120 feet above sea level and consist of moderately steep to gently sloping sides. The vicinity of the Project area is largely undeveloped and the primary land use is commercial forestry as well as sparsely located seasonal residences. The entire Project area has been heavily logged in the past, with harvesting activities occurring largely between 10 and 20 years ago. There is existing access to each of the proposed turbine strings and to the proposed collector line corridor, primarily on unimproved logging roads.

The Project area is dominated by a regenerating Beech-Birch-Maple forest. 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.

B. Vegetation and Habitat

As noted in Table 1 of the Application, total Project clearing will include 295 acres of temporary clearing and 66 acres of permanent clearing. The forest type in the Project area is common in Maine and there are no impacts to rare plants.

The dominant land cover types dictate the wildlife communities in the Project area. Climate conditions, geology, and past and recent land uses (i.e., forest harvesting) are the most significant factors affecting the type and structure of the available habitats. A complete discussion of vegetation and habitat can be found in Exhibits 11A and 13 of the Application.

The Project site is heavily harvested, characterized primarily by regenerating upland hardwood forest with pockets of emergent, scrub-shrub, and forested wetlands. Upland forested areas are dominated by a regenerating Beech-Birch-Maple forest. This is the dominant hardwood forest type in the State and is ranked by the Maine Natural Areas program as S5, which means it is demonstrably secure in Maine.

Survey efforts documented four rare plants within the vicinity of the Project area. Stantec and Champlain consulted with MNAP to ensure that habitat needs were appropriately factored into the design, and through avoidance and minimization measures, there are no impacts to any of these plants. See March 21, 2011 letter from Don Cameron.

C. Wetlands and Streams

1. Methodology

Wetlands within the Project area were delineated in 2009 and 2010 and involved several weeks of field work by teams traversing the Project area. The ridgeline was evaluated by 2-to 6-person teams following mapped courses and working abreast of each other in a coordinated manner across the defined Project area. Delineations were completed using the methodology established by the Corps 1987 Manual, and 2009 Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region. Stream determinations were made using criteria set forth in the LURC Land Use Districts and Standards Chapter 10. A Global Positioning System (GPS) receiver was used to ascertain the location of the project boundary to ensure a complete delineation of the Project area. Wetlands, potential vernal pools, and streams encountered within the Project area were marked with pink, numbered flagging and located using a GPS Trimble® Pro—XR receiver. A complete discussion of the wetland and stream delineation methodology can be found in

Exhibit 11A of the Application.

The wetlands were evaluated on three separate parameters. The first parameter is the presence of hydric soil. A soil auger is used to extract a sample that is then examined for indicators of hydric conditions. The second parameter is a predominance of wetland vegetation. Making this determination requires knowledge of plants and their indicator status (i.e., wetland plants versus upland plants). The tree, pole, shrub, and herbaceous layers are observed and a determination is made as to whether or not wetland vegetation is dominant. The last parameter investigated is evidence of hydrology, or water. This can be visible water on the surface or evidence that water has been on the ground surface recently. Wetland boundaries were assessed and determined using these three parameters. Given the sensitive nature and concerns expressed in dealing with hydrologically sensitive areas (e.g., seeps and intermittent drainages), these areas were also flagged to ensure that the design and construction of the project minimized impacts to the overall hydrology of the area. Maine State Soil Scientist David Rocque also reviewed the site with Dale Knapp on November 10, 2010.

2. Field Survey Results

The Project area contains a total of 337 wetland resources, 80 of which would be considered Wetlands of Special Significance (part of the resource protection subdistrict P-WL1) for containing Significant Wildlife Habitat or due to their proximity to a stream resource. There are 123 LURC-jurisdictional stream resources, 58 of which are considered perennial. The wetlands present within the Project area have been disturbed by timber harvesting activities and are predominantly forested. Many of the wetlands observed have been either directly created or influenced by timber harvesting activities. The entire Project area has been cut over in the past, and many of the wetlands and stream channels are located in old skid ruts.

3. Project Impacts

Wetlands, streams, and hydrologically sensitive areas within the Project area were identified. Due to design efforts to avoid wetlands, the total impacts associated with construction and operation of the Project, as described in Section 11 of the Application, amount to only 0.10 acre of permanent wetland fill, 3.79 acres of vegetation clearing, and 64 square feet of stream impact for a culvert replacement. Wetland communities along the collector that are currently emergent or scrub-shrub will retain their current functions and values. Forested wetlands that are cleared will still retain certain functions and values, but will experience changes in the types of functions and values they currently provide.

D. Vernal Pools

Vernal pools were surveyed in the spring of 2010 to determine if they qualify as vernal pools and meet the MDIFW definition of a Significant Vernal Pool.[2] Natural pools were visited twice to ensure accuracy in the documentation of species presence and abundance. The results of these surveys can be found in Exhibit 11A of the Application. Stantec identified 59 vernal pools within the Project area. Only five of those pools were determined to be naturally occurring, and only one of those natural pools was determined to be a Significant Vernal Pool (SVP) under the Natural Resources Protection Act (NRPA) definition.[3]

Two naturally occurring potential vernal pools ("PVP") were identified outside of vernal

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[2] See IFW regulations Chapter 10, Section 10.02(G).

[3] The difference between a Significant Vernal Pool and a vernal pool is defined by Chapter 10, Section 10.02(G) of MDIFW) regulations and is based on species abundance criteria. The abundance requirements are determined by entering the pool and counting the egg masses laid by the indicator species present. Some pools may contain one or all of the indicator species. Some contained water, but had no evidence of breeding amphibians. Finally, other areas identified as vernal pools contained egg masses but did not meet the abundance requirements to be considered Significant Vernal Pools.

pool season and were, therefore, initially treated as potential SVPs in the project design.[4] Both of these PVPs were visited during the 2011 vernal pool season and determined to be non-significant. Even though these two pools are not significant, there are still no impacts within 250' of these pools. A table detailing observed amphibian breeding activity in each vernal pool is presented in Table D-1 of Exhibit 11A of the LURC application, and an updated version is attached as Exhibit "D" to include results of 2011 surveys and recent communications with MDIFW.

In summary, there is only one Significant Vernal Pools within the project area. Through avoidance and minimization measures, there are no impacts to this Significant Vernal Pool or its associated 250-foot habitat area.

E. Wildlife

Stantec initiated consultation with MDIFW and USFWS on the Bowers Wind Project in spring 2009 with the presentation of a draft work plan for comprehensive natural resource surveys. A summary of the consultation that occurred with regard to species issues is included in Exhibit 12B of the Application. Potential impacts to wildlife and related habitat are addressed in Exhibit 12A of the Application.

Portions of the mountaintop electrical collector system are located near an Inland Wading Bird and Waterfowl Habitat and there will be 0.14 acres of upland clearing within this IWWH. This clearing is not expected to adversely affect the values of this IWWH. There are no other Significant Wildlife Habitats within the project area, such as habitats of state or federally-listed threatened or endangered animal species; Deer Wintering Areas (DWAs); shorebird nesting,

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[4] A PVP is treated by MDIFW as a Significant Vernal Pool with a 250 foot habitat buffer for regulatory purposes, unless verified as not significant during vernal pool season.

feeding, and staging areas; or seabird nesting islands.

No federally or state listed threatened, or endangered species were documented or observed within the Project area. Two state species of special concern were observed during raptor surveys, including northern harrier and bald eagle. The results of the raptor surveys (including for bald and golden eagles) are discussed below. Three state species of special concern were observed incidentally during other field surveys in the vicinity of the Project area, including black and white warbler, chestnut-sided warbler, rusty blackbird, and white-throated sparrow. In addition, although positive identification of bats using acoustic bat detectors is difficult, calls were documented in the acoustic dataset from hoary bat, silver-haired bat, tri-colored bat, as well as calls from species within the genus *Myotis*, all of which are listed as special concern. The results of the bat surveys are discussed below.

The Project area is located outside the federally-listed Critical Habitat for Atlantic salmon and for Canada lynx. For salmon, 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. For lynx, the Project area is over 29 miles at the nearest location from the boundary of the listed Critical Habitat and is separated from that habitat by two major highways and the Penobscot River.

1. Work Plan Development

Stantec conducted a robust avian and bat sampling effort at the Bowers Wind Project in 2009 and 2010. Avian and bat study designs were developed to be consistent with other pre-construction surveys conducted at other proposed and operational wind energy projects in the

State and in consultation with MDIFW and USFWS. Draft work plans were submitted to MDIFW and USFWS for comment and revised according to their recommendations.

2. Raptors and Eagles

Raptor migration surveys were conducted in fall 2009 and spring 2010 for a total of 27 days. The purpose of the raptor surveys was to document the species that occur in the vicinity of the project and the specific flights heights, flight path locations, and other flight behaviors of raptors within or in the vicinity of the project during the migratory period. A total of ten species of raptors were documented in the vicinity of the Project area in 2009 and 2010. No federally or state listed species were observed during either fall or spring surveys. Two state species of special concern were observed during both fall and spring surveys: bald eagle and northern harrier. For full results of raptor migration surveys conducted at Bowers, see Exhibit 12B of the Application.

No active bald eagle nests were identified within four miles of the Project area during spring 2010 aerial nest surveys. The nearest mapped bald eagle nests (MDIFW Nest #189 and #258) are located on Scraggly Lake and Junior Lake, both approximately 4.7 miles from the nearest turbine. No osprey nests were identified within four miles of the Project area. Attempts were made to locate a reported great blue heron rookery located near Baskahegan Stream, approximately 4.5 miles from the nearest turbine; however, no rookery was observed.

The overall mean passage rate during the spring (1.56 birds/hour) and fall (0.90 birds/hour) is consistent with the range of pre-construction 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 (Table 2).

Table 2. Comparison of fall raptor survey results between Bowers and Stetson.

Result	Bowers Pre-construction (Fall 2009)	Stetson Post-construction (Fall 2009)	Stetson Pre-construction (Fall 2006)
Total number of days surveyed:	15	8	7
Total number of hours surveyed:	105	50	42
Total number of raptors observed:	95	45	86
Overall survey passage rate (birds/hour)	0.90	0.9	2.05
Total number of raptor species observed*	9	8	11
Total number of raptors observed in the Project area (percent of total observations)	89 (94%)	69 (87%)	n/a
Number of raptors observed below maximum turbine height (percent of total observations):	66 (69%)	40 (89%)	54 (63%)

* not including raptors unidentified to species (n=1 at Bowers, n=2 at Stetson)

Perhaps most importantly, post-construction raptor migration surveys during the first year of operation at the Stetson Wind Project documented a combined spring and fall passage rate of 1.7 birds/hour (higher than the combined spring/fall rate of 1.16 for Bowers), without a single turbine related raptor fatality during post-construction mortality surveys, and no raptor fatalities were documented during the second year of mortality surveys at Stetson.[5] Similarly, only one owl fatality was found during two years of mortality surveys at Mars Hill, and no other raptor fatalities were documented.

In summary, based on pre-construction survey results at Bowers, a comparison of those results to pre-and post-construction results at proposed, permitted, and operational projects in Maine, and overall low raptor mortality at operational wind energy projects in the U.S., we do

[5] One red tailed hawk was found by operations personnel that had been electrocuted by a riser pole at the electrical collection system.

not expect any undue impacts to raptors as a result of the construction and operation of the Bowers Wind Project.

3. Bats

Eight species of bat could occur in the area based upon their normal geographical range. These include the little brown myotis, northern long-eared myotis, eastern small-footed bat, eastern red bat, hoary bat, tri-colored bat, silver-haired bat, and big brown bat. All of these, except for the big brown bat, are state species of special concern. Acoustic surveys were conducted at Bowers in fall 2009 as well as spring and summer 2010 in order to assess bat activity in the Project area. It's important to note that results of acoustic surveys cannot be used to determine the number of bats inhabiting an area because acoustic detectors do not allow for differentiation between individuals. Instead, acoustic surveys can provide insight into seasonal patterns in activity levels and examine how weather conditions influence bat activity.

The objectives of the acoustic surveys were (1) to document bat activity patterns in airspace near the rotor zone of the proposed turbines, at an intermediate height, and near the ground; and (2) to document bat activity patterns in relation to weather factors, including wind speed and temperature. Six Anabat® acoustic bat detectors were deployed in the Project area; two detectors were deployed in trees and then on a met tower once it was erected in spring 2010, and four were deployed in trees throughout the Project area. The purpose of detectors deployed in met towers is to collect information in or near the rotor zone. The purpose of detectors deployed in trees is to collect additional information about species composition and activity patterns because more bat activity from a greater number of species or species groups is generally documented at lower heights than at detectors in met towers. Therefore, detectors deployed in trees provide a complete picture of the species composition in the area, which may or may not be impacted by turbines. Data were summarized by guild and species and tallied per detector on an hourly and nightly basis. The complete results of acoustic surveys conducted at the Project site are included in Exhibit 12B.

During 286 detector nights from April to September, the met tower detection rates ranged from 1.1 to 2.0 call sequences per detector night. The majority of calls recorded at the met tower detectors were silver-haired and low-frequency unknown species. Tree detectors in both fall 2009 and spring-summer 2010 documented the majority of calls as either high-frequency unknown or as from bats of the Genus Myotis, which is expected due to the canopy and sub-canopy heights of detectors. In comparison, only 7 calls of myotis species were recorded in the met tower detectors. Myotis species are generally found foraging close to ground level in forested habitats and clearings in forested habitat. Other bat guilds that were documented include hoary bat, and eastern red bat/tri-colored bat guilds, which together represented about two percent of all call sequences. As is typically seen at similar types of acoustic surveys, the met tower detectors recorded a higher percentage of tree-roosting species, while detectors deployed in trees recorded more myotis and high-frequency unknown species.[6]

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, as well as post-construction acoustic surveys

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6 Additionally, there are typically higher number of detections at tree height (below the canopy) because bats foraging at tree height likely make multiple passes by one detector over the course of one night. Although some foraging likely occurs within the range of met tower height, which is near the lower end of the proposed rotor zone, food sources are much less concentrated at higher elevations, making it less likely that a single bat would fly multiple passes by one detector while foraging.

conducted during the same timeframe during fall 2009 at the operational Stetson I project (Table 3). In addition, the results from the met tower detectors in Spring 2010 were generally consistent with the results from the met tower detectors deployed during pre-construction surveys in Spring 2007 at Stetson I.

Table 3. Comparison of fall acoustic survey results between Bowers and Stetson.

Survey Type (year)	**Detector Location / Height (m)**	**Range of Detection Rates (calls/detector night)**	**Guild Ratios**				
			Big brown guild	**Red bat/ Tri-colored bat**	***Myotis* spp.**	**Unknown**	**Total**
Bowers Pre-construction (Fall 2009)	Tree (3-5)	0.3 to 36.3	0.80%	0%	35.4%	63.6%	2374
Stetson I Post-construction (Fall 2009)	Nacelle (80)	0.1 to 0.3	52%	0%	0%	48%	31
	Tree (3-5)	3.8 to 91.2	10%	<1%	56.2%	33.4%	9956
Stetson I Pre-construction (Fall 2006)	Met High (30)	0.1 to 2.2	9%	2%	9%	25%	178
	Met Low (15)	1.0 to 6.1	26%	1%	25%	48%	759

Bat activity levels are within the range documented at other sites with acoustic bat detectors at the forest-edge, including Mars Hill, Lempster, and Stetson. Like other studies in Maine and throughout the northeast, bat activity peaked in August with greater activity recorded from bat detectors deployed in trees than those located at greater heights in met towers.

The results of post-construction acoustic bat surveys conducted concurrently with mortality searches during the first year of operation at the Stetson Wind Project demonstrated similar bat activity rates as to what was observed at Bowers and only five bats were found during mortality searches. For additional information regarding results of other publicly available post-construction acoustic bat surveys see the table attached as Exhibit “E.”

In summary, based on pre-construction survey results at Bowers (including species composition and timing of activity), a comparison of those results to pre-and post-construction results at proposed, permitted, and operational projects in Maine, and overall low bat mortality at operational wind energy projects in Maine we do not expect any undue impacts to bats as a result of the construction and operation of the Bowers Wind Project.

4. Nocturnal Migrants

The majority of North American passerines (songbirds) migrate at night and documenting the patterns of nocturnal migrants requires the use of radar or other non-visual technologies to characterize the passages rates, flight direction and flight altitude. Stantec conducted nocturnal radar studies to characterize nocturnal migration activity in the Project area in fall 2009 and spring 2010, so that results could be compared with other similar surveys in Maine and the Northeast. Marine surveillance radar was used during field data collection. Radar surveys were conducted on 22 nights in fall 2009 and on 20 nights in spring 2010. The radar was located on the summit of Bowers and provided adequate visibility of the surrounding airspace to characterize migration. The complete results of radar surveys conducted at Bowers are included in Exhibit 12B of the Application.

The overall mean passage rate for the entire fall survey period was 344 targets per kilometer per hour (t/km/hr) and was 289 t/km/hr for the entire spring survey period. Nightly passage rates varied from 95 ± 14 to 844 ± 141 t/km/hr in fall 2009 and between 20 ± 5 t/km/hr to 589 ± 97 t/km/hr in spring 2010. Mean flight direction through the Project area for the fall season was 231 ± 65° and 56 ± 56° for the spring season. The seasonal mean flight height of targets in fall 2009 was 243 ± 10 meters above the radar site and 315 ± 7 meters above the radar site in spring 2010. Nightly flight heights ranged from 110 ± 12 meters to 418 ± 82 meters in fall 2009 and from 210 ± 21 meters to 453 ± 24 meters in spring 2010. The percent of targets observed flying below maximum turbine height was 14 percent for the entire fall 2009 season and was 26 percent for the entire spring 2010 season.

The results of the radar surveys in the project area are consistent with the 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 (Table 4).

Table 4. Comparison of fall radar survey results between Bowers and Stetson

Survey Type (year)	Passage Rate (t/km/hr)		Flight height (m)		Percent below Turbine Height[1]		Direction (º)
	Range	**Mean**	**Range**	**Mean**	**Range**	**Mean**	**Mean**
Stetson Pre-construction (2006)	131-1192	476	219-506	378	6-34	13	227
Stetson Post-construction (2009)	106-1745	457	328-514	420	0-9	2	227
Bowers Pre-Construction (2009)	95-844	344	210-458	315	9-40	17	231

[1] For Stetson, pre-construction surveys in 2006 used a proposed maximum turbine height of 125 m (410'). Post-construction surveys in 2009 used the actual maximum turbine height of 119 m (429').

Results of over 22 radar studies conducted in Maine suggest that the vast majority of nocturnal migrants fly at altitudes well above the rotor swept zone of the proposed turbines. In summary, based on pre-construction survey results at Bowers, a comparison of those results to pre-and post-construction results at proposed, permitted, and operational projects in Maine, and overall low avian mortality at operational wind energy projects in Maine, we do not expect any undue impacts to nocturnal migrants as a result of the construction and operation of the Bowers Wind Project.

5. Potential Collision Risk at Bowers

Although data gathered at Bowers during pre-construction surveys provides information about timing and patterns of activity and species composition, no consistent correlations have been documented between pre-construction survey results and quantitative predictions of post-construction mortality (Cryan and Barclay 2009, Kunz et al. 2007a, Kunz et al. 2007b). However, pre-construction survey data, when combined with information about patterns of mortality observed during post-construction fatality monitoring at operating facilities, can provide valuable information about possible level of impact at Bowers. Further, because operating projects in the same regional landscape as the Project have both pre-construction and post-construction survey results, their pre-construction survey results can be compared to results from the Project area to understand expected post-construction impacts. Projects such as Mars Hill and Stetson have conducted both pre-and post-construction surveys which provide useful information that may be used as an indicator of potential collision risk at the Bowers Wind Project.

The pre-construction results 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). Relative mortality estimates from post-construction monitoring conducted at the Mars Hill Wind Project in Maine, Stetson Wind Project in Maine, Stetson II Wind Project in Maine and the Lempster Wind Project in New Hampshire were low (Table 5), especially when compared with results from other operating wind projects in other regions. All of these projects share similar landscape and project design characteristics as the Bowers Wind Project.

Table 5. Summary of Mortality from Post-construction Monitoring at Wind Projects

Project (Year(s) of Monitoring)	Number of raptors	Number of birds (estimated fatalities/turbine/year)	Number of bats (estimated fatalities/turbine/year)
Operating Wind Projects in New England			
Mars Hill (2007-2008)	1 owl	36 (0.44-1.04 / 2.4-2.65)	27 (0.43 to 4.4 / 0.17-0.68)
Stetson I (2009)	1 red-tailed hawk perched on riser pole	30 (2.4)	5 (2.11)
Stetson II (2010)	None	11 (2.14)	14 (2.48)
Lempster (2009)	None	9 (6.75)	10 (6.21)
Lempster (2010)	None	11 (5.27)	14 (7.13)
Other Operating Wind Projects in the Northeast located in a forested landscape			
Mountaineer (2003)	1 red-tailed hawk 2 turkey vultures	69 (4.04)	475 (47.53)
Mountaineer (2004)	1 sharp-shinned hawk 1 turkey vulture	15 (n/a)	398 (38)
Maple Ridge (2008)	None	74 (3.42-3.76)	140 (8.18-8.92)
Myersdale (2004)	None	13 (n/a)	262 (25)
Casselman (2008)	None	16 (n/a)	148 (32.2)

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 farm. The Bowers Wind Project would include 27 turbines, a small project compared to most wind projects already operating in the eastern United States. Accordingly, collision risk at the Project is likely to be similar to Mars Hill and Stetson. For a complete discussion on potential collision risk, please refer to Exhibit 13A of the Application.

With regard to bats, the potential threat that wind turbines could pose to migrating bats has been evaluated. This concern has been heightened mainly due to a study of the 44-turbine Mountaineer Wind Project in West Virginia where 475 bats (47.5 fatalities/turbine/year (f/t/y) were documented. Similar results were documented at a project in Wisconsin (40.5 f/t/y), as well as in Texas (47 Brazilian free-tailed bats) and Oklahoma (95 Brazilian free-tailed bats) were found. Mortality of seven bat species has been documented in the eastern US, with most fatalities occurring from August to November. See Exhibit "E" as well as Exhibit 12A of the Application for further information.

These and subsequent studies have raised concerns that bat mortality associated with wind turbine collisions could adversely impact bat populations. As discussed below, however, given the low rates of bat mortality at existing projects in Maine, coupled with the fact that the bats of greatest concern (Myotis species—currently suffering adverse impacts from White-nose Syndrome) experience low or no mortality at wind facilities in Maine, the risk of adverse impacts to bat species of concern is fairly low.

Bats can be separated into two general groups based on their behavior during the winter, "long-distance migrants" and "resident species" (or "cave bats"). Three species found in Maine are long-distance migrants (hoary bats, eastern red bats, and silver-haired bats), which migrate away from the region for the winter months, and may make continental-scale movements. The remaining five species found in Maine can be referred to as "cave bats" or "resident species" (little brown bats, northern long-eared bats, small-footed bats, tri-colored bats, and big brown bats) migrate shorter distances in the fall to caves or mines within the region where they hibernate for the winter months.

Consistent patterns have emerged with regard to the species distribution of bat fatalities at wind facilities in North America. The three species of long-distance migratory bats comprised approximately 75% of all documented fatalities at 19 operating facilities; in comparison, fatalities of "resident species," including Myotis species (little brown, northern long-eared), and big brown bats were relatively low (0% to 13.5%) (Arnett et al. 2008).[7] Concerns about potential impacts to the Myotis species is heightened due to White-nose syndrome, an emerging disease that could affect all Maine species known to hibernate in caves. Most reports document region-wide effects of White-nose Syndrome and specific effects in Maine are presumed to be similar, although it was only recently documented in the state in May 2011. Additional impacts to these species from facility operation are not expected to be significant, as no known cave areas, suitable for hibernation, are located in the vicinity of the Project.

To reduce the risks to bats, MDIFW has requested that applicants increase the cut-in speed of turbines (the speed at which the blades start turning) to 5 meters/second instead of using the more typical cut-in speed of 3 meters/second. As described in Champlain's response to agency comments May 25, 2011, it is critical that any decisions about operational control measures be based on data from the project site or similar locations in Maine, and that operational curtailment be required only if it necessary to address mortality and only during periods of time when it is determined to reduce mortality. Maine specific data shows that:

- Detection rates at Bowers are consistent with pre-construction acoustic surveys conducted at Stetson;
- Post-construction surveys at Stetson and elsewhere in Maine have documented low rates of mortality, compared to surveys in mid-Atlantic locations cited by MDIFW;
- During four years of post-construction monitoring in Maine, peak fatalities occurred during a ten-day period in mid August, when between three and eight fatalities were documented on three separate days; and

7 Although more recent surveys documented higher fatality rates for Myotis species, these projects were situated within largely agricultural habitats (Stantec 2010, Stantec 2011, Jain et al. 2007).

- Although MDIFW expresses concern for declining populations of *Myotis* species as a result of White Nose Syndrome, only seven calls of *Myotis* species were recorded during Bowers pre-construction acoustic surveys in met towers.

Despite the current lack of a strong statistical relationship between pre-construction acoustic bat activity and post-construction mortality, comparison of pre-construction acoustic bat survey results from proposed projects and projects that have since been constructed inform the level of risk to bats. Stantec conducted pre-construction acoustic bat surveys in meteorological towers at Mars Hill and Stetson. The results of these studies are presented in Table 1 of the May 24, 2011 memorandum attached to Champlain's May 25th response to agency comments, and the results of over 25 other similar pre-construction surveys in similar landscapes are presented in Exhibit 12B of the application. Although surveys occurred in different years, with different numbers of detectors, the detection rates are consistently low. These findings suggest that anticipated bat mortality rates would also be similar among sites, and would be expected to be at the low end of the documented range compared to other operational wind projects in the Northeast.

Because the data does not indicate that this Project presents a significant risk of bat mortality, the applicant is suggesting an alternative to MDIFW's request for curtailment during the period April through October. Specifically, the applicant has committed to a study similar to that which has been proposed for the Bull Hill project. The applicant has met with MDIFW to discuss appropriate methodologies for this study, which will include curtailment at a portion of turbines during the season identified as highest risk, and MDIFW has provided input and recommendations on this protocol. As described in Exhibit "F", First Wind and MDIFW have agreed that a detailed study design for the first two years of operation will be developed in consultation with IFW, the Bat and Wind Energy Cooperative, Bat Conservation International

("BCI"), and potentially the University of Maine. BCI has confirmed their commitment to participating in the design of the study. The same collaborative protocol is being proposed for this Project.

Finally, as with other projects, the applicant has committed to perform post-construction mortality surveys. As requested by MDIFW, the applicant has agreed to conduct at least two years of surveys designed in consultation with MDIFW and USFWS to identify the level of project impact on migratory species. An adaptive management plan that involves close coordination with state and federal agencies will also be implemented if significant impacts to migratory species occur as a result of the project. A revised post-construction monitoring plan was submitted as part of Champlain's response to agency comments on May 25, 2011.

6. Other Wildlife

Large mammals observed in the Project area during on-site 2009 and 2010 environmental surveys include white-tailed deer, moose, and black bear. Eastern coyote were the only predator species observed in the Project area. Other predators expected to occur in the Project area based on their habitat requirements include red fox, bobcat, fisher, long-tailed weasel, and raccoon. Common medium-sized mammals expected to occur in the area include beaver, snowshoe hare, porcupine, and striped skunk. The small mammal community is likely made up of masked shrew, pygmy shrew, northern short-tailed shrew, eastern chipmunk, red squirrel, deer mouse, and southern red-backed vole. Listed species in the state such as Canada lynx, northern bog lemming, spring salamander, and roaring brook mayfly are not known to occur in this region of the state or the habitats within the Project area and are not expected to be impacted by the Project.

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 Project area by certain species, and the conversion of 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.

IV. CONCLUSION

In summary, Champlain has carefully considered the full range of environmental issues in determining that the Project, as proposed, is appropriately sited. Project layout and identified best management practices, which have been successfully utilized in connection with the construction of other First Wind projects, continue to focus on minimizing environmental impact to the maximum possible extent. As designed, the Project will impact a very small area relative to the overall property where it is situated and the amount of existing impact. Importantly, the Project area does not include unique habitat that requires protection from development and is not host to species that require special protection.

Date: 6/2/11

Adam Gravel

STATE OF MAINE
County of Sagadahoc

Date: 6/2/11

Personally appeared before me the above named Adam Gravel, who, being duly sworn, did testify that the foregoing testimony was true and correct to the best of his knowledge and belief.

Before me,

Notary Public
My commission expires: 10/21/2017

Date: 6/7/11

Dale Knapp

STATE OF MAINE
County of Sagadahoc

Date: 6/7/2011

Personally appeared before me the above named Dale Knapp, who, being duly sworn, did testify that the foregoing testimony was true and correct to the best of his knowledge and belief.

Before me,

Notary Public
My commission expires: 10/21/2017

Date: June 8, 2011

Joy Prescott

STATE OF MAINE
County of Sagadahoc

Date: 6/8/2011

Personally appeared before me the above named Joy Prescott, who, being duly sworn, did testify that the foregoing testimony was true and correct to the best of his knowledge and belief.

Before me,

Notary Public
My commission expires: 10/21/2017

Gravel, Knapp, and Prescott Pre-Filed Direct Testimony Exhibits

Exhibit A:	Gravel Resume
Exhibit B:	Knapp Resume
Exhibit C:	Prescott Resume
Exhibit D:	Amphibian Breeding Activity
Exhibit E	Post Construction Bat Mortality
Exhibit F	Post Construction Bat Survey Protocol

Adam J. Gravel

Project Manager, Certified Wildlife Biologist

Stantec

Mr. Gravel is a Project Manager at Stantec responsible for coordinating ecological inventories and environmental resource evaluations, including wildlife surveys, avian and bat impact evaluations, and habitat studies. Mr. Gravel has most recently been involved in organizing and conducting large-scale natural resource investigations associated with wind power and transmission projects. He has provided permitting and expert testimonial support to several New England wind projects and managed Stantec's New England based wildlife biologists. His field biology experience has allowed him to conduct avian radar surveys, breeding-bird surveys, winter track surveys, bat surveys, raptor surveys, and natural community surveys in Maine, New Hampshire, Vermont, Pennsylvania, Ohio, West Virginia, Virginia, and New York. Mr. Gravel takes an innovative, solution oriented approach to survey design and implementation which has enabled Stantec to conduct ecological surveys in some of the Northeast's most remote and challenging locations.

PROFESSIONAL EXPERIENCE

- Stantec Consulting. 2007-present. Project Manager.
- Woodlot Alternatives, Inc. 2004-2007. Project Manager.
- New Hampshire Division of Forests and Lands. 2003. Field Research Technician.
- University of New Hampshire. 2002-2003. Research Lab Technician.
- University of New Hampshire. 2002. Field Research Assistant.

EDUCATION

BS, Wildlife Management, University of New Hampshire, Durham, New Hampshire, 2003

40-hour HAZWOPER Certified, OSHA, Topsham, Maine, 2009

REGISTRATIONS

Certified Wildlife Biologist, The Wildlife Society

PROJECT EXPERIENCE

Natural Resource Services

Georgia Mountain Community Wind Project, Milton, Vermont

As Project Manager for this proposed 4.5 megawatt wind project, Mr. Gravel coordinated a nocturnal migration study using X-band radar. He also provided support for the Section 248 process, including participation in meetings with Vermont Agency of Natural Resources biologists and development of a work scope for nocturnal radar surveys. Mr. Gravel prepared and submitted pre-filed testimony and responses to discovery requests, and he provided expert witness testimony during subsequent evidentiary hearings before the Vermont Public Service Board.

Adam J. Gravel

Project Manager, Certified Wildlife Biologist

Groton Wind Project, Grafton County, New Hampshire

Mr. Gravel is Project Manager for the proposed Groton Wind Project, which will consist of up to 25 2.0 MW turbines on the forested ridges of Tenney and Fletcher Mountains in the Sunapee Uplands of New Hampshire. He has coordinated numerous studies to address wildlife-related issues present in the vicinity of the project, including avian radar studies, acoustic bat surveys, and Breeding Bird Surveys (BBS) using the United States Fish and Wildlife Service BBS methods. Mr. Gravel worked with the New Hampshire Fish and Game Department to develop protocol and perform spring and fall raptor surveys, and collaborated with New Hampshire Audubon to conduct monitoring of peregrine falcons near the project area. He was involved in the drafting of an avian risk assessment that evaluated the potential impacts to birds and bats as a result of the project and provided expert witness testimony and support during the New Hampshire Site Evaluation Committee process.

Highland Wind Project, Somerset County, Maine

Highland is a proposed wind energy facility consisting of 48 turbines. Mr. Gravel acted as Technical Lead during the planning process and was responsible for wildlife studies including nocturnal radar migration surveys, acoustic bat surveys, raptor migration surveys, and rare threatened or endangered species surveys. He acted a liaison between the client and state and federal resource agencies to develop work plans and avoidance and minimization measures during the planning phase of the project. Mr. Gravel also assisted in generating permit application materials for the project.

Mars Hill Wind Farm, Aroostook County, Maine

Mars Hill is a 28 turbine wind energy facility situated on a low-elevation ridge in Aroostook County, Maine. Mr. Gravel acted as Technical Lead during the planning process and was responsible for avian and bat studies including nocturnal radar migration surveys, acoustic bat surveys, raptor migration surveys, and morning bird stopover surveys. He also assisted in the design of a post-construction avian and bat monitoring program.

Wind Farm Development Bird and Bat Surveys and Impact Studies, Mid-Atlantic, New England, Pennsylvania, Ohio, and New York

Mr. Gravel has managed and conducted pre-construction wildlife impact assessments at proposed wind energy projects at multiple sites in the Mid-Atlantic, New England, Pennsylvania, Ohio, West Virginia and New York. These assessments include habitat analyses, critical issues analyses, nocturnal migration surveys using marine radar, acoustic bat surveys, breeding bird surveys, raptor migration surveys, and ecological community characterizations. Mr. Gravel has effectively served as liaison between clients and regulatory agencies to ensure that studies and monitoring plans are in accordance with federal and state guidelines. Study results and determinations of risk have been provided to clients to assist with their project planning and permit applications in compliance with applicable local, state, and federal natural resource regulations. Mr. Gravel has also provided expert witness testimony for projects in Vermont and New Hampshire.

Hounsfield Wind Farm, Galloo Island, New York

As Project Manager for the nocturnal migration surveys conducted to determine site suitability for this proposed wind energy project located on Galloo Island in Lake Ontario. Mr. Gravel negotiated and designed a marine radar survey reflective of the unique location of this island site. Solutions to transport, maintenance, and site coverage were carefully determined in order to produce one of the most extensive migration surveys to date, successfully documenting avian abundance, flight patterns, and flight altitudes surrounding the site. Mr. Gravel and his project team were praised for their thoroughness and insights provided to state agencies.

Adam J. Gravel

Project Manager, Certified Wildlife Biologist

Granite Reliable Wind Park, Coos County, New Hampshire

Mr. Gravel has acted as the Project Manager on this long-term project, supervising and conducting a variety of natural resource surveys to assess potential concerns raised by the proposed project. Surveys included several seasons of nocturnal radar surveys, wetland and vernal pool reconnaissance surveys, multiple seasons of acoustic bat surveys, rare plant surveys, a raptor migration survey, and a Natural Community Characterization. A winter track survey was also conducted within the project site to document occurrence of American marten (State Threatened) and Canada Lynx (Federally Threatened). Mr. Gravel gave several agency presentations to summarize the multiple seasons of environmental surveys and their implications for the project and he has provided expert witness testimony regarding the work conducted at the site.

Stetson Mountain Wind Farm, Washington County, Maine

Stetson is a 57 MW generation facility consisting of 38 turbines on a 6.5-mile, low-elevation ridge in Washington County, Maine. Mr. Gravel acted as Technical Lead responsible for avian and bat studies during the planning process and assisted in the design of a post-construction avian and bat monitoring program.

Lempster Wind Project, New Hampshire

As the Project Manager, Mr. Gravel was responsible for coordinating and conducting environmental surveys and providing permitting support for this 24 MW wind project, the first in New Hampshire. Tasks included developing and negotiating work plans with agencies, performing avian and bat studies, rare species investigations, vernal pool surveys, and providing testimonial support. Mr. Gravel was also involved in the initial development of post-construction bird and bat monitoring protocols for the project.

Record Hill Wind Farm, Maine

Mr. Gravel acted as Project Manager for the Record Hill wind project, which is a 22-turbine, 55 MW wind project on a forested ridge environment in the western mountains of Maine. For this project, he coordinated planning and feasibility studies, wetland delineations, wildlife impact studies, noise and visual impact assessments, and helped to coordinate all state and Federal environmental permitting.

Adam J. Gravel

Project Manager, Certified Wildlife Biologist

PUBLICATIONS

Pelletier, S.K., G.C. Kendrick, T.S. Peterson, and A.J. Gravel. Atlantic Offshore Bird & Bat Pilot Study: 2009 Results. *Poster Presentation at AWEA Offshore Energy Conference, Atlantic City, New Jersey*, 2010.

Giumarro, G. and A. Gravel. Assessing The Risk Of Avian And Bat Mortality At Commercial Wind Farms. *Presentation at the Windpower 2009 Conference and Exhibition, Chicago, Illinois*, 2009.

Pelletier, S., G. Kendrick, G. Giumarro, T. Peterson, and A. Gravel. Gulf of Maine Offshore Bat and Bird Project. *Poster Presentation at AWEA Offshore Energy Conference; Boston, Massachusetts*, 2009.

Pelletier, S.K., A.J. Gravel, and T.S. Peterson. Nocturnal avian flight heights relative to risk of collision with wind turbines. *Poster presentation at the NWCC Wind Wildlife Research Meeting VII in Milwaukee, Wisconsin*, 2008.

Pelletier, S.K., C.W. Meinke, T.S. Peterson, and A.J. Gravel. 2008. Radar and acoustic bat surveys in pre and post-construction bird and bat mortality monitoring. *Poster presentation at the 2008 American Wind Energy Association conference in Los Angeles, California*, 2008.

Gravel, A. Windpower and Wildlife an Overview of Pre-construction Survey Methods and Results. *Presentation to State and Federal Natural Resource Agencies*, 2008.

Dale F. Knapp

Senior Project Manager, Wetland Scientist, Soil Scientist

Stantec

Mr. Knapp is a Senior Project Manager and the Director of the Water Resources Division at Stantec. His primary responsibilities include staff management, project administration and management, ecological field surveys, strategic planning for permitting, and report preparation. In addition to managing and implementing large scale permitting and restoration projects, Mr. Knapp has conducted a variety of field biological sampling efforts to determine risk to ecological receptors and water quality determinations. He has also provided expert witness testimony regarding the findings of various ecological field surveys. Mr. Knapp also has extensive experience in soil mapping, morphology, and subsurface wastewater design.

Under Mr. Knapp's direction, the Water Resources Division performs wetland delineations, vernal pool surveys, threatened and endangered species surveys, ecological community characterizations, permitting, biological assessments, environmental planning, fish and wildlife surveys, wetland mitigation and compensation, project management and document preparation in accordance with the state and federal regulatory agencies.

PROFESSIONAL EXPERIENCE

- Stantec Consulting. 2007-present. Senior Project Manager, Director of Water Resources.
- Woodlot Alternatives, Inc. 2005-2007. Project Manager.
- Corinne Leary. 2002-2005. Field Scientist.
- Leary Soil Works. 2001-2002. Construction.

EDUCATION

BA, University of Maine, Orono, Maine, 2003

Preserving the Wetland Landscape - Tools for Successful Mitigation, Grappone Center, Concord, New Hampshire, 2006

Subsurface System Inspector, Joint Environmental Training Coordination Committee, Portland, Maine, 2006

Hydric Sandy Soils Workshop, Maine Association of Professional Soil Scientists, Scarborough, Maine, 2006

Basic and Advanced Erosion Control Practices, Maine Non-point Source Training and Resource Center, Portland, Maine, 2007

40-Hour HAZWOPER Certification, OSHA, Topsham, Maine, 2010

REGISTRATIONS

Onsite Sewage Disposal System Inspector #523, State of Maine, An Office of the Department of Health and Human Services - Subsurface Wastewater Program

Apprentice Wetland Scientist #WSA-18, New Hampshire Joint Board

Licensed Site Evaluator #386, State of Maine, An Office of the Department of Health and Human Services - Subsurface Wastewater Program

Enviro-Septic Certified #5058MEES, Presby Environmental Inc.

PROFESSIONAL ASSOCIATIONS

Vice President, Maine Association of Site Evaluators

Dale F. Knapp
Senior Project Manager, Wetland Scientist, Soil Scientist

Member, New Brunswick Environment Industry Association

Member, Society of Wetland Scientists

Professional Member, Society of Soil Scientists of Southern New England

President, Maine Association of Wetland Scientists

Recognized Wetland Delineator, New Brunswick Department of Environment

Member, Association of State Wetland Managers

Member, Maine Association of Professional Soil Scientists

PROJECT EXPERIENCE

Natural Resource Services

Pine Tree Landfill Restoration Project, Hampden, Maine
Senior Project Manager responsible for conducting natural resource surveys and developing and implementing a restoration plan to repair and rehabilitate habitat affected by an incidental release of liquid material of unknown composition from a gas-to-energy recovery system at the Pine Tree Landfill.

Rollins Wind Project, Penobscot County, Maine
Senior Project Manager responsible for organizing and managing all natural resource surveys for an extensive 60-megawatt wind project consisting of 40 turbines, 2 transmission lines, an electrical substation, and an operations and maintenance building. He also helped address agency questions and concerns, including those of the U.S. Fish and Wildlife Service regarding impacts to eagles and oversaw the QA/QC of natural community mapping and permitting efforts, which included Maine Department of Environmental Protection, U.S. Army Corps of Engineers, and local permit applications. The project is expected to be fully operational in 2010.

Oakfield Wind Project, Oakfield, Maine
Senior Project Manager responsible for organizing and managing all natural resource surveys for a 34-turbine wind project encompassing 600 acres, including 12 miles of collector line, capable of generating 51 megawatts of renewable energy. Survey efforts included wetland delineations, vernal pool surveys, and rare, threatened and endangered species plant and wildlife surveys. He also oversaw the QA/QC of natural community mapping and permitting efforts, which included Maine Department of Environmental Protection, U.S. Army Corps of Engineers, and local permit applications. The project is expected to be fully operational in 2010.

Old Port Village Peer Review, Kennebunkport, Maine
Senior Project Manager. Reviewed documents filed by the applicant as they pertained to natural resource impacts associated with a proposed subdivision and the presence or absence of rare, threatened, and endangered (RTE) species that may occur within the proposed project area. Work done on behalf of an abutting property owner to the proposed development.

Penobscot River Restoration Natural Resource, Penobscot County, Maine
Technical Lead. Coordinated and participated in natural resource assessment of three dam impoundments along a 10-mile stretch of the Penobscot and Piscataquis Rivers. Characterized existing ecological resources and collected existing infrastructure information. Tasks included wetland reconnaissance, site specific delineation and Function Value Assessments along the backwater of all three impoundments. In addition, coordination of invasive/exotic plant management and supporting development of ecological changes post removal.

Wind Farm Development Surveys and Risk Assessments, Maine
As Senior Project Manager, Mr. Knapp has managed preconstruction wind farm development surveys and assessments at multiple sites throughout Maine. These assessments include site prospecting for wind farm sites, landscape analyses, fatal flaws, and ecological community characterization.

Dale F. Knapp

Senior Project Manager, Wetland Scientist, Soil Scientist

Hoosac Wind Project, Massachusetts

Field Manager/Senior Project Manager. Conducted a series of wetland delineations in concert with other environmental team members. Field surveys included confirming mapped wetlands and other natural communities and delineating the boundaries of wetlands, streams, and other natural resource features. He also conducted extensive botanical field surveys within the project area to determine if any state- or federal-listed rare plant species were present.

Cabelas Retail Development, Scarborough, Maine

Wetland Scientist. Conducted wetland delineations and vernal pool surveys. Completed a systematic mitigation site search through several counties in suppport of permitting efforts.

Highland Wind, Maine

Senior Project Manager responsible for the organization and management and oversaw the QA/QC of the wetland delineations, vernal pool surveys, natural community mapping, and RTE plant and wildlife surveys conducted on an approximately 1,500-acre project area.

Line 56, Maine

Senior Project Manager responsible for organization and management of all natural resource work along more than 50 miles of transmission line corridor.

Maine Power Connection Transmission Corridor, Maine

Senior Project Manager responsible for the organization and management and oversaw the QA/QC of the wetland delineations, vernal pool surveys, natural community mapping, and RTE plant and wildlife surveys conducted along over 140 miles of existing and proposed power line corridor between Haynesville and Chester, Maine.

Grand Manan Wind Farm Phase I, New Brunswick

Senior Project Manager responsible for organization and management of all wetland delineations and impact assessments for a 20 MW wind project covering 250 acres on the island of Grand Manan.

Stetson Wind Farm, Maine

Field Manager and Permitting Support. Responsible for completing natural resource surveys on a 1,300-acre project area for this 24 MW wind project. Mr. Knapp functioned as field leader responsible for leading teams of 4-6 person crews. Studies included wetland delineations, vernal pool surveys, natural community mapping, and RTE plant and wildlife surveys. Assisted in the completion of required state and federal permit applications filed in support of the project.

Record Hill Wind Farm, Roxbury, Maine

Senior Project Manager supporting the Record Hill wind project, which is a 22-turbine, 55 MW wind project on a forested ridge environment in the western Maine mountains. This project has included planning and feasibility studies, wetland delineations, wildlife impact studies, noise and visual impact assessments, and coordination of all state and Federal environmental permitting.

Redington Wind Farm, Maine

Field Manager and Permitting Support. Responsible for completing natural resource surveys on a 1,700-acre project area. Functioned as field leader responsible for leading teams of 4-6 person crews. Studies included wetland delineations, vernal pool surveys, natural community mapping, and RTE plant and wildlife surveys. Assisted in the completion of required state and federal permit applications filed in support of the project.

Dale F. Knapp

Senior Project Manager, Wetland Scientist, Soil Scientist

PUBLICATIONS

Emerson, B., D. Knapp, and G. Carpentier. Potential Alteration of Wetland Functions and Values from Dam Removal. *Poster presented at New England Water Environment Association 2010 Annual Conference, Boston, Massachusetts,* 2010.

Emerson, B., D. Knapp, J.D. DeGraaf, and G. Carpentier. Potential Impacts to Wetland Functions and Values from Dam Removal. *Poster presented at The Diadromous Species Restoration Research Network Science Meeting, University of Maine, Orono, Maine,* 2009.

Presentation: The Dirty Side of Wetland Science. *Distinguished Speaker Series: University of Maine Fort Kent, Fort Kent, Maine,* 2009.

Guest Lecturer: College Level Course PSE 413/PSE 533 Wetland Delineation and Mapping. *University of Maine, Orono, Maine,* 2009.

Guest Lecturer: College Level Course PSE 413/PSE 533 Wetland Delineation and Mapping. *University of Maine, Orono, Maine,* 2008.

Workshop: Hydric Soil Determination. *Stantec Consulting,* 2007.

Guest Lecturer: College Level Course PSE 413/PSE 533 Wetland Delineation and Mapping. *University of Maine, Orono, Maine,* 2007.

Workshop: Intro to Soil Science. *Stantec Consulting,* 2006.

Joy Y. Prescott

Project Manager

Stantec

Ms. Prescott is responsible for providing large-scale project management, NEPA documentation, permitting assistance, and natural resource planning. She has specific management experience in the development of utility-scale alternative energy projects, including development of required NEPA environmental impact statements. She has also managed staffing, implementation, and reporting for Stantec's many wind power related field studies and has coordinated more than 40 studies over the past several years. Her prior experience includes identifying conservation options and creating site improvement and management plans.

Her information management and reporting skills include project planning and tracking, budget development and tracking, database system management, data compilation and analysis, technical presentation development, and multimedia document production. She has considerable permitting experience, including data collection for FERC pipeline, power, and wind projects; avoidance and minimization support; NEPA compliance and documentation; and state environmental permit exhibit preparation.

PROFESSIONAL EXPERIENCE

- Stantec Consulting. 2007-present. Project Manager.
- Woodlot Alternatives, Inc. 2005-2007. Project Manager.
- Land Trust Alliance. 2004-2005. Project Coordinator.
- Independent Consultant. 2003-2004.
- Akibia, Inc. 1999-2002. Principal Consultant.
- Systems Engineering, Inc. 1998-1999. Analyst.
- Cambridge Technology Partners. 1996-1998. Consultant.

EDUCATION

MA, Landscape Planning and Design, Conway School of Landscape Design, Conway, Massachusetts, 2003

BA, Economics, Smith College, Northampton, Massachusetts, 1996

PROFESSIONAL ASSOCIATIONS

Member, Town of Brunswick Department of Planning and Development, Conservation Commission

Member, Maine Association of Planners

PROJECT EXPERIENCE

Natural Resource Services

Confidential Wind Projects, New Hampshire, Vermont, New York, Pennsylvania, Ohio, West Virginia (Project Manager)

Managed pre-construction fieldwork surveys and impact assessments at multiple sites in the Mid-Atlantic, New England and the Midwest. The assessments include habitat analyses, fatal flaw analyses, migration surveys using marine radar, acoustic bat surveys, breeding bird surveys and raptor surveys. Ms. Prescott has effectively served as liaison between clients and regulatory agencies to ensure that studies and monitoring plans are in accordance with federal and state guidelines.

Moresville Wind Project, Delaware County, New York (Project Manager)

Coordinated and prepared comment responses to Draft Environmental Impact Statement.

Joy Y. Prescott
Project Manager

Sheffield Wind Project, Vermont

Managed pre-construction fieldwork and reporting for proposed wind energy project. Coordinated documentation and responses for Section 248 Discovery, Testimony and Rebuttal.

Oakfield Wind Project, Washington County, Maine (Project Manager)

Provided project management and planning services. Coordinated fieldwork and deliverables for natural and cultural resource assessments and assisted in permitting.

Rollins Wind Project, Penobscot County, Maine (Project Manager)

Provided project management and planning services. Managed fieldwork and deliverables for natural and cultural resource assessments. Coordinated consultations with state and federal agencies and helped to coordinate state and federal environmental permitting.

Cape Wind EIS, Nantucket Sound, Massachusetts (Project Manager)

Stantec participated in the federal environmental permitting effort for the Cape Wind project in Nantucket Sound, Massachusetts. As Project Manager and Regulatory Specialist, Joy was instrumental in the coordination and development of NEPA documentation for the project. She was responsible for preparing and reviewing sections of the Draft and Final Environmental Impact Statement and Biological Assessment documents as well as responding to comments regarding issues raised by public and government entities. Her work also included extensive literature reviews, analysis of applicant field survey data concerning avian and bat species distribution and behavior, and informal and formal consultations with USFWS staff and MMS.

Table D-1

Vernal Pool Identifier	Origin	Associated Wetland Identifier	NRPA		Corps Regulated Vernal Pool	Apply 750' Corps VP Management Area	Number of Egg Masses[1]						Presence[2]		Comments
			Vernal Pool	SVP			Wood Frog		Spotted Salamander		Blue-spotted salamander		Fairy Shrimp	Other Indicator Species[3]	
							V1	V2	V1	V2	V1	V2			
VP32MG-M	Man-made	W008			X	X	67	-	62	-	0	-	-	-	Meets MDEP's SVP egg mass threshold for wood frogs and spotted salamanders
VP31MG-M	Man-made	W012			X		11	-	14	-	0	-	-	-	
VP30MG-M	Man-made	W020			X		0	-	1	-	0	-	-	-	
VP13MG-M	Man-made	W024			X		8	-	0	-	0	-	-	-	
VP14MG-M	Man-made	W024			X		0	-	4	-	0	-	-	-	
VP08MG-M	Man-made	W028			X		0	-	2	-	0	-	-	-	
VP07MG-M	Man-made	W032			X		4	-	2	-	0	-	-	-	
VP05MG-M	Man-made	W046			X		10	-	2	-	0	-	-	-	
VP06MG-M	Man-made	W046			X		14	-	7	-	0	-	-	-	
VP01RL-M	Man-made	W047			X		5	-	0	-	0	-	-	-	
VP02RL-M	Man-made	W047			X		0	-	1	-	0	-	-	-	
VP03MG-M	Man-made	W047			X	X	21	-	0	-	0	-	-	-	Clustered with VP04MG-M, combined wood frog egg mass count exceeds MDEP's SVP significance threshold
VP04MG-M	Man-made	W047			X	X	31	-	0	-	0	-	-	-	Clustered with VP03MG-M, combined wood frog egg mass count exceeds MDEP's SVP significance threshold
VP41MG-M	Man-made	W057			X		11	-	7	-	0	-	-	-	
VP42MG-M	Man-made	W057			X		9	-	8	-	0	-	-	-	
VP40MG-M	Man-made	W058			X	X	4	-	22	-	0	-	-	-	Meets MDEP's SVP egg mass threshold for spotted salamanders
VP15MG-M	Man-made	W062			X		21	-	1	-	0	-	-	-	
VP16MG-M	Man-made	W063			X		15	-	11	-	0	-	-	-	
VP17MG-M	Man-made	W069			X		4	-	0	-	0	-	-	-	
VP18MG-M	Man-made	W071			X		3	-	0	-	0	-	-	-	
VP19MG-M	Man-made	W072			X		23	-	3	-	0	-	-	-	
VP20MG-M	Man-made	W082			X		0	-	4	-	0	-	-	-	
VP21MG-M	Man-made	W084			X		1	-	1	-	0	-	-	-	
VP22MG-M	Man-made	W086			X		3	-	1	-	0	-	-	-	
VP24MG-M	Man-made	W087			X		24	-	6	-	0	-	-	-	
VP01CF-M	Man-made	W087			X		1	-	4	-	0	-			
VP23MG-M	Man-made	W088			X		3	-	0	-	0	-	-	-	
VP12MJ-M	Man-made	W088			X		0	-	6	-	0	-	-	-	
VP03BE-M	Man-made	W091			X		0	-	1	-	0	-	-	-	
VP04BE-M	Man-made	W091			X		6	-	0	-	0	-	-	-	
VP01MG-M	Man-made	W092			X		8	-	0	-	0	-	-	-	
VP02BE-M	Man-made	W094			X		0	-	6	-	0	-	-	-	
VP05BE-M	Man-made	W097			X		3	-	0	-	0	-	-	-	
VP09MG-M	Man-made	W102			X		6	-	4	-	0	-	-	-	
VP03RL-N	Natural	W105	X		X		1	0	1	1	0	0	-	-	
VP01BE-M	Man-made	W128			X		0	-	3	-	0	-	-	-	
VP49MG-M	Man-made	W136			X	X	0	-	42	-	0	-	-	-	Meets MDEP's SVP egg mass threshold for spotted salamanders
VP50MG-M	Man-made	W136			X	X	0	-	10	-	0	-	-	-	Clustered with VP49MG-M, combined spotted salamander egg mass count exceeds MDEP's SVP significance threshold
VP10MG-M	Man-made	W142			X		1	-	0	-	0	-	-	-	
VP11MG-M	Man-made	W143			X		0	0	11	-	0	-	-	-	
VP12MG-M	Man-made	W145			X		0	-	1	-	0	-	-	-	
SVP06BE-N	Natural	W150	X	X	X	X	53	tads	5	11	4	0	-	-	Significant Vernal Pool
VP07BE-N	Natural	W155	X		X		4	0	2	0	0	0	-	-	
VP08BE-M	Man-made	W169			X		0	-	2	-	0	-	-	-	
VP09BE-M	Man-made	W183			X		0	-	1	-	0	-	-	-	
VP10BE-M	Man-made	W183			X		0	-	5	-	0	-	-	-	

Table D-1

Vernal Pool Identifier	Origin	Associated Wetland Identifier	NRPA		Corps Regulated Vernal Pool	Apply 750' Corps VP Management Area	Number of Egg Masses[1]						Presence[2]		Comments
			Vernal Pool	SVP			Wood Frog		Spotted Salamander		Blue-spotted salamander		Fairy Shrimp	Other Indicator Species[3]	
							V1	V2	V1	V2	V1	V2			
VP11BE-M	Man-made	W183			X		0	-	1	-	0	-	-	-	
VP46MG-M	Man-made	W192			X	X	0	-	69	-	0	-	-	-	Meets MDEP's SVP egg mass threshold for spotted salamanders
VP47MG-M	Man-made	W203			X		0	-	10	-	0	-	-	-	
VP51MG-M	Man-made	W203			X		0	-	4	-	0	-	-	-	
VP43MG-M	Man-made	W206			X	X	0	-	49	-	0	-	-	-	Meets MDEP's SVP egg mass threshold for spotted salamanders
VP29MG-M	Man-made	W219			X		4	-	0	-	0	-	-	-	
VP27MG-M	Man-made	W227			X		2	-	2	-	0	-	-	-	
VP28MG-M	Man-made	W227			X		0	-	5	-	0	-	-	-	
VP25MG-M	Man-made	W231			X		0	-	1	-	0	-	-	-	
VP26MG-M	Man-made	W231			X		8	-	1	-	0	-	-	-	
PSVP52MG-N	Natural	W266	X		X	X	-	tads	-	7	0	-	-	-	Wood frog tadpoles present, but identified outside of wood frog season (too small to consider potential SVP - correspondence with MDIFW)
VP20CF-N	Natural	W300	X		X		3	0	17	9	0	0	-	-	Pool was completely dry on second visit
VP21CF-M	Man-made	W302			X	X	36	-	24	-	0	-	-	-	Meets MDEP's SVP egg mass threshold for spotted salamanders
VP01AA-M	Man-made	W253			X		5	-	1	-	0	-	-	-	identified outside vernal pool window
VP01MA-N	Natural	W298					0	0	0	0	0	0	-	-	Not a Vernal Pool. Does not hold water for depth/time req'd. No indicator species present.
VP07AH-M	Man-made	W312			X		18	-	19	-	0	-	-	-	Permanent Hydrology. Deep borrow.
VP05AH-M	Man-made	W314					2	-	1	-	0	-	-	-	Not a Vernal Pool. Fish Obsv'd. Viable population connected to stream.
VP06AH-M	Man-made	W314			X		0	-	7	-	0	-	-	-	Permanent Hydrology.
VP04AH-M	Man-made	W315			X		24	-	6	-	0	-	-	-	Permanent Hydrology. Deep borrow. Green Frogs present
VP03AH-M	Man-made	W317			X		0	-	4	-	0	-	-	-	Permanent Hydrology. Deep borrow.
VP02AH-M	Man-made	W319					0	-	0	-	0	-	-	-	Not a Vernal Pool. No Indicator Species Present
VP01AH-M	Man-made	W321			X		7	-	0	-	0	-	-	-	Permanent Hydrology. Deep borrow.

[1] The number in column V1 represents the results of the first site visit, and the number in column V2 represents the results of the second site visit.

[2] Presence indicates observation during vernal pool survey.

[3] BT = Blanding's Turtle; ST = Spotted Turtle; RB = Ringed Boghaunter Dragonfly; WT = Wood Turtle; RS = Ribbon Snake; SD = Swamp Darner Dragonfly; CD = Comet Darner Dragonfly

Table E-1. Estimated bat mortality rates reported at wind-energy facilities in the United States (U.S.) and Canada.

Project Location	Year	No. of turbines at site	Estimated no. bats per	95% confidence interval (per no.	Study period	Source
U.S. - Midwest						
Blue Sky Green Field, WI	2008	88	35.6	30.98-51.16 [c f]	21 Jul-31Oct 2008, 15Mar-31 May 2009	Gruver et al. 2009
Buffalo Ridge, MN (Phase I)	1999	73	0.26	0.06-0.46[c]	15 Mar-15 Nov 1999	Johnston et al. 2003
Buffalo Ridge, MN (Phase II)	1998	143	1.62	1.21-2.03[c]	15 Mar-15 Nov 1998	Johnston et al. 2003
Buffalo Ridge, MN (Phase II)	1999	143	1.94	1.53-2.35[c]	15 Mar-15 Nov 1999	Johnston et al. 2003
Buffalo Ridge, MN (Phase III)	1999	138	2.04	1.46-2.62[c]	15 Mar-15 Nov 1999	Johnston et al. 2003
Buffalo Ridge, MN (Phase II)	2001	143	3.26	2.25-4.48[c]	15 Jun-15 Sep 2001	Johnston et al. 2004
Buffalo Ridge, MN (Phase III)	2001	138	2.78	1.96-3.71[c]	15 Jun-15 Sep 2001	Johnston et al. 2004
Buffalo Ridge, MN (Phase II)	2002	143	1.36	0.82-2.00[c]	15 Jun-15 Sep 2002	Johnston et al. 2004
Buffalo Ridge, MN (Phase III)	2002	138	1.3	0.89-1.77[c]	15 Jun-15 Sep 2002	Johnston et al. 2004
Cedar Ridge, WI	2009	41	50.5 [d]	NR	Mar-May; July-Nov 2009	BHE 2010
Crescent Ridge, IL	2005/2006	33	0.18-2.67	4.36-5.46	Sep-Nov 2005;Mar-May 2006; Aug 2006	Kerlinger et al. 2007
Fowler Ridge, IN	2010	355	22.2	19.32-29.17[c]	13 Apr-5 May 2010; 1 Aug-15 Oct 15 2010;	Good et al. 2011
Forward Energy Center, WI	2008-2009	86	NR	NR	15 Jul 2008-15 Oct 2009	Drake et al. 2010
Kewaunee County, WI	1999-2001	31	4.26	NR	Jul 1999-Jul 2001	Howe et al. 2002
NPPD Ainsworth, NE	2006	36	1.91 [d]	0.91-3.37[c]	13 Mar-4 Nov, 2006	Derby et al. 2007
Top of Iowa, IA	2003	89	3.74-8.08[d]	NR	15 Apr-15 Dec 2003	Jain 2004
Top of Iowa, IA	2004	89	7.19-13.14[d]	NR	15 Apr-15 Dec 2004	Jain 2005
AVERAGE Midwest		112.2	9.7			
U.S. - South-Central						
Buffalo Gap, TX	2007-2008	155	0.21	NR	Jul 2007-Dec 2009	Tierney 2009
Oklahoma Wind Energy Center, OK	2004-2005	68	1.19-1.71[i]	NR	May-Jul 2004/2005	Piorkowski and O'Connell 2010
AVERAGE South Central		111.5	0.83			
Eastern United States						
Buffalo Mountain, TN (Phase I)	2000-2003	3	20.8	19.5-22[c]	29 Sep 2000-30 Sep 2003	Fiedler 2004
Buffalo Mountain, TN (Phase II)	2005	18	63.9		Apr-Dec 2005	Fiedler et al. 2007
Casselman, PA	2008	23	32.2	20.8-51.4	26 Jul-10 Oct 2008	Arnett et al. 2009
Cohocton/Dutch Hill, NY	2009	50	13.8-40	804.13-3062.02	15 Apr-15 Nov 2009	Stantec 2010
Cohocton/Dutch Hill, NY	2010	50	5.04-25.62[d]	65.63-963.89[d]	26 Apr-22 Oct 2010	Stantec 2011
Lempster Ridge, NH	2009	12	6.21[d]	3.08-9.84[d]	15 Apr-31 Oct 2009	Tidhar et al. 2010
Maple Ridge, NY	2006	195	11.39-20.31	14.3-34.7	17 Jun-15 Nov 2006	Jain et al. 2007
Maple Ridge, NY	2007	195	15.5	14.1-17.0	30 Apr-14 Nov 2007	Jain et al. 2009
Maple Ridge, NY	2008	195	8.2	7.4-9.0	5 Apr-9 Nov 2008	Jain et al. 2009
Mars Hill, ME	2007	28	4.37	NR	23 Apr-23 Sep 2007	Stantec 2008
Mars Hill, ME	2008	28	0.17	NR	19 Apr-8 Oct 2008	Stantec 2009
Meyersdale, PA	2004	20	25.1	20.1-32.7 [c]	2 Aug-13 Sep 2004	Arnett et al. 2005
Mount Storm, WV (Phase I)	2008	82	24.2	17.1-33.1[cd]	18 Jul-17 Oct 2008	Young et al. 2009
Mount Storm, WV (Phase I,II)	2009	132	28.6	18.7-40.5	23 Mar-14 Jun & 16 Jul-8 Oct 2009	Young et al. 2010
Mount Storm, WV (Phase I,II)	2010	132	9.98[d]	8.2-14.06[cd]	16 Apr-14 Jul 2010	Young et al. 2011
Mountaineer, WV	2004	44	37.7	31.2-45.1 [c]	2 Aug-13 Sep 2004	Arnett 2005
Mountaineer, WV	2003	44	47.5	31.8-91.6 [c]	4 Apr-22 Nov 2003	Kern and Kerlinger 2004
Munnsville, NY	2008	23	3.6f[g]	32.99-40.19f[g]	15 Apr-15 Nov 2008	Stantec 2009
Noble Bliss, NY	2008	67	7.58-14.66[h]	NR	21 Apr-14 Nov 2008	Jain et al. 2009
Noble Clinton, NY	2008	67	3.76-5.45[dh]	NR	26 Apr-13 Oct 2008	Jain et al. 2009
Noble Ellensburg, NY	2008	54	4.19-8.17[dh]	NR	28 Apr-13 Oct 2008	Jain et al. 2009
Stetson Mountain I, ME (Year 1)	2009	38	2.11	NR	20 Apr-21 Oct 2009	Stantec 2010
Stetson Mountain II, ME (Year 1)	2010	17	2.48	2.19-2.77	19 Apr-31 Oct 2010	Normandeau 2010
AVERAGE East		66.0	17.9			

Project Location	Year	No. of turbines at site	Estimated no. bats per	95% confidence interval (per no.	Study period	Source
U.S. - West						
Foote Creek Rim, WY Year 1	1998-1999	69	2.38[f]	0.68-4.71[f]	3 Nov 1998-31 Oct 1999	Young et al. 2003
Foote Creek Rim, WY Year 2	2000	69	0.63[f]	0.2-2.04[f]	1 Nov 1999-31 Dec 2000	Young et al. 2003
Foote Creek Rim, WY Year 3	2001-2002	69	0.94[f]	0.26-1.13[f]	1 Jun 2001-5 Jun 2002	Young et al. 2003
Judith Gap, MT	2006-2007	90	13.4 [d]	NR	Aug-Oct 2006, Feb-May, 2007	TRC Environmental 2008
AVERAGE West		74.3	4.3			
U.S. - Pacific NW and Coast						
Biglow Canyon, OR	2008	76	3.29	2.27-4.85 [c]	Jan-Dec 2008	Jeffrey et al. 2009
Biglow Canyon, OR	2009	76	0.96	0.57-1.49[c]	26 Jan-11 Dec 2009	Enk et al. 2010
Combine Hills, OR (Phase I)	2004-2005	41	1.88	1.15-2.8c	9 Feb 2004-8 Feb 2005	Young et al. 2006
High Winds, CA Year 1	2003-2004	90	2.72	NR	Aug 2004-Jul 2005	Kerlinger et al. 2006
High Winds, CA Year 2	2004-2005	90	3.63	NR	Aug 2003-Jul 2005	Kerlinger et al. 2006
Hopkins Ridge, WA	2006	83	1.13	0.69-1.71 [c]	Jan-Dec 2006	Young et al. 2007
Klondike, OR (Phase I) Year 1	2001-2002	16	1.16	0.41-2.12 [c]	2001-2002	Johnson et al. 2003
Stateline, OR/WA	2002	399	0.954	0.646-1.312[c]	Jul 2001-Dec 2002	Erickson et al. 2003
Stateline, OR/WA	2003	454	1.51	1.08-1.94[c]	Jan 2003-Dec 2003	Erickson et al. 2004
Vansycle, OR	1999	38	0.74	0.26-1.56	1999	Erickson et al. 2000
Wild Horse, WA	2007	127	0.7	NR	Jan-Dec 2007	Erickson et al. 2008
AVERAGE Pacific NW and Coast		135.5	1.7			
Canada						
Castle River, AB	2001-2002	60	0.22-0.89[a]	NR	Apr 2001- Jan 2002	Brown and Hamilton 2002
McBride Lake, AB	2003-2004	114	0.47[a]	NR	Jul 2003-Jun 2004	Brown and Hamilton 2004
Ripley, ON	2008	38	0.17-12.38[j]	NR	Apr-May, Jul-Oct 2008	Jacques Whitford Stantec Ltd. 2009
Summerview, AB	2005-2006	39	18.49	NR	Jan 2005-Jan 2006	Brown and Hamilton 2006
Summerview, AB	2006-2007	39	26.32	NR	Jul-Sep, 2006 & 2007	Baerwald 2008
Wolfe Island, ON	2009	86	14.77	NR	1 Jul-31 Dec 2009	Stantec 2010
AVERAGE Canada		62.7	11.1			
AVERAGE U.S. and Canada		92.2	10.9			

[a] estimation unadjusted
[b] where a range of estimated number of bats per turbine was given, the median was used to calculate average estimated number bats per turbine per year
[c] reported as 90% confidence interval
[d] estimation based on study period, not per year
[e] reported as 99% confidence interval
[f] estimation includes incidental fatalities
[g] estimation is an average of standardized search estimate and dog search estimate
[h] range includes estimations of 1-day, 3-day, and 7-day standardized surveys
[i] author did not define if estimation is calculated for fatalities per turbine/year or per turbine/study period
[j] estimation is a range of spring and fall study periods
NR not reported by author

Table E-2. Observed species[a] composition of bat mortality reported at wind-energy facilities in the United States (U.S.) and Canada.

Project Location	Year	Number of fatalities (Percentage of total fatalities)											Total no. bat fatalities	Source
		EPFU	LABL	LABO	LACI	LANO	MYLU	MYSE	MYSO	PISU	TABR	Other		
U.S. - Midwest														
Blue Sky Green Field, WI	2008	33 (17.0)		11 (5.7)	29 (14.9)	51 (26.3)	60 (30.9)					10 (5.2)	194	Gruver et al. 2009
Buffalo Ridge, MN (Phase I,II,III)	1998-1999	1 (0.5)		37 (20.1)	108 (58.7)	6 (3.3)	5 (2.7)			6 (3.3)		21 (11.4)	184	Johnson et al. 2003
Buffalo Ridge, MN (Phase II & III)	2001-2002	8 (5.3)		21 (13.9)	115 (76.2)	4 (2.6)	3 (2.0)						151	Johnson et al. 2004
Cedar Ridge, WI	2009	15 (17.9)		12 (14.3)	29 (34.5)	16 (19.0)	12 (14.3)						84	BHE 2010
Crescent Ridge, IL	2005-2006			6 (28.6)	6 (28.6)	8 (38.0)						1 (4.8)	21	Kerlinger et al. 2007
Fowler Ridge, IN	2010	17 (3.0)		368 (62.0)	86 (15.0)	116 (20.0)	2 (0.3)		1 (0.2)	2 (0.3)			592[b]	Good et al. 2011
Forward Energy Center, WI	2008-2009	12 (9.9)		14 (11.6)	34 (28.1)	36 (29.5)	12 (9.9)					13 (10.7)	121	Drake et al. 2010
Kewaunee County, WI	1999-2001	1 (1.4)		27 (37.5)	25 (34.7)	13 (18.1)						6 (8.3)	72	Howe et al. 2002
NPPD Ainswoth, NE	2006	1 (8.3)		1 (8.3)	12 (75.0)							2 (16.7)	16	Derby et al. 2007
Top of Iowa, IA	2003	3 (10.0)		6 (20.0)	11 (36.7)	2 (6.7)	9 (30.0)						31	Jain 2004
Top of Iowa, IA	2004	9 (11.8)		18 (23.7)	21 (27.6)	9 (11.8)	18 (23.7)			1 (1.3)			76	Jain 2005
AVERAGE Midwest		10.0 (9.8)		47.4 (22.3)	43.3 (39.1)	25.9 (17.5)	15.4 (14.2)		1 (0.2)	3.0 (1.6)		8.8 (9.5)	140.2	
U.S. - East														
Buffalo Mountain, TN (Phase II)	2005	1 (0.4)		145 (60.9)	31 (13)	18 (7.6)				41 (17.2)		2 (0.8)	238	Fiedler et al. 2007
Buffalo Mountain, TN (Phase I)	2000-2003	1 (0.9)		69 (60.5)	11 (9.6)	2 (1.8)				29 (25.4)		2 (1.8)	114	Fiedler 2004
Casselman, PA	2008	4 (2.7)		27 (18.2)	46 (31.1)	39 (26.4)	14 (9.5)			17 (11.5)		1 (0.01)	148	Arnett et al. 2009
Cohocton/Dutch Hill, NY	2009	2 (2.9)		2 (2.9)	12 (17.4)	11 (16.0)	41 (59.4)					1 (1.4)	69	Stantec 2010
Cohocton/Dutch Hill, NY	2010	4 (6.3)		13 (20.6)	24 (38.1)	9 (14.3)	11 (17.5)	1 (1.6)				1 (1.6)	63	Stantec 2011
Lempster Ridge, NH	2009	2 (2.0)			3 (30.0)	4 (40.0)	1 (1.0)						10	Tidhar et al. 2010
Maple Ridge, NY	2006	21 (5.4)		50 (13)	176 (45.9)	56 (14.6)	52 (13.5)					29 (7.6)	384[b]	Jain et al. 2007
Maple Ridge, NY	2007	17 (8.4)		20 (9.9)	100 (49.5)	32 (15.8)	31 (15.3)					2 (1.0)	202	Jain et al. 2009
Maple Ridge, NY	2008	7 (5.0)		16 (11.4)	61 (43.6)	29 (20.7)	24 (17.1)					3 (2.1)	140	Jain et al. 2009
Munnsville, NY	2008	1 (10.0)		1 (10.0)	6 (60.0)		2 (20.0)						10[b]	Stantec 2009
Mars Hill, ME Year 1	2007			3 (13.0)	5 (21.0)	9 (38.0)	4 (17.0)						21	Stantec 2008
Mars Hill, ME Year 2	2008			2 (40.0)	2 (40.0)	1 (20.0)							5	Stantec 2009
Meyersdale, PA	2004	18 (6.9)		72 (27.5)	119 (45.4)	15 (5.7)	7 (2.7)	2 (0.7)		21 (8.0)		1 (0.5)	262	Kerns et al. 2005
Mountaineer, WV	2004	10 (2.5)		96 (24.1)	134 (33.7)	19 (4.8)	39 (9.8)			98 (24.6)		2 (0.5)	398	Arnett 2005
Mountaineer, WV	2003	2 (0.4)		200 (42.1)	88 (18.5)	28 (5.9)	60 (12.6)	6 (1.3)		87 (18.3)		4 (0.8)	475	Kerns and Kerlinger 2004
Mount Storm, WV (Phase I)	2008			35 (19.2)	57 (31.3)	30 (16.5)	18 (9.9)	1 (0.5)		29 (15.9)		3 (1.6)	182	Young et al. 2009
Mount Storm, WV (Phase I & II)	2010	3 (4.6)		16 (24.6)	24 (36.9)	9 (13.8)	6 (9.2)			7 (10.8)			65	Young et al. 2011
Noble Bliss, NY	2008	1 (1.4)		6 (8.1)	24 (32.4)	13 (17.6)	29 (39.2)			1 (1.4)			74	Jain et al. 2009
Noble Bliss, NY	2009			7 (19.4)	14 (38.9)	6 (16.7)	6 (16.7)					3 (8.3)	36[b]	Jain et al. 2010
Noble Clinton, NY	2008			1 (2.6)	9 (23.1)	11 (28.2)	13 (33.3)			3 (7.7)		2 (5.1)	39	Jain et al. 2009
Noble Clinton, NY	2009			1 (2.4)	19 (45.2)	11 (26.2)	11 (26.2)						42[b]	Jain et al. 2010
Noble Ellensburg, NY	2008			1 (2.9)	6 (17.7)	7 (20.6)	19 (55.9)			1 (2.9)			34	Jain et al. 2009
Noble Ellensburg, NY	2009	1 (3.6)		2 (7.1)	11 (39.3)	3 (10.7)	10 (35.7)			1 (3.6)			28[b]	Jain et al. 2010
Stetson Mountain I, ME (Year 1)	2009				2 (40)	1 (20)	1 (20.0)						5	Stantec 2010
Stetson Mountain II, ME (Year1)	2010	2 (14.3)			5 (35.7)	6 (42.9)	1 (7.1)						14	Normandeau 2010
AVERAGE East		5.7 (4.6)		35.7 (20.0)	39.6 (33.5)	15.4 (18.5)	18.2 (20.4)	2.5 (1.0)		27.9 (11.4)		4.0 (2.4)	122.3	
U.S. - South-Central														
Buffalo Gap 2, TX	2007-2008				5 (41.7)						4 (33.3)	3 (25.0)	12	Tierney 2009
Oklahoma Wind Energy Center, OK	2004-2005	1 (0.9)		3 (2.7)	10 (9)	1 (0.9)				1 (0.9)	94 (84.7)	1 (0.9)	111	Piorkowski and O'Connell 2010
AVERAGE South Central		1 (0.9)		3 (2.7)	7.5 (25.35)	1 (0.9)				1 (0.9)	49 (59)	2 (13)	61.5	
U.S. - West														
Foote Creek Rim, WY	1999	1 (2.4)			34 (82.9)	1 (2.4)	4 (9.8)					1 (2.4)	41	Young et al. 2003
Foote Creek Rim, WY	2000				10 (83.3)	1 (8.3)	1 (8.3)						12	Young et al. 2003
Foote Creek Rim, WY	2001-2002				12 (66.7)	3 (16.7)	1 (5.6)					1 (5.6)	18	Young et al. 2003
Judith Gap, MT	2006-2007				17 (49)	4 (11)						14 (40)	35	TRC Environmental 2008
AVERAGE West		1 (2.4)			18.3 (70.5)	2.3 (9.6)	2 (7.9)					5.3 (16)	26.5	
U.S. - Pacific NW and Coast														
Biglow Canyon, OR	2008				25 (50.0)	25 (50.0)							50	Jeffrey et al. 2009
Biglow Canyon, OR	2009				4 (23.5)	8 (47.1)						3 (17.6)	17	Enk et al. 2010
Combine Hills, OR (Phase I)	2004-2005				13 (62.0)	8 (38.0)							21	Young et al. 2006
High Winds, CA Year 1	2003-2004		3 (4.3)		45 (64.3)						22 (31.4)		70	Kerlinger et al. 2006
High Winds, CA Year 2	2004-2005		1 (2.2)		17 (37.0)	2 (4.3)					26 (56.5)		46	Kerlinger et al. 2006
Hopkins Ridge, WA	2006	1 (5.3)			4 (21.0)	12 (63.0)	1 (5.3)					1 (5.3)	19	Young et al. 2007
Klondike, OR Phase I	2001-2002				3 (50.0)	1 (16.7)						2 (33.3)	6[b]	Johnson et al. 2003
Stateline, OR/WA Year 1	2002	2 (3.7)			25 (46.3)	25 (46.3)	1 (1.9)					1 (1.9)	54	Erickson et al. 2003
Stateline, OR/WA Year 2	2003				34 (45.9)	39 (52.7)						1 (1.4)	74	Erickson et al. 2004
Vansycle, OR	1999				5 (50.0)	3 (30.0)	1 (10)					1 (10)	10	Erickson et al. 2000
Wild Horse, WA	2007				10 (58.8)	3 (17.6)	4 (23.5)						17	Erickson et al. 2008
AVERAGE Pacific NW and Coast		1.5 (4.5)	2 (3.3)		16.8 (46.3)	12.6 (36.6)	1.8 (10.2)				24 (44)	1.5 (11.6)	34.9	
Canada														
Wolfe Island, ON	2009	13 (7.2)		44 (24.4)	54 (30.0)	36 (20.0)	13 (7.2)					20 (11.0)	180	Stantec 2010
Castle River, AB	2001-2002				30 (57.7)	7 (13.4)	12 (23.1)					3 (5.8)	52	Brown and Hamilton 2006

Project Location	Year	Number of fatalities (Percentage of total fatalities)											Total no. bat fatalities	Source
		EPFU	LABL	LABO	LACI	LANO	MYLU	MYSE	MYSO	PISU	TABR	Other		
McBride Lake, AB	2003-2004	1 (1.9)			47 (87.0)	1 (1.9)	5 (9.2)						54	Brown and Hamilton 2004
Ripley, ON	2008	5 (4.2)		7 (5.8)	38 (31.7)	17 (14.2)	22 (18.3)	2 (1.7)		10 (8.3)		19 (15.8)	120	Jacques Whitford Stantec Ltd. 2009
Summerview, AB	2005-2006	4 (0.8)		1 (0.2)	244 (45.9)	272 (51.1)	6 (1.1)					5 (0.9)	532	Brown and Hamilton 2006
Summerview, AB Year 2, 3	2006-2007	18 (1.8)		6 (0.6)	608 (61.2)	337 (33.9)	6 (0.6)					18 (1.8)	993	Baerwald 2008
AVERAGE Canada		8.2 (3.2)		14.5 (7.8)	170.2 (52.3)	111.7 (22.4)	10.7 (9.9)	2 (1.7)		10 (8.3)		13.0 (7.1)	321.8	
AVERAGE U.S. and Canada		6.8 (5.7)	2.0 (3.3)	36.0 (18.9)	46.8 (35.2)	26.1 (21.1)	14.0 (16.0)	2.4 (1.2)	1.0 (0.2)	20.9 (8.9)	36.5 (51.5)	5.6 (7.5)	121.1	

[a] EPFU = big brown bat; LABL = western red bat; LABO = eastern red bat; LACI = hoary bat; LANO = silver-haired bat; MYLU = little brown bat; MYSE = northern long-eared bat; MYSO = Indiana bat; PISU = eastern pipistrelle; TABR = Brazilian (Mexican) free-tailed bat.

[b] Number bats found includes incidental fatalities.

firstwind
CLEAN ENERGY. MADE HERE.

June 2, 2011

VIA EMAIL: Richard.Bard@maine.gov
AND U.S. POSTAL SERVICE

Richard Bard
Assistant Regional Wildlife Biologist
Maine Department of Inland Fisheries and Wildlife
317 Whitneyville Road
PO Box 220
Jonesboro, ME 04648

Re: Bull Hill Curtailment Request

Dear Mr. Bard:

The purpose of this letter is to summarize our discussions which took place from May 16-26, 2011 between the Maine Department of Inland Fisheries and Wildlife ("IFW") and First Wind. Those present during the May 26th meeting included the following from IFW: Rich Bard, Shawn Haskell, Steve Timpano and John DePue. First Wind representatives included Geoff West and Bob Roy from ecological services. Don Murphy from the Land Use Regulation Commission ("LURC") was also present.

On March 10, 2011, IFW first recommended that First Wind change the cut-in speeds for all 19 turbines at the Bull Hill project from 3.0 m/s to 5.0 m/s (known as curtailing turbines) during the period of April 20-October 15 in order to reduce bat fatalities. First Wind responded to that recommendation on April 13, 2011 in a memo which revised the post construction mortality plan; subsequently, IFW in response to that letter requested curtailment again on May 9, 2011. On May 16, 2011 Blue Sky East responded with a proposal to study curtailment. The proposal was developed to determine the efficacy of curtailment as a means for mitigating impacts to bats at the project and to determine the appropriate schedule for implementing curtailment. Data previously collected at operating wind projects indicates that a majority of bat fatalities occur during relatively low-wind conditions over a relatively short period of time during the summer-fall bat migration period.[1] Altering turbine operations poses significant economic and operational challenges but may be appropriate when the strategy is limited to the periods when bats are most active.

[1] Arnett, E. B., M. P. Huso, M. R. Schirmacher, and J. P. Hayes. 2010. Altering turbine speed reduces bat mortality at wind-energy facilities. *Frontiers in Ecology and the Environment.*

Blue Sky East, LLC ("Blue Sky East") has submitted an application to LURC to construct a wind-energy facility in Hancock County, Maine known as the Bull Hill Wind Farm. Construction is anticipated to begin in the first quarter of 2012 and the facility is expected to become fully operational by the end of 2012. Prior to becoming fully operational, Blue Sky East has agreed to develop a robust study plan in consultation with IFW that closely follows the Sheffield protocol, with specific details to be decided by the principal investigator with the goal of ensuring that the results are statistically valid and defensible.

First Wind and IFW agreed that a detailed study design for the first two years of operation will be developed in consultation with IFW, the Bat and Wind Energy Cooperative, Bat Conservation International ("BCI"), and potentially the University of Maine. Attached please find an email confirmation from BCI expressing their commitment to the study. The results of this study will help Blue Sky East develop a curtailment plan that is both economically and operationally feasible while reducing impacts to bats at the Bull Hill Wind Farm.

Regards,

Geoff West

Enclosure: Email from BCI
cc: Don Murphy, LURC, via email and USPS
Kelly Boden, Verill Dana, via email
Steve Timpano, IFW, via email
Lynn Williams, CCRHC, via email

Geoff West

From: Ed Arnett <earnett@batcon.org>
Sent: Wednesday, June 01, 2011 5:15 PM
To: Robert Roy; Geoff West
Cc: Cris Hein
Subject: Bull Hill Wind Project

Greeting Bob and Geoff,

Thanks for contacting me and inquiring about a potential curtailment project for reducing bat fatalities at your proposed Bull Hill Wind Project in Maine. Per our discussion, we (BCI) understand that the work would not likely begin until the spring of 2013, the beginning of the first full bat-activity year after project construction. BCI is very interested in working with you on this project and including this site in our research portfolio for the region. We are happy to advise on development of survey protocol and study design, and would be interested in leading project efforts. Our design for a similar study at the Sheffield project seems appropriate for this proposed project, but we are happy to entertain alternatives as well.

Thanks again and we look forward to discussing this project, and other efforts we're working together on, in the upcoming months.

Regards,
Ed

Edward B. Arnett, Ph.D.
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Bat Conservation International's mission is to conserve the world's bats and their ecosystems in order to ensure a healthy planet.

MAINE AUDUBON
20 Gilsland Farm Rd., Falmouth, ME 04105
(207)781-2330, www.maineaudubon.org

May 31, 2011

Maine Land Use Regulation Commission
22 State House Station
Augusta, Me 04333-0022

To Whom It May Concern:

Please consider these comments as part of the public record for Development Permit 4886, a wind energy development proposed by Blue Sky East, LLC, to be located in T16 MD, Hancock County.

Maine Audubon supports the development of wind power projects as part of an overall renewable energy plan when they are sited in locations with minimal impacts to wildlife and wildlife habitat. Maine Audubon supports this permit application, with a request that the permit be amended to address bat mortality concerns.

Because bats are so imperiled and other studies have demonstrated that bat mortality has been significantly reduced by shutting down turbines at slow wind speeds, Maine Audubon requests curtailment below 5m/sec from one-half hour before sunset to one half-hour after sunrise during critical periods for both migrant and breeding bats (from April 20th through October 15th) as a condition of the permit. If, however, the applicant can demonstrate that different curtailment conditions would be appropriate at this particular site - based on robust post-construction monitoring and analysis that is approved by both the Maine Department of Inland Fisheries and Wildlife and a third party such as Bat Conservation International - Maine Audubon supports amending the curtailment conditions of the permit accordingly.

If results show that curtailment has little effect on bat mortality, the permit may be amended to reduce or even eliminate curtailment. If results show significant losses to bats without curtailment, or if the applicant cannot come to agreement with MIDIFW about acceptable study parameters and protocols, then the curtailment recommendations should stand as a permanent part of this application. To clarify, the preliminary study design as outlined in the revised application (Exhibit 19 REVISED 5/16/2011) does not meet the criteria of a robust study design as outlined above.

We know very little about how many bats are in Maine, what their demographics are, or how additive mortality might impact populations. However, there is no evidence to suggest that Maine's bat mortality at wind developments, however low it may appear, won't translate into serious population effects. In fact, with steep declines in bat populations throughout other states in the northeast, and with pending state and federal endangered listing for several *Myotis* species, Maine may play a crucial role in providing quality roosting, breeding and migratory habitat. We believe that reducing mortality risk for bats in Maine is critical, especially with the discovery of white-nosed syndrome right here in Maine.

Curtailing wind power turbines at low speeds has been documented to significantly reduce bat mortality. Previous studies have documented a 43-93% reduction in bat mortality per night when cut in speeds where set at 5.0-6.5 m/sec (Arnett et al., 2010, Baerwald et al., 2009). For the sites in these studies, the economic cost of curtailment was no more than 1% of total annual output.

Our request for a robust study design is based on the need to bring the best available science to bear on this evolving field. We believe that having third party oversight, in addition to oversight by MDIFW, will assure that the data is both collected and analyzed in a way that provides the best information for the applicant, the agency, and the general public. Because there are multiple ways to estimate total fatality rates, small changes in assumptions about searcher efficiency or carcass removal rates can have a big impact on the resulting fatality estimate.

This request is consistent with other comments Maine Audubon has submitted to LURC in the past. Maine Audubon has been engaged with wind resource policy and development since the early 1990s, when the first industrial wind farm was proposed in the Boundary Mountains. Since that time, we have participated in several working groups and task forces, including the Governor's Task Force on Wind Power Development in Maine that was convened in 2007. Throughout our almost 20-year involvement with this emerging industry, we have consistently advocated for rightly-sited wind, where no undue adverse impacts to wildlife and wildlife habitat result from the construction of roads, pads, and transmission corridors, or from the operation of the turbines themselves.

Impacts to five key wildlife themes guide Maine Audubon's wind policy and our decision to support or oppose any given wind project. These include impacts to unique natural communities, large blocks of undeveloped habitat, significant wildlife habitat, species of conservation concern (endangered, threatened, special concern or otherwise rare), and bird and bat migration. It is also our position that reducing reliance on fossil fuels is critical to any long-term energy strategy. This position affects our support of wind power developments, along with an assessment of where developments are built and how they impact wildlife and wildlife habitat.

Thank you for your consideration.

Sincerely,

Ted Koffman　　　　Susan Gallo

Ted Koffman
Executive Director

Susan Gallo
Wildlife Biologist

<u>Literature Cited:</u>

Erin F. Baerwald, J Edworthy, M Holder,RMR Barclay. 2009. A large0sclae mitigation experiment to reduce bat fatalities at wind energy facilities. Journal of Wildlife Management, 73(7):1077-1081

Edward B. Arnett, MMP Huso, MR Schirmacher, and JP Hayes. 2010. Altering turbine speed reduces bat mortality at wind-energy facilities. Front. Ecol Environ 10.1890/100103