



2010
Spring and Fall Raptor Migration Surveys
for the Wild Meadows Wind Project
Grafton and Merrimack Counties, New Hampshire

Prepared for

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Executive Summary

During spring and fall 2010, Stantec Consulting Services Inc. (Stantec) and the Audubon Society of New Hampshire (Audubon) conducted raptor migration surveys at Atlantic Wind LLC's (Atlantic Wind) proposed Wild Meadows Wind Project (Project) in Grafton and Merrimack Counties, New Hampshire. As part of the site evaluation process for the Project, Atlantic Wind consulted with the New Hampshire Fish and Game Department (NHFGD) and the U.S. Fish and Wildlife Service (USFWS) at a meeting in Concord, New Hampshire on April 1, 2010. Raptor migration surveys were conducted at the request of NHFGD. The revised Project will include the installation of 23 wind turbines, a permanent meteorological (met) tower on Forbes Mountain, and associated infrastructure (e.g., access roads, electrical collector system, electrical substation, and an operations and maintenance building). The turbines will be 3.3 megawatt (MW) machines mounted on tubular steel towers with a hub height of 94 meters (m; 308 feet [']) and a rotor diameter of 112 m (367'). The proposed turbines will have a maximum tip height of approximately 150 m (492').

Additional wildlife surveys conducted in 2009, 2010, and 2011 at the Project include spring breeding bird surveys; spring and fall nocturnal radar surveys; spring, summer, and fall bat acoustic surveys; summer bat mist netting; and camera trap surveys. The methods and results of these surveys are presented in separate reports.

Raptor Migration Surveys

Stantec conducted raptor migration surveys in spring and fall 2010 to assess the level of raptor migration activity and seasonal species composition of raptors at the Project. Visual observation surveys¹ were conducted simultaneously by two observers (one Stantec biologist and one Audubon biologist) at two observation locations (west observation site [WOS] and east observation site [EOS]) during the spring and fall 2010. The landscape features, and airspace above, that are visible from the survey locations were considered the Study Area. Therefore any raptor observed was within the Study Area, and raptors were further classified as inside of or outside of the Project area. More specifically, the Project area refers to the proposed turbine locations along the ridge. These designations of Study Area and Project area are consistent with other studies conducted at proposed wind projects in the region. The EOS is located inside the Project area. The WOS was considered inside the Project area in 2009 but as of 2013 is now outside, but in the vicinity of, the currently proposed Project area. Raptors observed flying over the WOS or outside the current proposed Project area have been considered to be outside of the Project area for the purposes of this report. Survey methods were based on standard methodologies used for raptor migration surveys at

¹ Raptor migration surveys are visual surveys, therefore estimates of location, distance, and height are determined based on the observer's best estimate from the survey location; numeric results provided in this report are only as accurate as observers' estimates in the field.

wind development sites in the region. The timing of surveys targeted seasonal and daily peak periods during raptor migration. The results of the spring and fall 2010 surveys represent a sample of raptor migration activity in the vicinity of the Project area and provide site-specific species composition and behavioral data for migrants and seasonally local raptors during baseline conditions at the Project.

Spring 2010

Stantec conducted spring raptor migration surveys on 11 days from April 15 through May 26, 2010. Surveys were conducted simultaneously with two observers at two observation locations, resulting in a total of 22 observation days (11 days at the WOS – Melvin Mountain, and 11 days at the EOS – Grants Pond and Tinkham Hill). Because the surveys were simultaneous, there were a few instances when the same individual raptors were counted by both observers. Tinkham Hill was surveyed only one day and after that day, the Grants Pond location was used as it provided better visibility. A total of 152.75 hours were surveyed between the observations sites (75.75 hours at the WOS and 77 hours at the EOS).

Over the course of the survey period, a total of 266 observations of raptors were made from both locations combined (62 observations from the WOS site and 204 observations from the EOS). Five of these observations were simultaneous between the observers at the WOS and EOS; therefore, these birds were double-counted in the total raptors observed.

The seasonal passage rate for WOS site was 0.82 raptor observations per hour (raptors/hr). The seasonal passage rate for the EOS was 2.65 raptors/hr. The majority of birds observed were suspected to be seasonally local birds based on their behaviors and activity.

Of the 266 total raptor observations made within the Study Area from both observation sites combined, 174 (65%) observations occurred within the Project area. Specifically, 6 (10%) of the 62 raptor observations documented from the WOS occurred in the Project area, and 168 (82%) of the 204 raptor observations documented from the EOS occurred in the Project area. All other observations occurred either over hills, peaks, or valleys outside of the Project area.

From the WOS (considered to be outside of the Project area as of 2013 and for the purposes of this report), 6 observations (10%) occurred within the Project area. Of these birds, 5 (83% of the 6 in the Project area) occurred at flight heights below the proposed maximum turbine height of 150 m (Note: Nearby objects with known heights, such as met towers, telecommunication towers, and trees, were used to estimate flight height). At the EOS, 168 observations (82%) occurred within the Project area. Of these birds, 142 (84% of the 168 in the Project area) occurred at flight heights below the proposed maximum turbine height.

One bald eagle (*Haliaeetus leucocephalus*) (state threatened) was observed during the spring surveys but did not fly within the Project area. Two state species of special concern, American kestrel (*Falco sparverius*) and osprey (*Pandion haliaetus*), were observed during the surveys. None of the American kestrels observed were within the Project area. Ten of the 14 ospreys observed were in the Project area, and 7 were below the proposed turbine height.

Fall 2010

Stantec conducted fall raptor migration surveys on 10 days from September 14 to October 13, 2010. Surveys were conducted simultaneously with two observers at two observation locations, resulting in a total of 20 observation days (10 days at the WOS – Melvin Mountain, and 10 days at the EOS). A total of 137.5 hours were surveyed between the observations sites (67.5 hours at the WOS and 70 hours at the EOS).

Over the course of the fall survey period, 51 observations were made from the WOS, and 295 observations were made from the EOS for a total of 346 observations combined. Five of these observations were simultaneous observations between the observers at the two different sites; therefore, these birds were double-counted in the total raptors observed.

The seasonal passage rate for the WOS was 0.76 raptors/hr; the seasonal passage rate for the EOS was 4.2 raptors/hr. At the WOS, 63 percent (n=32) of raptors observed were suspected to be actively migrating based on their flight paths and behaviors. At the EOS, for those birds where migrant or non-migrant status was known, 48 percent (n=141) were suspected to be actively migrating.

Of the 346 raptor observations made in the Study Area during the fall surveys from both observation sites combined, 71 percent (n=244) occurred within the Project area. From the WOS, 5 observations (10%) occurred within the Project area. Of these birds in the Project area, 3 birds (60%) occurred at flight heights below the proposed maximum turbine height. From the EOS, 239 observations (81%) occurred within the Project area. Of these birds, 159 (67%) occurred at flight heights below the proposed maximum turbine height of 150 m.

Four species of conservation concern were observed during the fall 2010 surveys: state endangered northern harrier (*Circus cyaneus*) (n=2), state threatened bald eagle (n=7), state species of special concern osprey (n=12), and state species of special concern American kestrel (n=7). No federally listed species were observed. Six of the bald eagle observations occurred within the Project area, and two flew at heights below the proposed turbines. One of the northern harrier observations occurred in the Project area and flew below the height of the proposed turbines. Eleven of the osprey observations occurred in the Project area, and 7 flew at heights below the proposed turbines. Location inside or outside of the Project area was not recorded for two of the American kestrel observations. Three of the American kestrel observations occurred in the Project area and were flying at heights below the proposed turbines.

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² This report was prepared by Stantec Consulting Services Inc. for Atlantic Wind LLC (a subsidiary of Iberdrola Renewables LLC). The material in it reflects Stantec's judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. Stantec accepts no responsibility for damages, if any suffered by any third party as a result of decisions made or actions based on this report.

1.0 Introduction

1.1 PROJECT BACKGROUND

Atlantic Wind LLC (Atlantic Wind) is evaluating the proposed Wild Meadows Wind Project (Project) in Grafton and Merrimack Counties, New Hampshire. The Project would include the installation of 23 wind turbines, a permanent meteorological (met) tower on Forbes Mountain and associated infrastructure (e.g., access roads, transmission, electrical substation, and operations and maintenance building) (Figure 1-1). The turbines will be 3.3 megawatt (MW) machines mounted on tubular steel towers with an approximate hub height of 94 meters (m; 308 feet [']) and a rotor diameter of 112 m (367'). The proposed turbines will have a maximum tip height of approximately 150 m (492').

As part of the site evaluation process for the proposed wind energy project, Atlantic Wind consulted with the New Hampshire Fish and Game Department (NHFGD) and the U.S. Fish and Wildlife Service (USFWS) at a meeting in Concord, New Hampshire on April 1, 2010. Atlantic Wind contracted Stantec Consulting Services Inc. (Stantec) and the Audubon Society of New Hampshire (Audubon) to conduct raptor migration surveys.

Additional wildlife surveys conducted by Stantec in 2009, 2010, and 2011 at the Project included spring breeding bird surveys; spring and fall nocturnal radar surveys; spring, summer, and fall bat acoustic surveys; summer bat mist netting; and camera surveys. The methods and results of these surveys are presented in separate reports. This document summarizes the spring and fall 2010 raptor migration survey that was conducted jointly by Stantec and Audubon. This report was revised September 2013 after the turbine type and layout for the Project were finalized.

1.1.1 Project Area Description

Based upon characterized ecoregions of northern New England and New Hampshire, the Project is located within the Vermont-New Hampshire Upland section and the Sunapee Uplands subsection (Sperduto and Nichols 2004). The Sunapee Uplands subsection is characterized by hills and peaks, principally of granite, that are interspersed with small lakes and narrow stream valleys. Topography of this area is generally moderate, and soils are stony, shallow and nutrient poor.

Peaks located partially or entirely within the Project include Braley Hill (635 m; 2,083'), Tinkham Hill (692 m; 2,270') and the Pinnacle (604 m; 1,981') on the western portion of the Project. Forbes Mountain (658 m; 2,159') and Pine Hill (638 m; 2,091') make up the eastern portion of the Project. Tinkham Hill and Braley Hill are generally oriented northeast to southwest and Forbes Mountain is a narrow north-northeast, south-southwest oriented ridgeline. The peaks range in elevation from 604 m (2,100') to 692

m (2,270) at their highest points. Located west and outside of the Project area, Barber Mountain (651 m; 2,136'), Melvin Mountain (660 m; 2,165'), and Sheppard Hill (550 m; 1,640') were originally part of the Project area but as of the 2013 design, were dropped from the project layout.

Because of the moderate elevation, the dominant tree species in the Project area are hardwood species including sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), and American beech (*Fagus grandifolia*). These tree species are typical of northern hardwood – conifer forest, which is the most common forest community in the northern half of the state of New Hampshire. Conifer species such as red spruce (*Picea rubens*) and balsam fir (*Abies balsamea*) are present, but are generally limited to the ridge summits. On the majority of Project ridgelines, conifer species are mixed with the more dominant hardwood species, or occur as small patches within the hardwood dominated landscape. Common understory species include regenerating canopy species (e.g., sugar maple, yellow birch, and American beech), hobblebush (*Viburnum lantanoides*), striped maple (*Acer pensylvanicum*), and white birch (*Betula papyrifera*). The Project area ridgelines all show signs of timber harvesting activities as evidenced by skidder trails and cuts in various stages of regeneration.

Raptor Migration Survey Study Area

Spring and fall 2010 raptor surveys were conducted from two observation locations: the West Observation Site (WOS) – Melvin Mountain, and the East Observation Sites (EOS) – Grants Pond and Tinkham Hill³ (Figure 1-1). The landscape features, and airspace above, that were visible from the survey locations were considered the Study Area. The Study Area is depicted by the red lines in Figure 1-1. Any raptor observed during the study was within the Study Area, and raptors were further classified as inside of or outside of the Project area. More specifically, the Project area refers to the proposed turbine locations. The EOS is located inside the Project area. The WOS was considered inside the Project area in 2009, but as of 2013 is outside, but in the vicinity of, the currently proposed Project area. For this report, raptors observed flying over the WOS, or outside the current proposed Project area, are considered outside of the Project area. For this report, the Project area is the current proposed turbine areas, as depicted in Figure 1-1. .

West Observation Site (WOS)

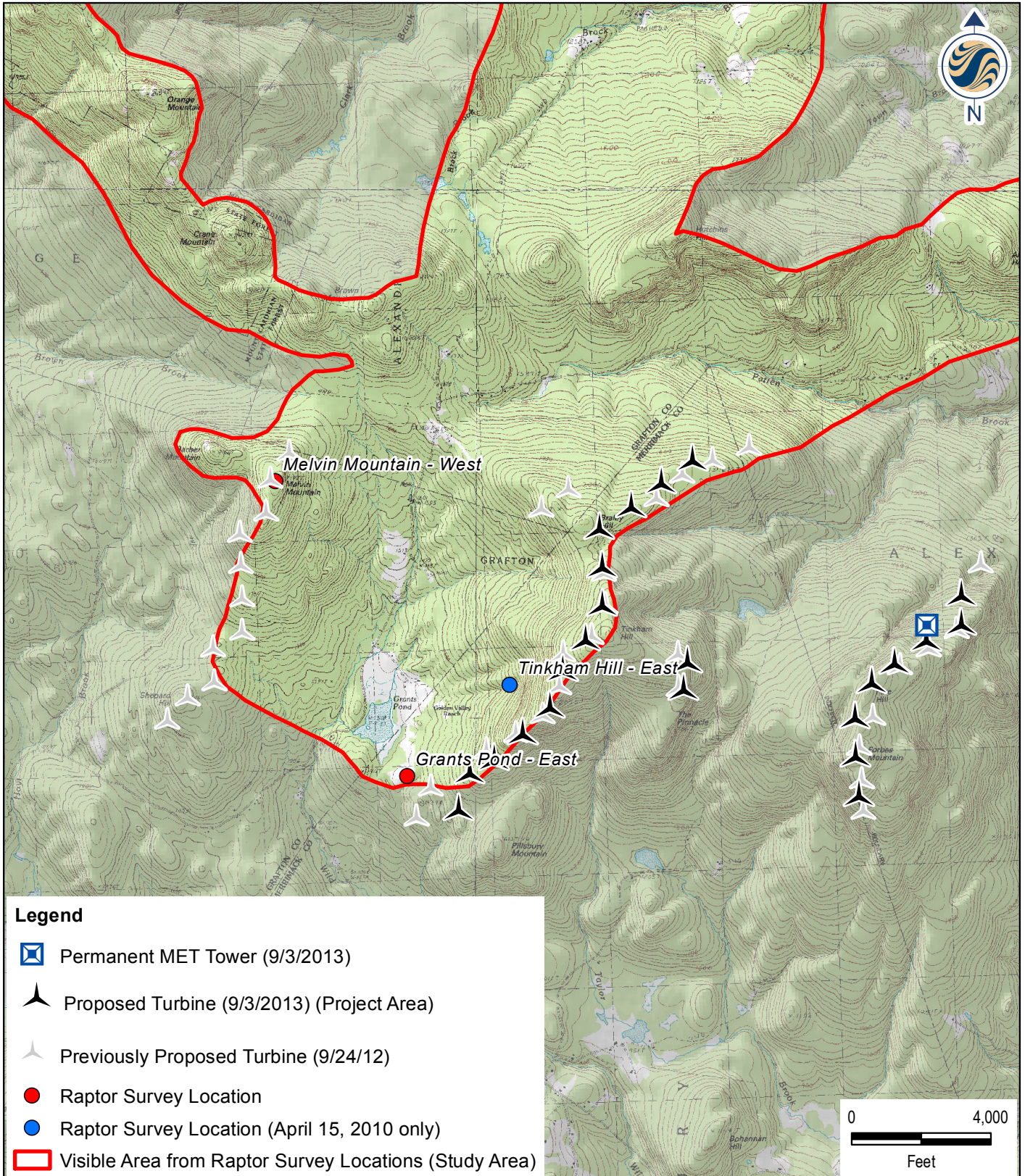
Surveys at the WOS were conducted from the temporary meteorological (met) tower clearing on Melvin Mountain. The clearing on Melvin Mountain provides good views to the north, northeast, and east. To the west, only the summit of Barber Mountain is visible through the tree line at the edge of the observation clearing. The view to the north overlooks much of Mount Cardigan State Park, including the southern ridgeline along Orange, Crane, and Brown Mountains. To the east, the valley between Melvin

³ Only one survey day in the spring (April 15) was conducted at Tinkham Hill; there were no surveys conducted at Tinkham Hill in the fall. All other surveys at the EOS were conducted from Grants Pond due to better visibility at that location.

Mountain and Tinkham Hill, including the northern half of Tinkham Hill and Braley Hill, are visible. Grants Pond is not visible from this location due to the tree line at the temporary met tower clearing (Figure 1-1).

East Observation Site (EOS)

Surveys at the EOS were conducted from the south end of the field adjacent to Grants Pond. From this location, the temporary met towers on both Melvin Mountain and Tinkham Hill are visible. This location affords an excellent view of the entire southeastern slope of Melvin Mountain, as well as the southwest slope of Tinkham Hill, southern portions of Tinkham Hill, and the valley between the two peaks (Figure 1-1).



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Client/Project
 Atlantic Wind LLC
 Wild Meadows Wind Project
 Merrimack & Grafton Counties, New Hampshire

Figure No.

1-1

Title

Study Area Location Map

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2.0 Raptor Survey Objectives and Methods

2.1 STUDY OBJECTIVES

During the meeting with the agencies on April 1, 2010, the USFWS and NHFGD recommended that raptor surveys be conducted at the Project area during spring and fall migration periods. The purpose of the raptor surveys was to sample migration activity within the Project area, including flight heights, flight path locations, and other flight behaviors of all raptor species observed.

The spring and fall raptor migration study work plan dated March 26, 2010, was developed by Atlantic Wind and Stantec and was provided to NHFGD and USFWS on March 29, 2010 and subsequently revised based on agency feedback provided during the meeting on April 1, 2010. Raptor surveys conducted at the Project utilized standard methodologies used at other proposed wind projects to sample diurnal raptor activity during the spring and fall migration seasons. The results of the surveys provide baseline species composition and behavioral data for migrants and seasonally local raptors in the area.

2.2 DATA COLLECTION METHODS

2.2.1 Field Surveys

Survey days consisted of visual observation surveys⁴ during seven consecutive hours between 9 am and 4 pm, during the peak hours of thermal development and raptor activity. Surveys were conducted simultaneously from each observation location, with one Stantec biologist at the WOS, and one Audubon biologist at the EOS. During surveys, the observer scanned the sky and surrounding landscape by naked eye or with binoculars. Each raptor observation, or pass, was documented. Each time a bird was observed, it was recorded, regardless of whether it was suspected to be a local bird observed previously. Therefore, daily count totals include all passes of birds observed throughout a survey day. Detailed information for each observation was recorded on standardized data sheets, including:

- Observation date and time;
- Species,⁵ number of individuals, and age (if possible);
- Location of each bird depicted on a topographical map;

⁴ Raptor migration surveys are visual surveys, therefore estimates of location, distance, and height are determined based on the observer's best estimate from the survey location; numeric results provided in this report are only as accurate as observers' estimates in the field.

⁵ Birds that flew too rapidly or were too far away to accurately identify were recorded as unidentified to their genus or, if the identification of genus was not possible, unidentified raptor.

- Flight height⁶ and behaviors observed in each of the topographical positions where birds occurred (Figure 2-1);⁷ and
- General flight direction of each bird.

Observations of non-raptor species, including passerines and water birds, were documented by observers, and the incidental data are provided in Sections 2.4.9 and 2.5.9.

Topographical flight positions were summarized into categories that describe the landscape surrounding the observation site. These positions apply to raptors observed within and outside of the Project area: A1) parallel to ridge, A2) perpendicular to ridge, A3) over saddle, B) flight path over upper slope of ridge, C) flight path over lower slope of ridge, and D) flight path over a valley (see Figure 2-1 below). As individual birds traveled through or in the vicinity of the Project, all position categories in which a bird occurred were recorded.

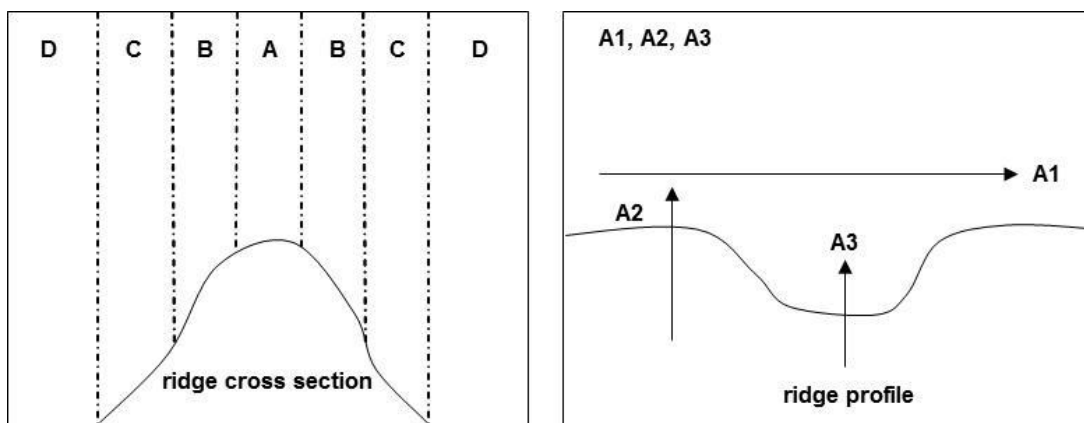


Figure 2-1. Raptor flight position categories in relation to the topography of the Study Area (codes apply to locations within and outside of Project area). A1) parallel to ridge, A2) perpendicular to ridge, A3) over saddle, B) flight path over upper slope of ridge, C) flight path over lower slope of ridge, and D) flight path over a valley.

2.2.2 Weather Data

Wind direction, wind speed, and the development of thermals largely influence raptor flight behaviors and flight paths. Therefore, the observer recorded hourly weather conditions, including wind speed and direction, temperature, sky condition, percent cloud cover, cloud type, and relative cloud height throughout the survey day.

Specific seasonal weather conditions result in accentuated raptor migration movements. Atmospheric instability and updrafts are conditions that accompany low pressure systems and storms, and raptors will move in advance of these conditions (Drennan 1981). Additionally, soaring on southerly winds is more efficient for northbound migrants in the spring (Drennan 1981), and soaring on northerly winds is more efficient for

⁶ Nearby objects with known heights, such as met towers, telecommunication towers, and trees, were used to estimate flight height.

⁷ As individual birds traveled through or in the vicinity of the Project, all topographical position categories (Figure 2-1) in which a bird occurred were recorded.

southbound migrants. In order to consider the atmospheric influences on raptor activity during the days that were sampled in spring and fall 2010, regional surface weather map images were interpreted to determine the dates that daytime pressure systems (high, low, or none) moved through the region. Surface weather maps, prepared by the National Centers for Environmental Prediction, the Hydro-meteorological Prediction Center, and the National Weather Service, were downloaded daily for the majority of the survey window. The Surface Weather Maps show station data and the analysis for 7:00 am eastern standard time (EST).

2.3 RAPTOR DATA ANALYSIS METHODS

Raptor observation data were summarized by survey day and for the spring and fall survey periods. Because there were two observation locations, data were analyzed separately (where applicable) for each observation location. Data analysis included a summary of:

- Daily and seasonal observation rates (raptors observed per hour [raptors/hr]);
- Total observations of the different species observed;
- Hourly observation totals;
- Percent of birds observed in the Study Area that occurred specifically within the Project area;
- Percent of birds suspected to be actively migrating;
- Summary of flight behaviors observed in the topographical positions of the different locations of the Study Area;
- Average minimum flight height of birds within each topographical position category; and
- Birds observed within proposed turbine areas as depicted on Figure 1-1 (and in topographical positions A, B, and C as depicted in Figure 2-1) and the percent of birds observed below 150 m (492'), the height of the proposed turbines.

2.4 Spring Survey Effort and Results

2.4.1 Spring Survey Effort

Simultaneous surveys from the WOS and EOS were conducted on 11 days from April 15 through May 26, 2010. Though surveys were simultaneous, due to travel logistics there was minor variability in the total number of survey hours between the two observation sites. A total of 152.75 hours were surveyed between the two sites (75.75 hours at WOS and 77 hours at EOS). Table 2-1 summarizes the spring 2010 survey effort and results. Figure 2-2 shows the range of spring survey days, as well as the timing of peak migration movements of raptor species that typically occur in the northeast during migration.

Table 2-1. A Summary of the Spring 2010 Survey Effort and Results at the Wild Meadows Wind Project		
Survey Effort	WOS	EOS
Range of survey dates	April 15 - May 26	
No. survey days	11 simultaneous surveys	
No. survey hours	75.75	77
No. raptor species observed	10	
Raptor species observed (common name) from both observation locations combined	Scientific name	
American kestrel	<i>Falco sparverius</i>	
bald eagle	<i>Haliaeetus leucocephalus</i>	
broad-winged hawk	<i>Buteo platypterus</i>	
Cooper's hawk	<i>Accipiter cooperii</i>	
northern goshawk	<i>Accipiter gentilis</i>	
osprey	<i>Pandion haliaetus</i>	
red-shouldered hawk	<i>Buteo lineatus</i>	
red-tailed hawk	<i>Buteo jamaicensis</i>	
sharp-shinned hawk	<i>Accipiter striatus</i>	
turkey vulture	<i>Cathartes aura</i>	
unidentified accipiter	n/a	
unidentified buteo	n/a	
unidentified raptor	n/a	
Results	WOS	EOS
Total no. observations of raptors	62	204
Seasonal passage rate (raptor observations/hour)	0.82	2.65
Total no. observations of raptors within Project area (percent of total observations)	6 (10%)	168 (82%)
Total no. of observations of raptors seen in the Project area and below max turbine height (percent of total observations within Project area)	5 (83%)	142 (84%)

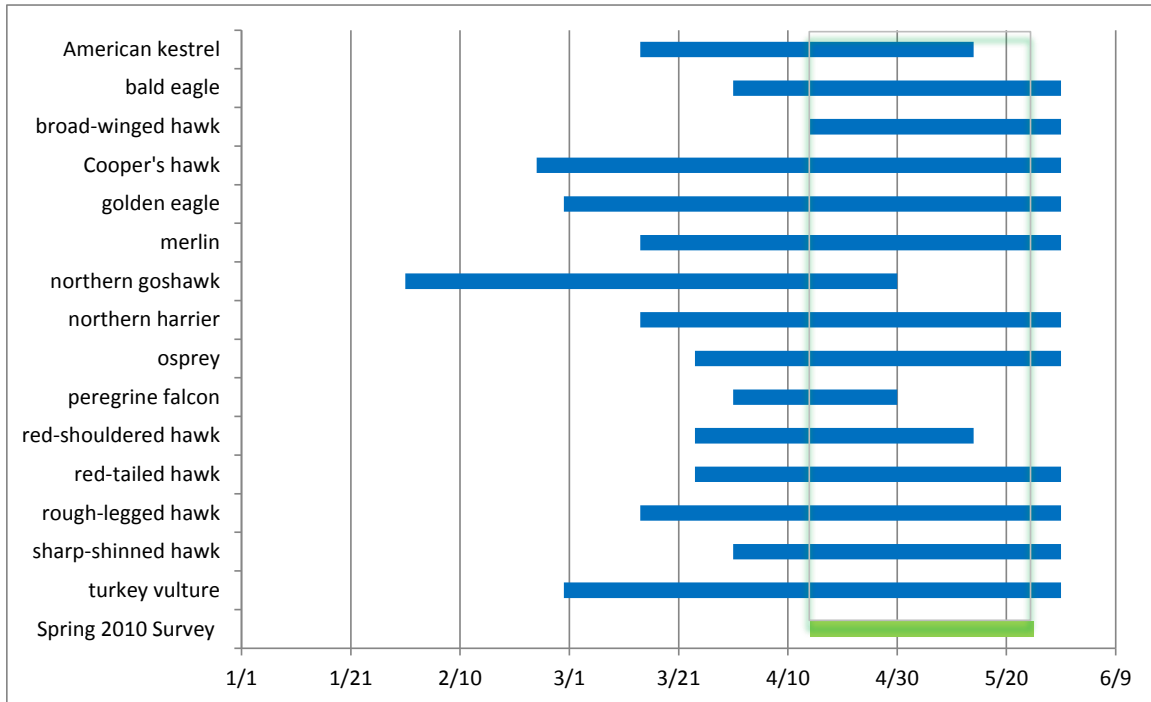


Figure 2-2. Peak movements for raptor species occurring in the northeast during spring migration. The green box represents the timing of the spring 2010 raptor surveys at the Project.

2.4.2 Spring Weather Summary

The average hourly temperature was 17° Celsius (C) (62° Fahrenheit [F]) on survey days. Temperatures ranged from 4° C to 32° C (40° to 89° F). Sky conditions were generally clear to partly cloudy. Wind direction was generally from the northwest, west, and southwest. Wind speeds ranged from calm to 19 to 24 miles per hour (mph; 30-36 kilometers per hour [kph]).

Analysis of regional surface weather maps indicated the timing of approaching low pressure systems is when raptor movements tended to be accentuated. Table 2-2 shows the wind direction and pressure system pattern on each survey date during the spring surveys.

Table 2-2. Wind Direction, Speed, and Pressure Systems during Spring 2010 Surveys at the Wild Meadows Wind Project			
Date	Wind Direction	Wind Speed*	High (H) or Low (L) Daytime Pressure System
4/15/10	N	1,2,3	H to the north, L to the south, occluded front brings rain/snow mix
4/29/10	NW	5	L in the Gulf of ME brings snow to New England, moves off by 4/29
4/30/10	NW	5	Continued clearing after 4/29
5/5/10	SW	1,2	Cold front approaching from west reaching NY by evening
5/6/10	SW	0,1,5	Cold front moves into NH bringing scattered showers
5/13/10	NW	4,5	H to the north, clear skies
5/17/10	NW	variable	H, clear, rain to the south approaching region by PM
5/18/10	E	0,2,3	L to the south approaches bringing scattered showers
5/20/10	NW	2,3,4	L in Gulf of ME, a cold front descends from the N crossing NH
5/25/10	NW	3	H clear skies
5/26/10	NW	3,4,5	H in AM, L by PM, cold front passing north to south

*Wind Speed codes 1 = 1-3 mph; 2 = 4-8 mph; 3 = 9-12 mph; 4 = 13-18 mph; 5 = 19-24 mph

2.4.3 Spring Raptor Data

Over the course of the survey period, a total of 266 observations of raptors were made from both observation locations combined (62 observations from WOS, 204 observations from EOS). Five of these observations (1 turkey vulture [*Cathartes aura*] seen on May 5, 6, 13, 18, and 1 bald eagle [*Haliaeetus leucocephalus*] seen on May 25) were simultaneous observations between the observers at the WOS and EOS. Therefore, these birds were double counted in the total number of birds observed. The seasonal passage rate for the WOS was 0.82 raptors/hr. The seasonal passage rate for the EOS was 2.65 raptors/hr.⁸ Figures 2-3a and b and Appendix A Table 1 show the daily totals of raptor species seen at the observation sites.

At the WOS (considered to be outside of the Project area as of 2013 and for the purposes of this report), daily passage rates ranged from 0.29 raptors/hr (March 25 and 26) to 1.60 raptors/hr (April 15). Daily passage rates at the EOS ranged from 0.29 raptors/hr (April 15 at Tinkham Hill) to 6.0 raptors/hr (May 6 at Grants Pond). The highest passage rate at both sites occurred on May 5, and weather that day was characterized by moderate southwest winds and a low pressure system approaching from the west.

⁸ The total number of raptors observed and the total number of survey hours at the two east observations sites were used to calculate the seasonal passage rates.

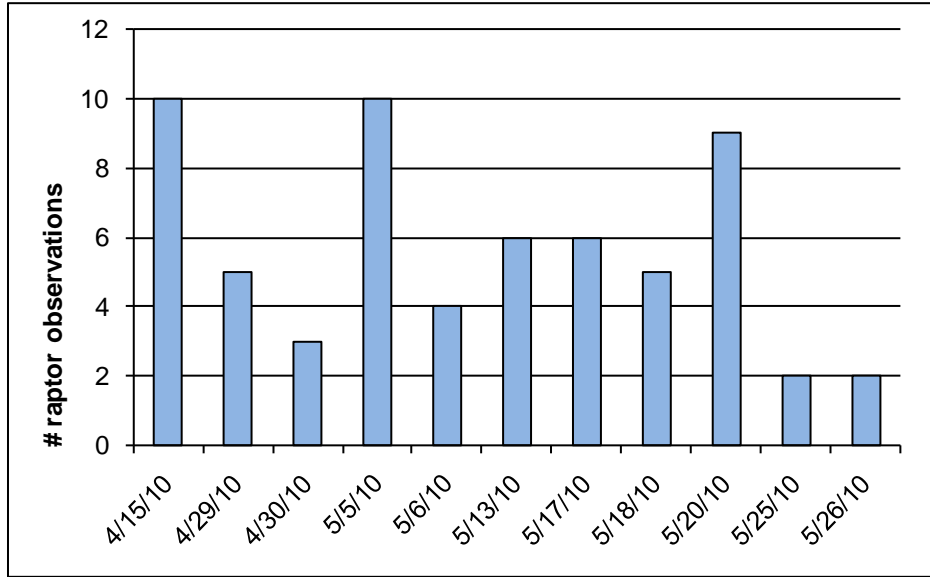


Figure 2-3a. Total raptor observations by survey day at WOS during spring 2010 surveys at the Wild Meadows Wind Project.

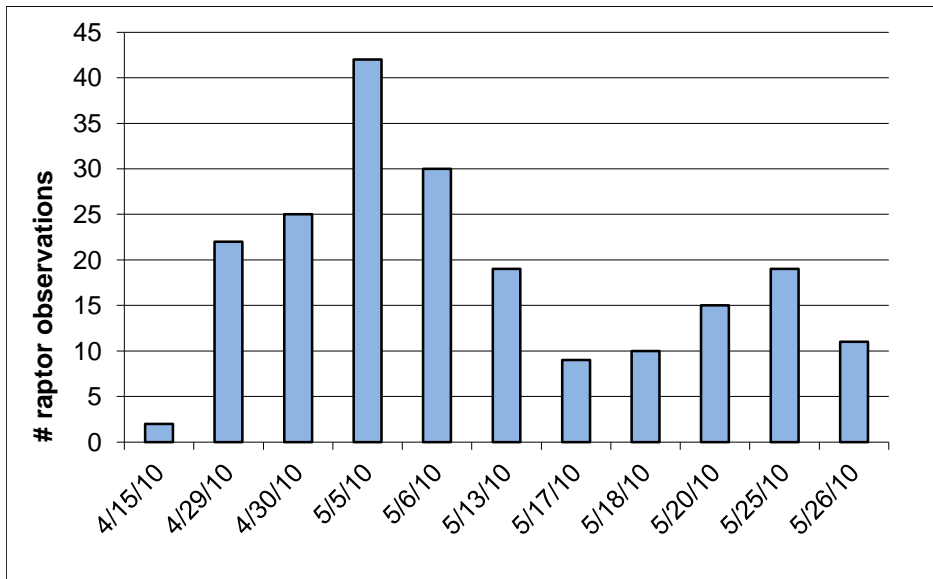


Figure 2-3b. Total raptor observations by survey day at EOS during spring 2010 surveys at the Wild Meadows Wind Project.

Ten species of raptors were observed (not including unidentified accipiter, unidentified buteo, and unidentified raptor) at both observation locations combined (Figures 2-4a and b, Appendix A Table 1).

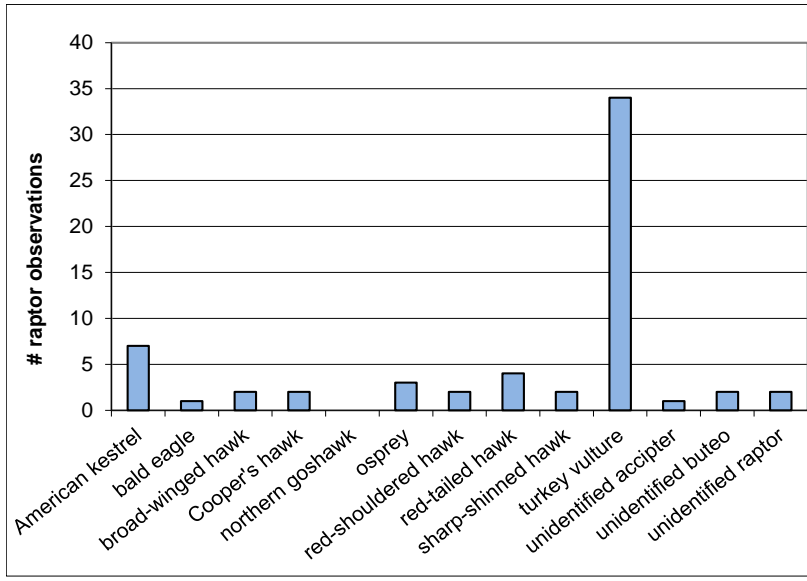


Figure 2-4a. Number of observations of raptor species observed from the WOS during spring 2010 surveys at the Wild Meadows Wind Project. Please note, only 9 species were observed at each of the observation locations, but the two sites combined resulted in 10 species observed.

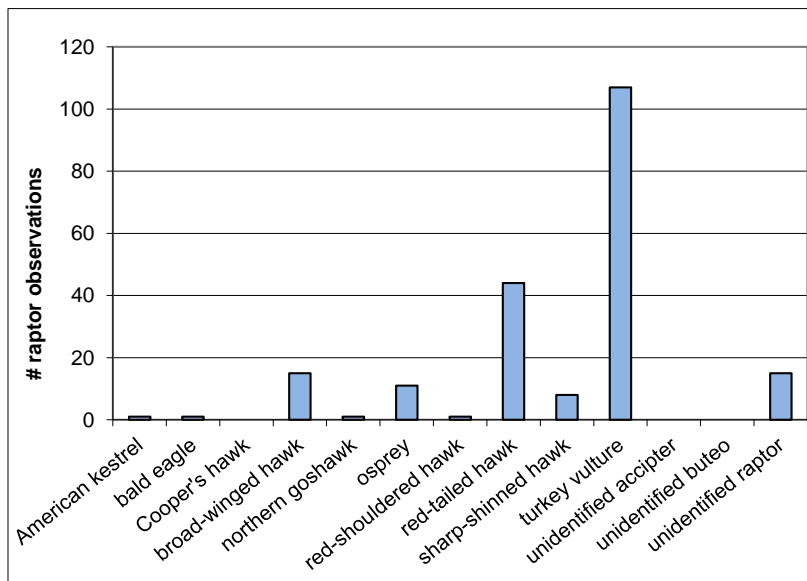


Figure 2-4b. Number of observations of raptor species observed from the EOS during spring 2010 surveys at the Wild Meadows Wind Project. Please note only 9, species were observed at each of the observation locations, but the two sites combined resulted in 10 species observed.

At the WOS, turkey vultures (n=34, 55%) and American kestrel (*Falco sparverius*; n=7, 11%) were the most commonly observed species. At the EOS, turkey vultures were the most commonly observed species (n=107, 52%), followed by red-tailed hawk (*Buteo jamaicensis*; n=44, 22%).

2.4.4 Spring Hourly Observations

At the WOS, the timing of peak raptor movements during survey days occurred between 1:00 and 2:00 pm, with a smaller peak earlier in the day between 10:00 and 11:00 am (Figure 2-5a, Appendix A Table 2). At the EOS, observations peaked between 12:00 and 1:00 pm (Figure 2-5b, Appendix A Table 2).

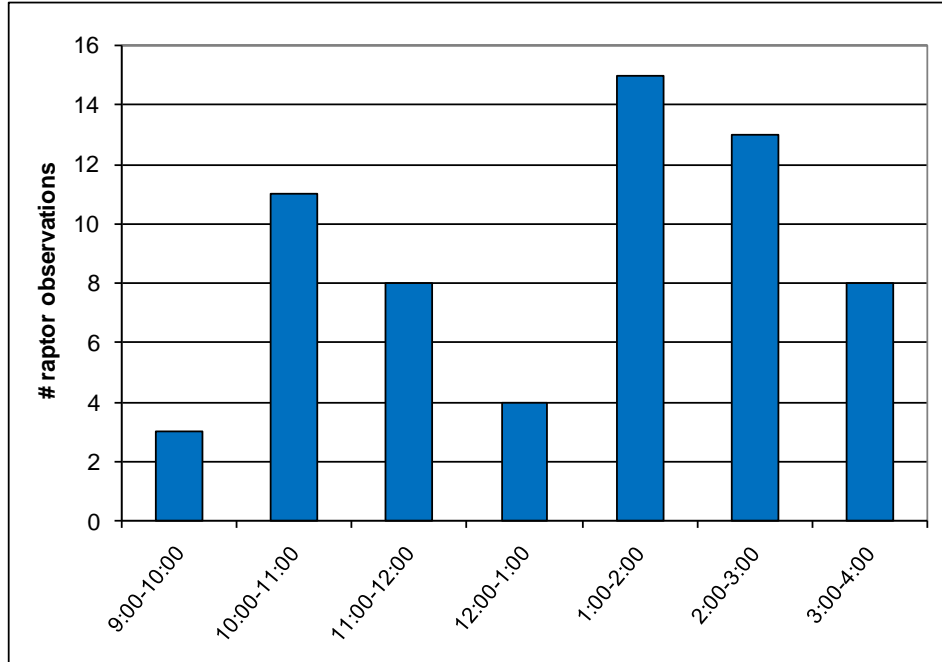


Figure 2-5a. Number of observations of raptors per survey hour observed from the WOS during spring 2010 surveys at the Wild Meadows Wind Project.

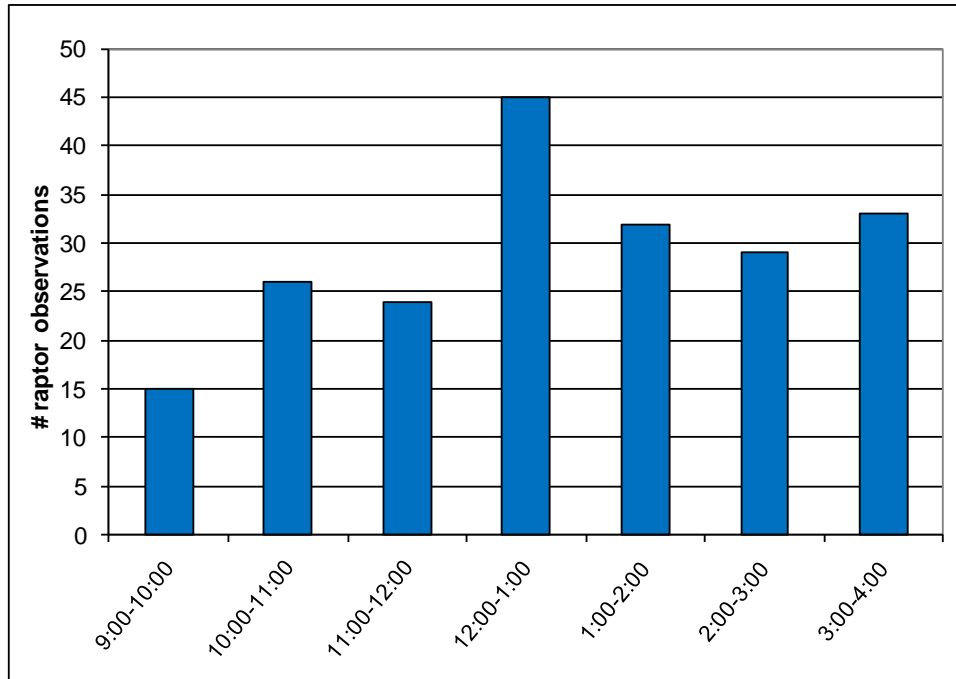


Figure 2-5b. Number of observations of raptors per survey hour observed from the EOS during spring 2010 surveys at the Wild Meadows Wind Project.

2.4.5 Spring Raptor Flight Path Locations

Of the 62 raptor observations made from the WOS, 6 (10%) occurred within the Project area (Appendix A Tables 3 and 4). Of the 204 raptor observations made from the EOS, 168 (82%) occurred within the Project area (Appendix A, Tables 3 and 4). Within the Study Area, the majority of raptors seen from the WOS occurred in the vicinity of Melvin Mountain which as of 2013 is no longer considered to be part of the Project area (Figure 2-6a, Appendix A Table 3; n=35, 56%). Within the Study Area, the majority of raptors seen from the EOS occurred in the vicinity of Tinkham Hill (Figure 2-6b, Appendix A Table 3; n=153, 75%). It is important to note raptors observed at, or in proximity to, either observer would have a greater chance of being spotted than those raptors flying at greater distances away from the observer.

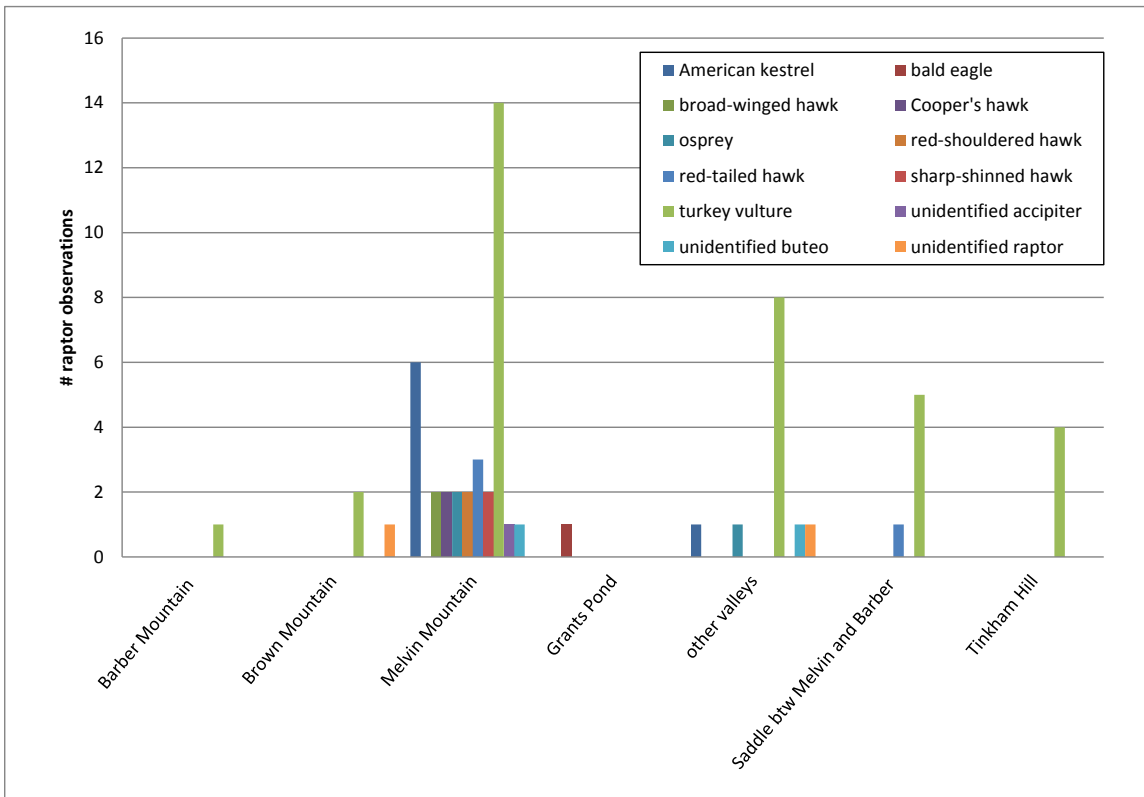


Figure 2-6a. Number and locations of raptor species observed from the WOS during spring 2010 surveys at the Wild Meadows Wind Project. Note: Surveys were conducted at Melvin Mountain and raptors observed at, or in proximity to, Melvin Mountain would have been more likely observed than those raptors flying over different locations in the Study Area.

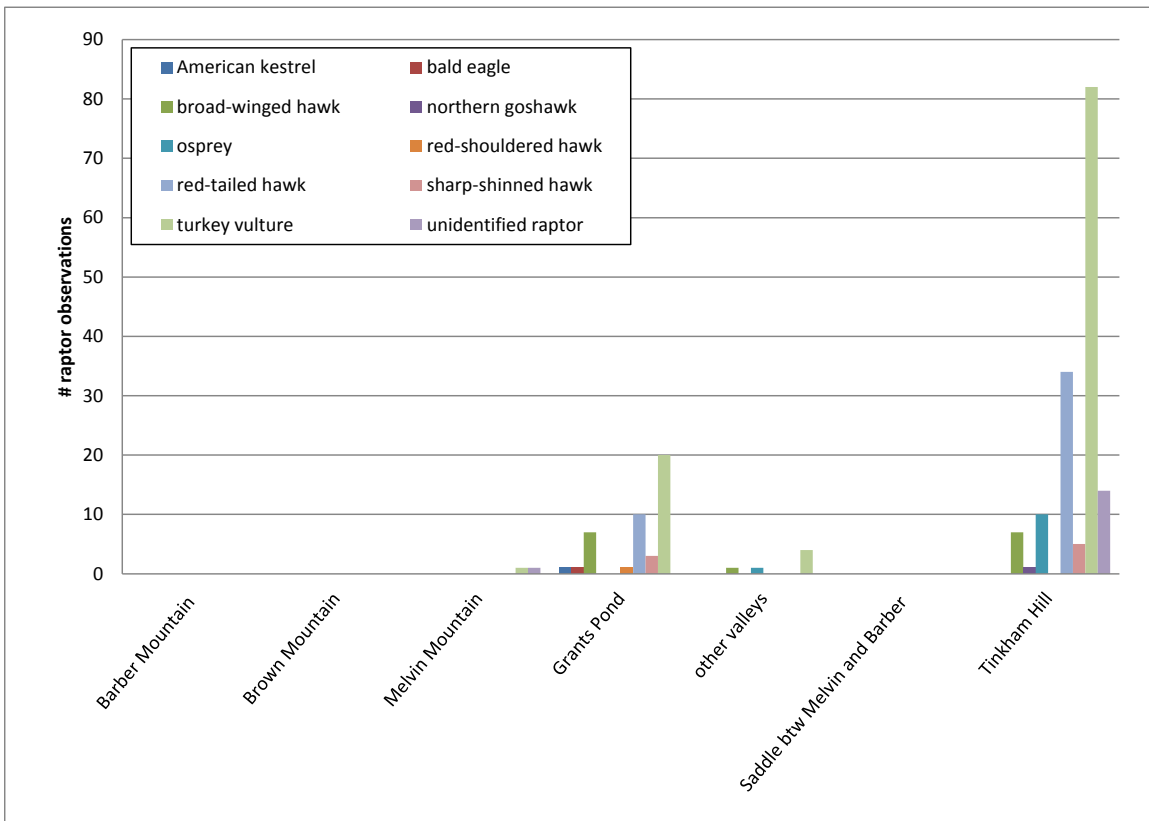


Figure 2-6b. Number and locations of raptor species observed from the EOS during spring 2010 surveys at the Wild Meadows Wind Project. Note: Surveys were conducted at Grants Pond and Tinkham Hill and raptors observed at, or in proximity to, these locations would have been more likely observed than those raptors flying over different locations in the Study Area.

2.4.6 Spring Raptor Behaviors

Raptor behaviors observed in the topographical positions of different Study Area locations (Figure 2-1) are summarized in Table 2-3. There are more behavior observations than total raptors observed because some raptors exhibited multiple behaviors while passing through several topographical positions of the Study Area.

Table 2-3. Raptor Behaviors Summarized by Location in Study Area and Flight Position as Seen from WOS and EOS, Spring 2010																																
WOS																																
Location in Study Area	Behavior	Soaring, Gliding					Powered Flight					Foraging Behaviors					Territorial or courtship behavior					Perched										
	Flight position where behavior observed	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	
	Barber Mountain	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brown Mountain	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Saddle btw Melvin and Barber Mtns	0	3	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Melvin Mountain	14	8	2	15	8	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	Tinkham Hill	3	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Grants Pond	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	other valleys	4	0	0	6	7	12						1																			
	Total obs behaviors = 104	21	13	5	23	16	21	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	
EOS																																
Location in Study Area	Behavior	Soaring, Gliding					Powered Flight					Foraging Behaviors					Territorial or courtship behavior					Perched										
	Flight position where behavior observed	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	
	Melvin Mountain	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tinkham Hill	77	25	1	39	29	18	8	1	0	2	5	1	0	0	0	0	2	1	0	0	0	0	4	0	0	0	0	0	0	0	0
	Grants Pond	1	0	0	1	11	31	0	0	0	0	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	other valleys	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total obs behaviors = 270	80	25	1	40	40	55	8	1	0	2	5	5	0	0	0	0	3	1	0	0	0	0	4	0	0	0	0	0	0	0	0

Within Project area locations where raptors were observed (Barber Mountain and Tinkham Hill), the majority of birds observed were soaring or gliding over the upper slopes of the ridges, or parallel to the ridges (Table 2-3). An American kestrel was observed perched on Melvin Mountain on two occasions. Over the course of the survey season, four red-tailed hawks were observed demonstrating territorial or courtship behavior while hovering over the upper slope of Tinkham Hill (Table 2-3).

Based on their flight behaviors, raptors suspected to be actively migrating or not actively migrating are summarized in Tables 2-4a and b. A raptor was considered actively migrating if its flight path was generally direct and in a northerly direction. A raptor was suspected to be a stop-over or seasonally local bird if it was traveling in a non-direct manner and in a non-migratory direction, or if it exhibited perching or foraging flight behaviors. At the WOS, 21 percent (n=13) of raptors observed were suspected to be actively migrating (Table 2-4a). At the EOS, 12 percent (n=25) of raptors observed were suspected to be actively migrating (Table 2-4b).

Table 2-4a. Observations of Raptors Suspected to Be Actively Migrating as Seen from WOS, Wild Meadows Wind Project, Spring 2010

Species	Not Actively Migrating	Actively Migrating	Total
American kestrel	7		7
bald eagle	1		1
broad-winged hawk	1	1	2
Cooper's hawk	2		2
northern goshawk			
osprey	3		3
red-shouldered hawk		2	2
red-tailed hawk	3	1	4
sharp-shinned hawk	2		2
turkey vulture	26	8	34
unidentified accipiter	1		1
unidentified buteo	2		2
unidentified raptor	1	1	2
Total	49	13	62

Table 2-4b. Observations of raptors suspected to be actively migrating as seen from EOS, Wild Meadows Wind Project, Spring 2010

Species	Not Actively Migrating	Actively Migrating	Unknown	Total
American kestrel	1			1
bald eagle			1	1
broad-winged hawk	10	3	2	15
Cooper's hawk				
northern goshawk			1	1
osprey	1	10		11
red-shouldered hawk		1		1
red-tailed hawk	35	5	4	44
sharp-shinned hawk	5	1	2	8
turkey vulture	87	5	15	107
unidentified accipiter				
unidentified buteo				
unidentified raptor	8		7	15
Total	147	25	32	204

2.4.7 Spring Flight Heights

The average minimum flight heights of birds observed in the different topographical positions of the Study Area are summarized in Tables 2-5a and b. These summaries include birds seen within and outside of the Project area.

Table 2-5a. Number of Observations and Average Flight Heights for Each Position Category for Raptors Observed from WOS, Wild Meadows Wind Project, Spring 2010						
	A1) flight along or parallel to ridge	A2) crossed ridge	A3) flight crossed depression or saddle	B) upper slope	C) lower slope	D) over valley
No. of position observations (n=99)	23	9	9	22	16	20
Average minimum flight height (m)	102	53	21	123	188	368

Table 2-5b. Number of Observations and Average Flight Heights for Each Position Category for Raptors Observed from EOS, Wild Meadows Wind Project, Spring 2010						
	A1) flight along or parallel to ridge	A2) crossed ridge	A3) flight crossed depression or saddle	B) upper slope	C) lower slope	D) over valley
No. of position observations (n=247)	85	22	1	43	37	59
Average minimum flight height (m)	89	166	100	95	78	99

From the WOS, 6 observations (10%) occurred within the Project area in topographical positions where the turbines are to be sited (positions A, B, and C as depicted in Figure 2-1). Of these birds, 5 birds (83% of the 6 in the Project area) occurred at flight heights below the proposed maximum turbine height of 150 m (Figure 2-7a, Appendix A Table 4).

At the EOS, 168 observations (82%) occurred within the Project area in topographical positions where the turbines are to be sited (positions A, B, and C as depicted in Figure 2-1). Of these birds, 142 (84% of the 168 in the Project area) occurred at flight heights below the proposed maximum turbine height (Figure 2-7b, Appendix A Table 4).

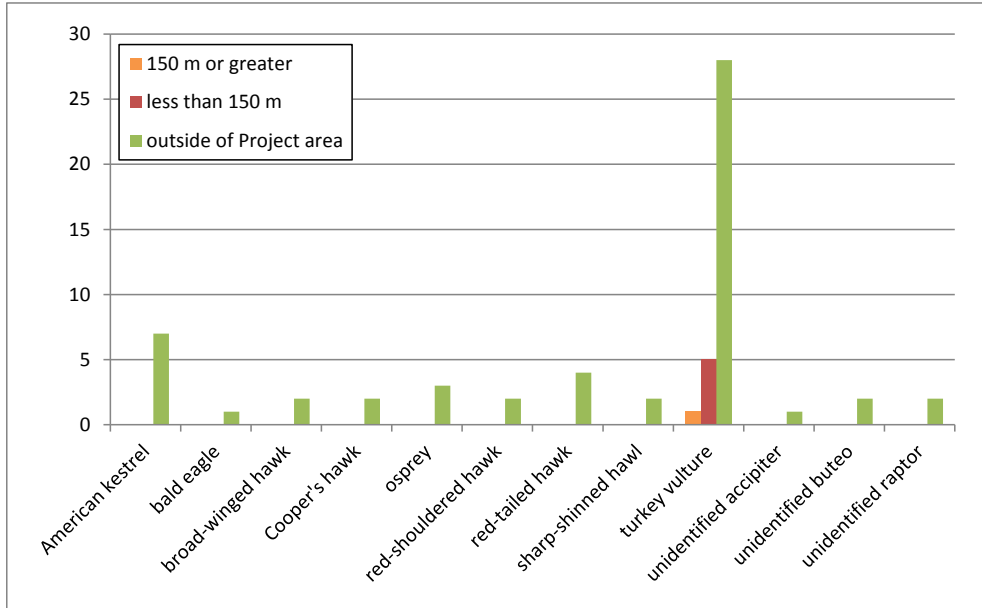


Figure 2-7a. Number of observations of raptor species observed within proposed turbine areas (positions A, B, C of slopes within Project area) at heights above and below 150 m from WOS during spring 2010 surveys at the Wild Meadows Wind Project.

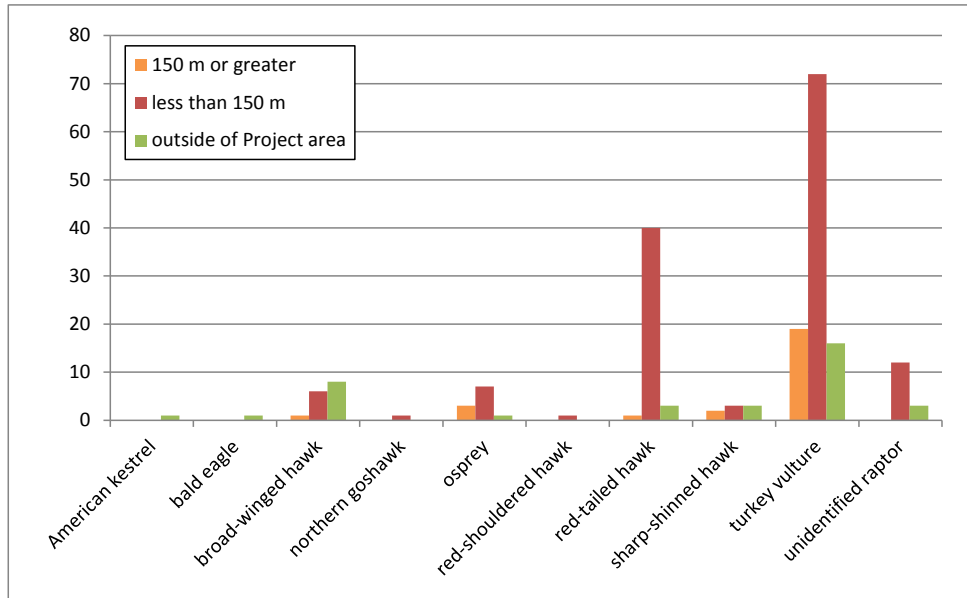


Figure 2-7b. Number of observations of raptor species observed within proposed turbine areas (positions A, B, C of slopes within Project area) at heights above and below 150 m from EOS during spring 2010 surveys at the Wild Meadows Wind Project.

2.4.8 Spring Rare Threatened and Endangered Species

No federally listed endangered or threatened raptor species were observed during the spring 2010 surveys. One state-listed threatened species, bald eagle, was observed.

The bald eagle was observed simultaneously by the observers at the WOS and EOS. The eagle was seen outside the Project area on May 25 directly over Grants Pond at a height of 100 to 500 m. The bird was flying west away from the Project area. It is unknown if the bird was actively migrating at the time; however, it was only seen once during surveys, so it was not suspected to be resident to the area.

In addition, two state species of special concern, American kestrel (n=8) and osprey (*Pandion haliaetus*; n=14), were observed during spring 2010 surveys. Seven American kestrel observations and 3 osprey observations were recorded from the WOS, and 1 American kestrel and 11 osprey observations were documented from the EOS. All eight American kestrels observed were outside the Project area. Ten of the 14 ospreys observed were in the Project area, and 7 were below the proposed turbine height.

2.4.9 Spring Incidental Bird Observations

There were 57 non-raptor avian species (not including unidentified waterfowl, unidentified passerine, unidentified buteo, or unidentified swallow) observed incidentally during the spring 2010 raptor surveys at the WOS and EOS (Table 2-6).

Spring and Fall 2010 Raptor Migration Surveys
 Wild Meadows Wind Project, NH
 July 2011 (REV October 2013)

Table 2-6. Incidental Species Observed at Observation Sites during Spring 2010 Surveys at the Wild Meadows Wind Project				
Species	Scientific Name	Melvin Mountain	Grants Pond Valley	Tinkham Hill*
American Crow	<i>Corvus brachyrhynchos</i>		X	
American Goldfinch	<i>Spinus tristis</i>		X	
American Redstart	<i>Setophaga ruticilla</i>	X		
American Robin	<i>Turdus migratorius</i>		X	
Baltimore Oriole	<i>Icterus galbula</i>		X	
Barn Swallow	<i>Hirundo rustica</i>		X	
Black-and-white Warbler	<i>Mniotilta varia</i>	X		
Black-capped Chickadee	<i>Poecile atricapillus</i>	X	X	X
Blue-headed Vireo	<i>Vireo solitarius</i>		X	
Blue Jay	<i>Cyanocitta cristata</i>	X	X	
Bobolink	<i>Dolichonyx oryzivorus</i>		X	
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	X	X	
Black-throated Green Warbler	<i>Dendroica virens</i>	X	X	
Canada Goose	<i>Branta canadensis</i>	X	X	
Cedar Waxwing	<i>Bombycilla cedrorum</i>		X	
Common Raven	<i>Corvus corax</i>	X	X	
Common Yellowthroat	<i>Geothlypis trichas</i>		X	
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	X	X	
Dark-eyed Junco	<i>Junco hyemalis</i>	X	X	X
Downy Woodpecker	<i>Picoides pubescens</i>		X	
Eastern Kingbird	<i>Tyrannus tyrannus</i>		X	
Eastern Phoebe	<i>Sayornis phoebe</i>		X	
Eastern Wood-Pewee	<i>Contopus virens</i>		X	
Great Blue Heron	<i>Ardea herodias</i>		X	
Great Crested Flycatcher	<i>Myiarchus crinitus</i>		X	
Golden-crowned Kinglet	<i>Regulus satrapa</i>	X		X
Hairy Woodpecker	<i>Picoides villosus</i>		X	
Hermit Thrush	<i>Catharus guttatus</i>	X	X	
Least Flycatcher	<i>Empidonax minimus</i>		X	
Mallard	<i>Anas platyrhynchos</i>		X	
Mourning Dove	<i>Zenaidura macroura</i>		X	
Mourning Warbler	<i>Oporornis philadelphia</i>	X		
Northern Flicker	<i>Colaptes auratus</i>	X	X	X
Northern Parula	<i>Parula americana</i>	X		
Ovenbird	<i>Seiurus aurocapilla</i>	X	X	
Pileated Woodpecker	<i>Dryocopus pileatus</i>		X	
Purple Finch	<i>Carpodacus purpureus</i>		X	
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	X	X	
Red-breasted Nuthatch	<i>Sitta canadensis</i>	X		
Red-eyed Vireo	<i>Vireo olivaceus</i>		X	
Savannah Sparrow	<i>Passerculus sandwichensis</i>		X	
Scarlet Tanager	<i>Piranga olivacea</i>	X	X	
Song Sparrow	<i>Melospiza melodia</i>		X	
Sharp-shinned Hawk	<i>Accipiter striatus</i>		X	
Tennessee Warbler	<i>Oreothlypis peregrina</i>	X	X	
Tree Swallow	<i>Tachycineta bicolor</i>		X	
Turkey Vulture	<i>Cathartes aura</i>		X	
Veery	<i>Catharus fuscescens</i>	X	X	
White-breasted Nuthatch	<i>Sitta carolinensis</i>	X	X	
Wild Turkey	<i>Meleagris gallopavo</i>		X	
Wilson's Warbler	<i>Wilsonia pusilla</i>	X		
Winter Wren	<i>Troglodytes hiemalis</i>			X
Wood Thrush	<i>Hylocichla mustelina</i>		X	
White-throated Sparrow	<i>Zonotrichia albicollis</i>	X	X	
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	X	X	
Yellow-rumped Warbler	<i>Dendroica coronata</i>	X	X	
Yellow Warbler	<i>Dendroica petechia</i>	X		
Unidentified waterfowl	N/A	X		
Unidentified passerine	N/A	X		
Unidentified buteo	N/A		X	
Unidentified swallow	<i>Hirundinidae (gen, sp)</i>		X	

*Only one survey was conducted from Tinkham Hill.

2.5 Fall Survey Effort and Results

2.5.1 Fall Survey Effort

Fall surveys were conducted on 10 simultaneous survey days from September 14 through October 13. Though surveys were simultaneous, due to travel logistics there was minor variability in the total number of survey hours between the two observation sites. There were a total 67.5 hours at the WOS, and 70 hours at the EOS. Table 2-7 summarizes the Fall 2010 survey effort and results. Figure 2-8 shows the range of fall survey days, as well as the timing of peak migration movements of raptor species that typically occur in the northeast during migration.

Table 2-7. A Summary of the Fall 2010 Survey Effort and Results at the Wild Meadows Wind Project		
Survey Effort	WOS	EOS
Range of survey dates	Sept 14 - Oct 13	
No. survey days	10 simultaneous surveys	
No. survey hours	67.5	70
No. raptor species observed	12	
Raptor Species Observed (Common Name)	Scientific Name	
American kestrel	<i>Falco sparverius</i>	
bald eagle	<i>Haliaeetus leucocephalus</i>	
broad-winged hawk	<i>Buteo platypterus</i>	
Cooper's hawk	<i>Accipiter cooperii</i>	
merlin	<i>Falco columbarius</i>	
northern goshawk	<i>Accipiter gentilis</i>	
northern harrier	<i>Circus cyaneus</i>	
osprey	<i>Pandion haliaetus</i>	
rough-legged hawk	<i>Buteo lagopus</i>	
red-tailed hawk	<i>Buteo jamaicensis</i>	
sharp-shinned hawk	<i>Accipiter striatus</i>	
turkey vulture	<i>Cathartes aura</i>	
unidentified accipiter	n/a	
unidentified buteo	n/a	
unidentified raptor	n/a	
Results	WOS	EOS
Total no. observations of raptors	51	295
Seasonal passage rate (raptor observations/hour)	0.76	4.2
Total no. observations of raptors within Project area (percent of total observations)	5 (10%)	239 (81%)
Total no. of observations of raptors seen in the Project area and below max turbine height 150 m (percent of total observations within Project area)	3 (60%)	159 (67%)

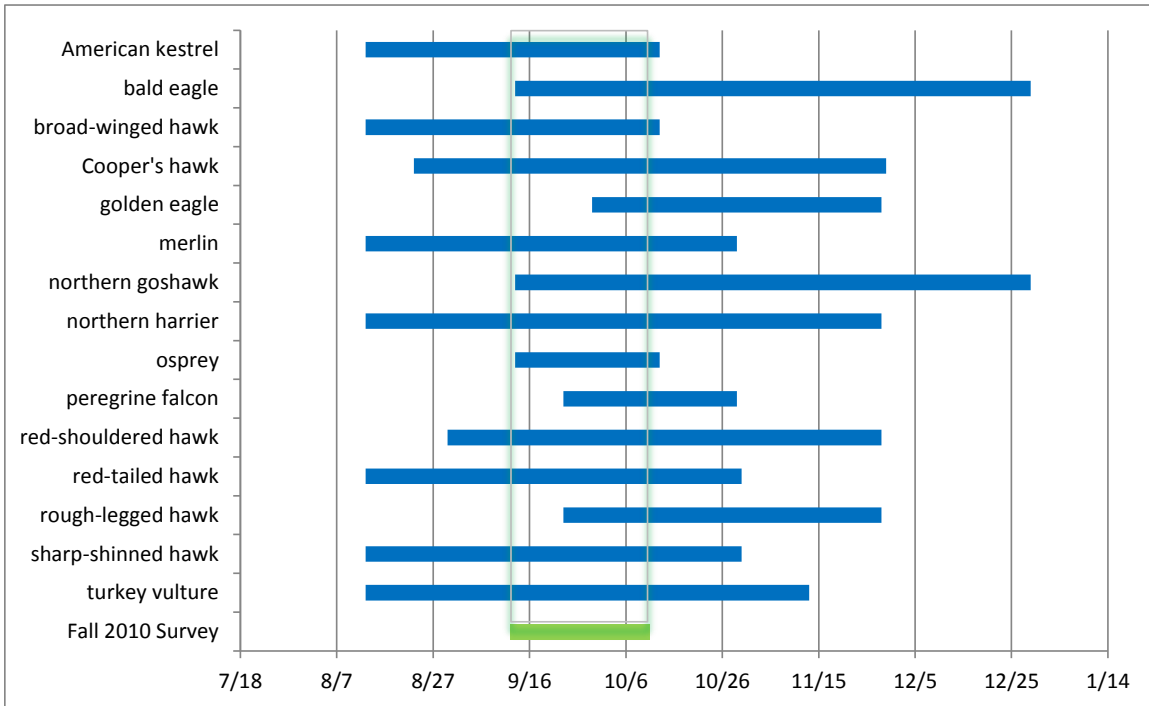


Figure 2-8. Peak movements for raptor species occurring in the northeast during fall migration. The green box represents the timing of the fall 2010 raptor surveys at the Project.

2.5.2 Fall Weather Summary

Temperatures ranged between 6° to 26° C (42.8° to 78.8° F) on fall survey days. Sky conditions were generally clear to partly cloudy; however, there were intermittent periods of fog and/or rain showers on 3 survey days (September 22, October 6, and October 7). Wind direction was predominantly from the west. Wind speeds generally ranged from 1 to 3 mph (2-5 kph) to 19 to 24 mph (30-36 kph).

Analysis of regional surface weather maps indicated the timing of approaching low pressure systems when raptor movements tend to be accentuated. Table 2-8 shows the wind direction and pressure system pattern for each survey date during the fall survey.

Table 2-8. Wind Direction, Speed, and Pressure Systems during Fall 2010 Surveys at the Wild Meadows Wind Project			
Date	Wind Direction	Wind Speed*	High (H) or Low (L) Daytime Pressure System
9/14/2010	W	2,3,4	L, front, light precipitation over region
9/15/2010	W	2,3,4	H and L, front, light precipitation over region
9/21/2010	NW	variable	H, no front, no precipitation over region
9/22/2010	variable	1,2,3	front, light precipitation over region
9/29/2010	W	3,4	H and L, front, light precipitation over region
10/6/2010	NE	4,5	L, no front, medium precipitation over region
10/7/2010	W	variable	L, front, medium precipitation over region
10/8/2010	W	4,5	front, medium precipitation over region
10/12/2010	NW	variable	H and L, front, medium precipitation over region
10/13/2010	NW	3,4	H, no front, no precipitation over region

*Wind Speed codes 1 = 1-3 mph; 2 = 4-8 mph; 3 = 9-12 mph; 4 = 13-18 mph; 5 = 19-24 mph

2.5.3 Fall Raptor Data

Over the course of the fall survey period, 51 observations were made from the WOS and 295 observations were made from the EOS. Five of these observations (one bald eagle on October 6, one bald eagle on October 7, one red-tailed hawk on October 12, and one red-tailed hawk on October 13) were simultaneous observations between the observers at the two different sites. The seasonal passage rate for the WOS was 0.76 raptors/hr; the seasonal passage rate for the EOS was 4.2 raptors/hr. Figures 2-9a and 2-9b and Appendix A Table 5 show the daily totals of raptor species for the fall season at the two observation sites.

At the WOS (considered to be outside of the Project area as of 2013 and for the purposes of this report), daily passage rates ranged from 0.14 raptors/hr (September 15 and October 6) to 2.71 raptors/hr (September 14). Daily passage rates at the EOS ranged from 0.57 raptors/hr (October 6) to 8.86 (September 29) raptors/hr. The day with the highest number of observations at the EOS occurred on September 29. Weather on this day was characterized by moderate westerly winds and a combination of high and low pressure systems bringing light precipitation to the general region. The day with the highest number of observations at the WOS occurred on September 14. The weather on this day was characterized by light westerly winds and a low pressure system bringing light precipitation to the general region. This day also coincided with the second highest number of observations at the EOS.

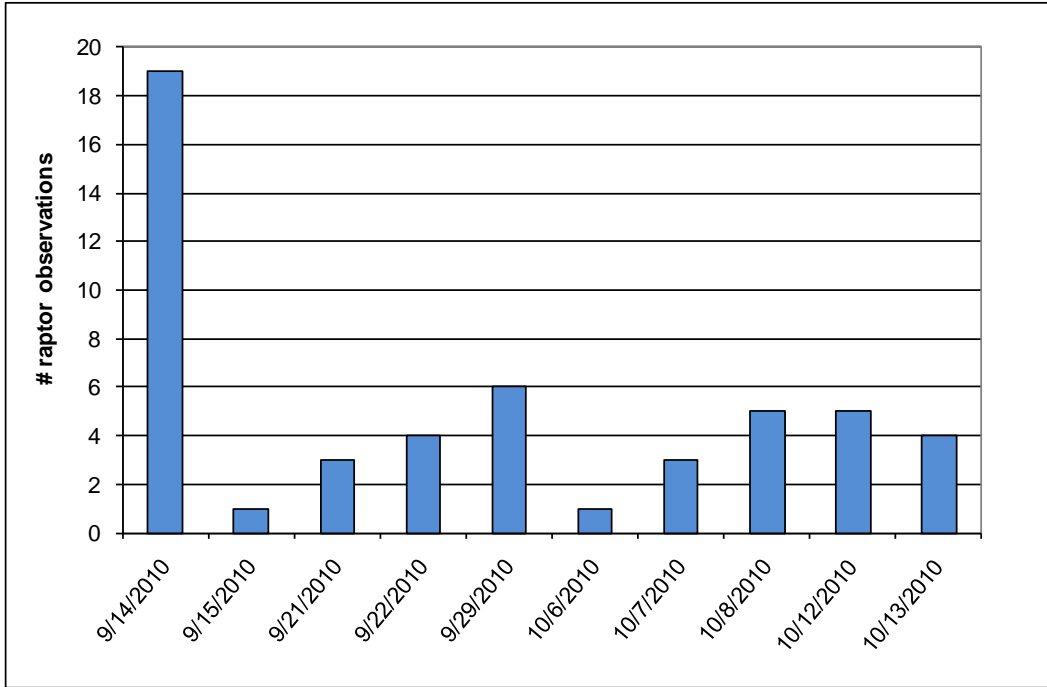


Figure 2-9a. Total raptor observations by survey day at the WOS during fall 2010 surveys at the Wild Meadows Wind Project.

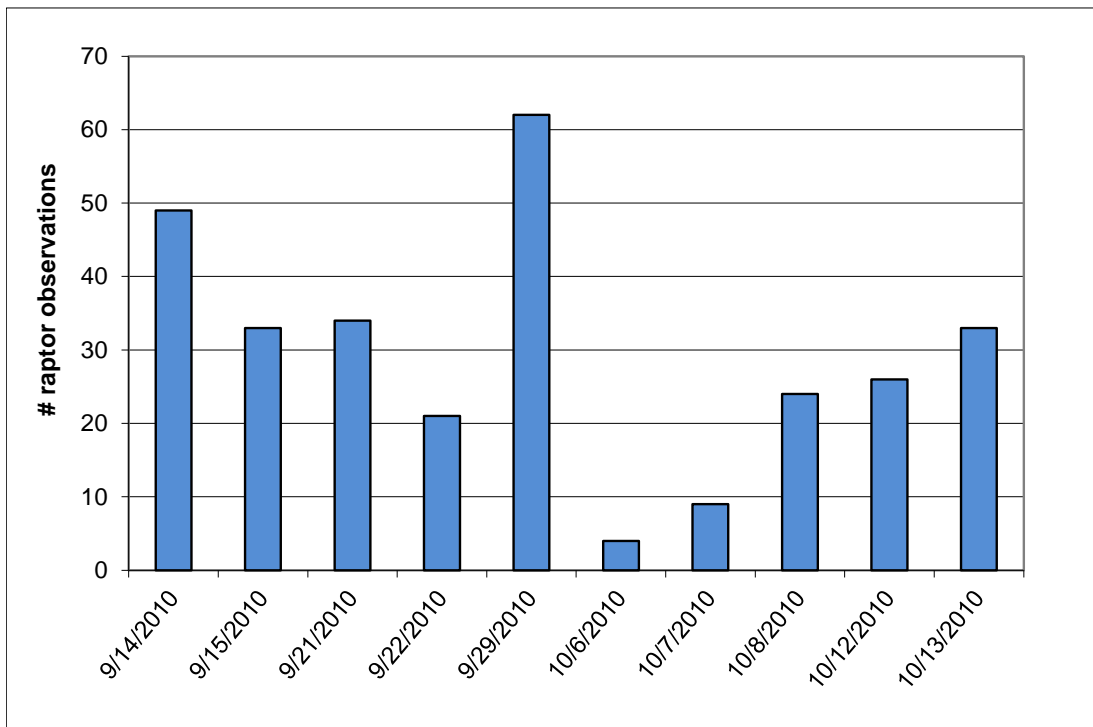


Figure 2-9b. Total raptor observations by survey day at the EOS during fall 2010 surveys at the Wild Meadows Wind Project.

There were 12 species of raptor observed from both observation sites combined (not including unidentified buteo and unidentified raptor) (Figures 2-10a and 2-10b, Appendix A Table 5).

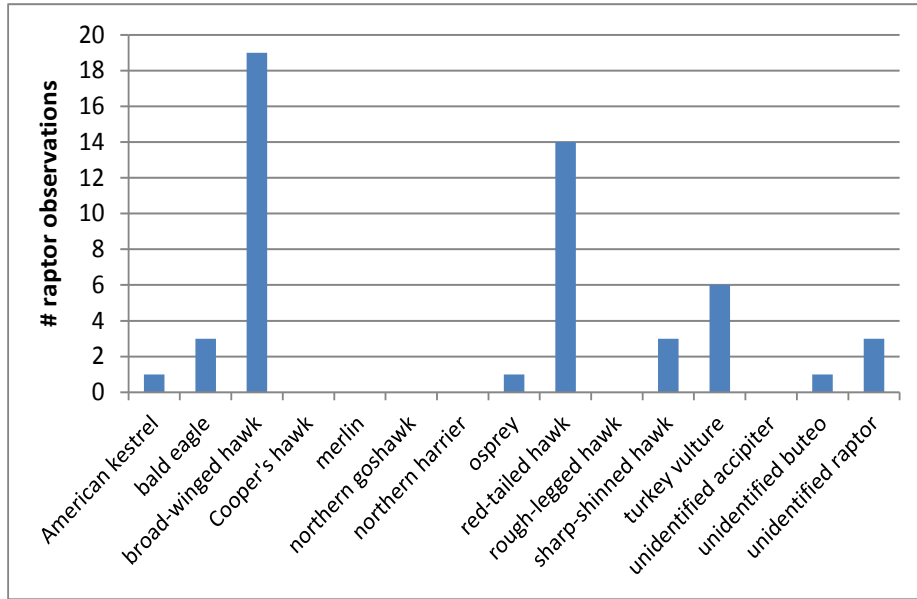


Figure 2-10a. Number of observations of raptor species observed from the WOS during fall 2010 surveys at the Wild Meadows Wind Project.

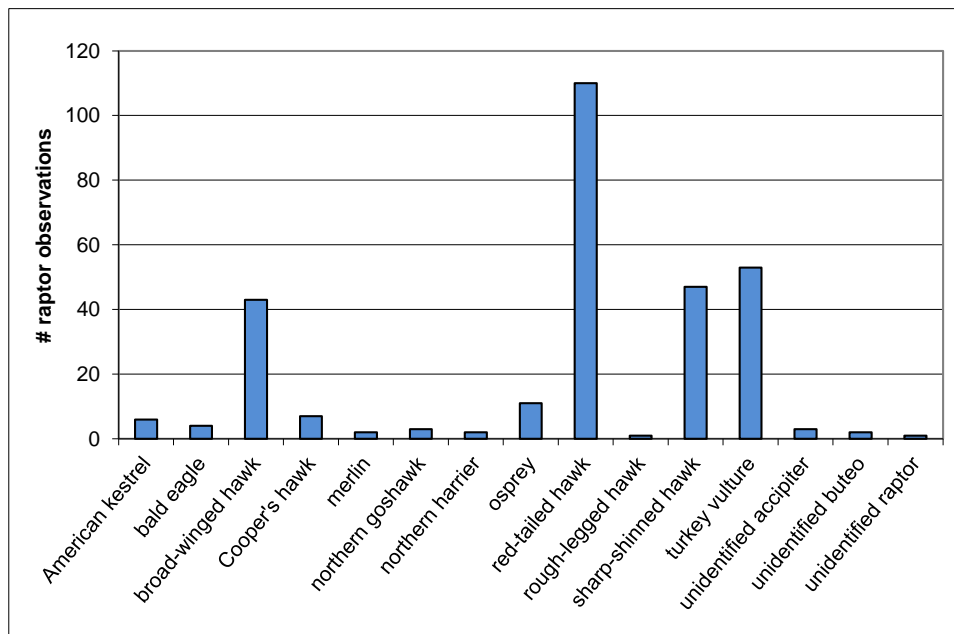


Figure 2-10b. Number of observations of raptor species observed from the EOS during fall 2010 surveys at the Wild Meadows Wind Project.

At the WOS, broad-winged hawk (*Buteo platypterus*; n=19, 37%) and red-tailed hawk (n=14, 27%) were the most commonly observed species. At the EOS, red-tailed hawks were the most commonly observed species (n=110, 37%), followed by turkey vulture (n=53, 18%).

2.5.4 Fall Hourly Observations

At the WOS, observations peaked slightly between 10:00 am and 11:00 am, with the highest peak between 3:00 pm and 4:00 pm; at the EOS, observations peaked between 10:00 am and 11:00 am then between 1:00 pm and 2:00 pm (Figures 2-11a and 2-11b, Appendix A Table 6).

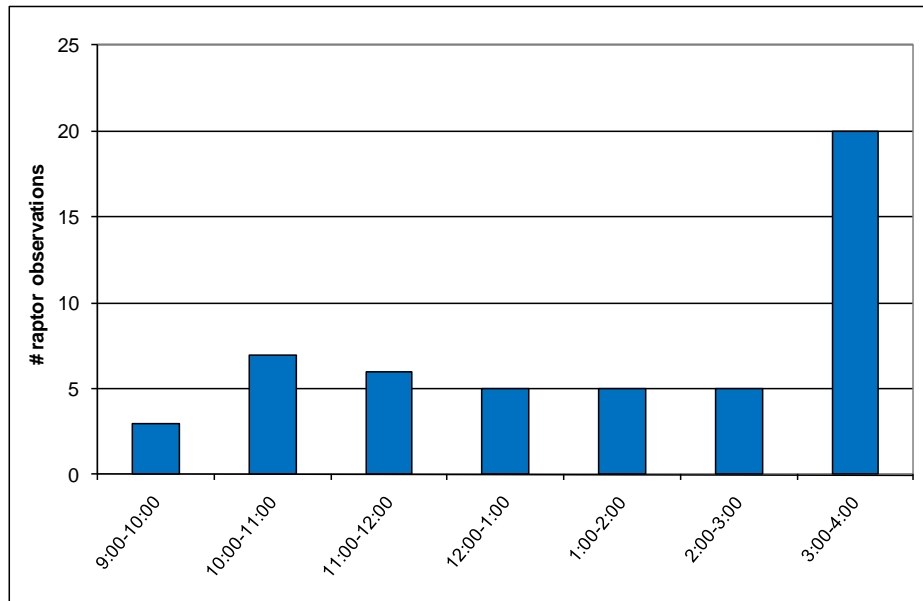


Figure 2-11a. Number of observations of raptors per survey hour observed from the WOS during fall 2010 surveys at the Wild Meadows Wind Project.

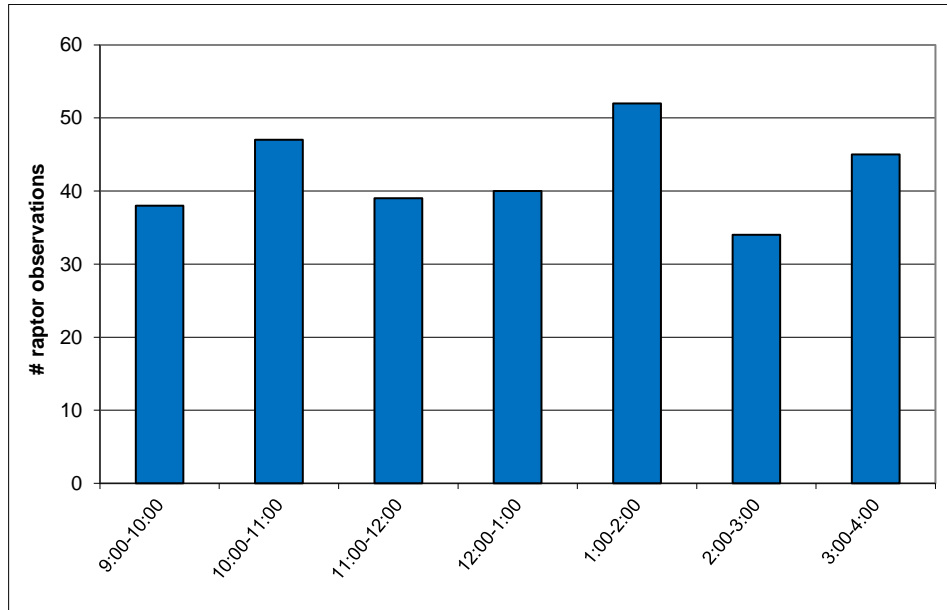


Figure 2-11b. Number of observations of raptors per survey hour observed from the EOS during fall 2010 surveys at the Wild Meadows Wind Project.

2.5.5 Fall Raptor Flight Path Locations

Of the birds seen from the WOS, the majority of birds occurred over the observation location (Melvin Mountain which as of 2013 is no longer considered to be part of the Project area; n=39; 76%) (Figure 2-12a; Appendix A Table 7). Of the birds seen from the EOS, the majority of birds occurred over Tinkham Hill (n=140; 47%) (Figure 2-12b; Appendix A Table 7). It is important to note raptors observed at, or in proximity to, either observer would have a greater chance of being spotted than those raptors flying at greater distances away from the observer.

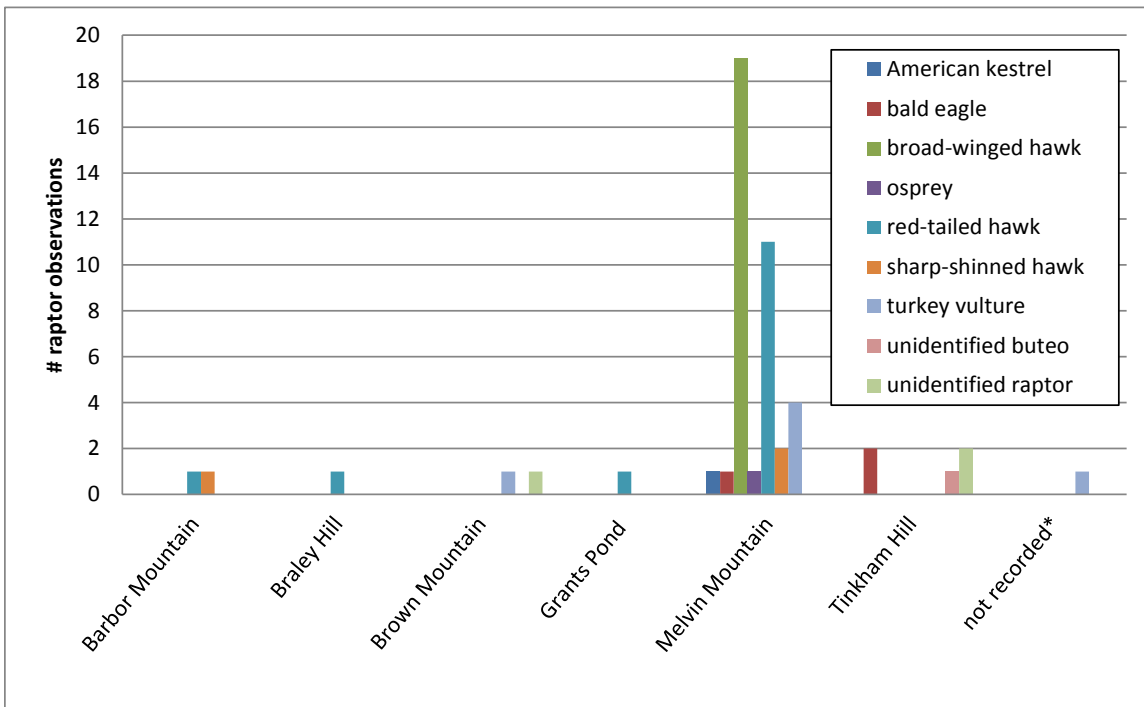


Figure 2-12a. Number and locations of raptor species observed from the WOS during fall 2010 surveys at the Wild Meadows Wind Project. Note: Surveys were conducted at Melvin Mountain thus raptors observed at, or in proximity to, Melvin Mountain would have been more likely observed than those raptors flying over different locations in the Study Area.

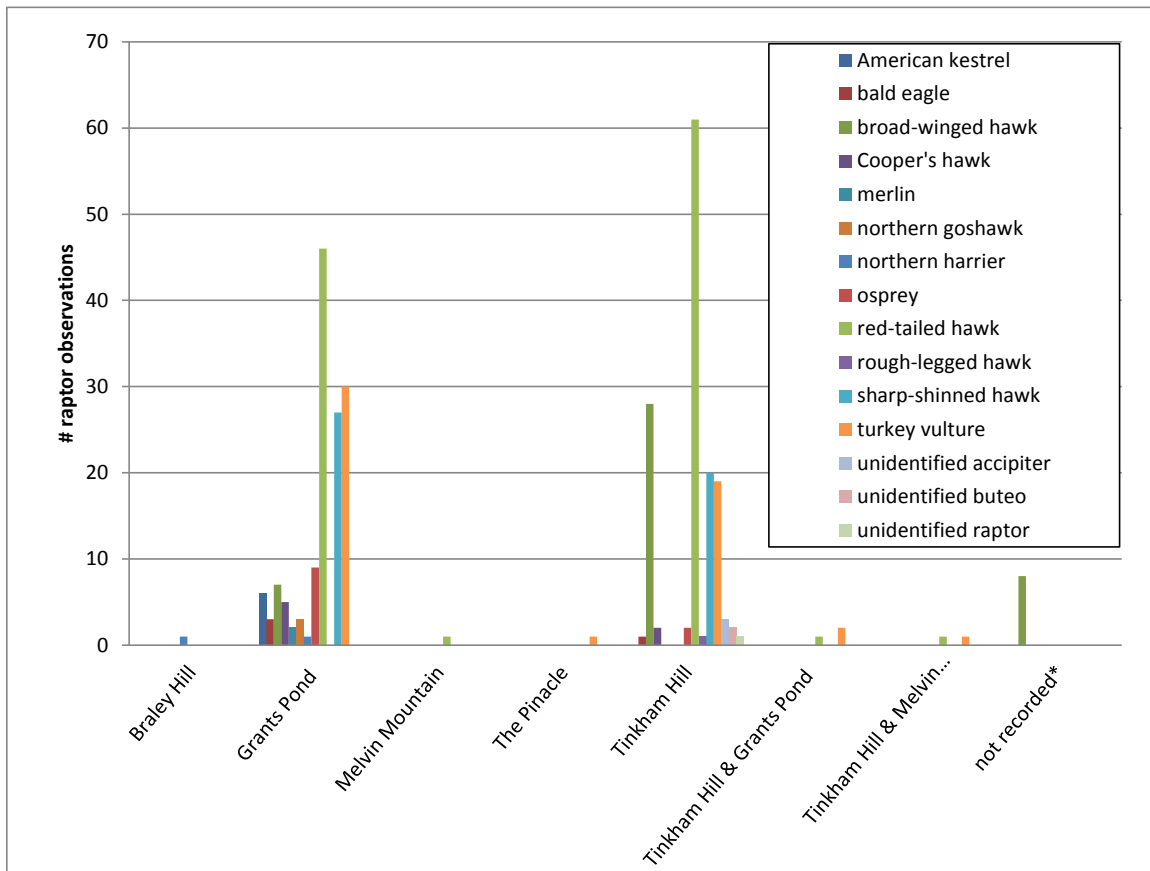


Figure 2-12b. Number and locations of raptor species observed from the EOS during fall 2010 surveys at the Wild Meadows Wind Project. Note: Surveys were conducted at Grants Pond and raptors observed at, or in proximity to, Grants Pond would have been more likely observed than those raptors flying over different locations in the Study Area.

2.5.6 Fall Raptor Behaviors

Raptor behaviors observed in the topographical positions of the Study Area (Figure 2-1) locations are summarized in Table 2-9. There are more behavioral observations than there were total raptors observed because some raptors exhibited multiple behaviors while passing through multiple topographical positions in the Study Area.

Table 2-9. Raptor Behaviors Summarized by Location in Study Area and Flight Position as Seen from WOS and EOS, Fall 2010, Wild Meadows Wind Project

		WOS																													
Location in Study Area	Behavior	Soaring, Gliding						Powered Flight						Foraging Behaviors						Territorial or Courtship Behavior						Perched					
	Flight position where behavior observed	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D
	Barber Mountain		0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Braleley Hill		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown Mountain		1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grants Pond		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melvin Mountain		30	2	2	4	3	3	2	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Tinkham Hill		2	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Total behavior obs = 64		33	2	3	7	5	5	2	0	1	0	0	0	3	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	
		EOS																													
Location in Study Area	Behavior	Soaring, Gliding						Powered Flight						Foraging Behaviors						Territorial or Courtship Behavior						Perched					
	Flight position where behavior observed	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D	A1	A2	A3	B	C	D
	Braleley Hill		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grants Pond		5	3	0	22	51	99	1	0	0	2	3	23	2	1	0	4	3	7	0	0	0	0	0	0	0	0	0	0	0	0
Location not reported		0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
The Pinnacle		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tinkham Hill		31	35	2	81	59	27	5	2	0	4	6	0	5	2	0	10	5	1	0	0	0	0	0	0	0	0	0	0	1	0
Melvin Mountain		1	2	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total behavior obs = 520		37	40	2	114	113	127	6	2	0	6	9	23	7	3	0	14	8	8	0	0	0	0	0	0	0	0	0	1	0	

Within Project area locations where raptors were observed (Barber Mountain, Braleley Hill, Grants Pond, and Tinkham Hill), the majority of raptors were soaring or gliding over the upper slopes of the ridges or parallel to the ridges (Table 2-9). One sharp-shinned hawk (*Accipiter striatus*) and two red-tailed hawks exhibited foraging behaviors over Melvin Mountain. A red-tailed hawk was observed perched on Melvin Mountain, and an unidentified raptor was seen perched on Tinkham Hill. A number of birds seen from the EOS exhibited potential foraging behaviors (hovering, kiting, aerial feeding, or low aerial hunting) over Grants Pond and Tinkham Hill. Red-tailed hawk, unidentified buteo, and rough-legged hawk (*Buteo lagopus*) demonstrated potential foraging behaviors in the vicinity of Tinkham Hill; bald eagle exhibited potential foraging behaviors in the vicinity of Grants Pond; osprey exhibited potential foraging behaviors over Grants Pond; and a red-tailed hawk was seen perched on Tinkham Hill. The only individual observed actively foraging was a red-tailed hawk at Tinkham Hill.

Based on their flight behaviors, raptors suspected to be actively migrating or not actively migrating are summarized in Table 2-10a and b. Raptors were considered actively migrating if their flight path was generally direct and in a southerly direction. Raptors were suspected to be stop-over or seasonally local birds if they were traveling in a non-direct manner and in a non-migratory direction, or if they exhibited perched or foraging flight behaviors. Of those birds seen from the WOS, 62 percent (n=32) were suspected to be actively migrating (Table 2-10a). Of those birds seen from the EOS, and for those birds for which migrant or non-migrant status was known, 48 percent (n=141) were suspected to be actively migrating (Table 2-10b).

Table 2-10a. Observations of Raptors Suspected to be Actively Migrating as Seen from WOS, Fall 2010, Wild Meadows Wind Project			
Species	Not Actively Migrating	Actively Migrating	TOTAL
American kestrel	1		1
bald eagle		3	3
broad-winged hawk		19	19
osprey		1	1
red-tailed hawk	8	6	14
sharp-shinned hawk	2	1	3
turkey vulture	6		6
unidentified buteo	1		1
unidentified raptor	1	2	3
Total	19	32	51

Table 2-10b. Observations of Raptors Suspected to be Actively Migrating as Seen from EOS, Fall 2010, Wild Meadows Wind Project				
Species	Not Actively Migrating	Actively Migrating	Unknown	TOTAL
American kestrel		6		6
bald eagle	2	2		4
broad-winged hawk		42	1	43
Cooper's hawk	1	6		7
merlin		2		2
northern goshawk		3		3
northern harrier		2		2
osprey		10	1	11
red-tailed hawk	98	8	4	110
rough-legged hawk		1		1
sharp-shinned hawk	2	43	2	47
turkey vulture	36	14	3	53
unidentified accipiter	2		1	3
unidentified buteo	1	1		2
unidentified raptor		1		1
Total	142	141	12	295

2.5.7 Fall Flight Heights

The average minimum flight heights of birds observed in the different topographical positions of the Study Area (Figure 2-1) are summarized in Tables 2-11a and 2-11b below. These summaries include birds seen both within and outside of the Project area. As birds were often seen in multiple position categories as they passed through the Study Area, there are more observations of flight positions than there were observations of raptors.

Table 2-11a. Number of Observations and Average Flight Heights for each Position Category for Raptors Observed from WOS, Fall 2010, Wild Meadows Wind Project						
	A1) flight along or parallel to ridge	A2) crossed ridge	A3) flight crossed depression or saddle	B) upper slope	C) lower slope	D) over valley
No. of position observations (n=59)	34	2	4	8	6	5
Average minimum flight height (m)	68	23	20	94	148	189

Table 2-11b. Number of Observations and Average Flight Heights for each Position Category for Raptors Observed from EOS, Fall 2010, Wild Meadows Wind Project						
	A1) flight along or parallel to ridge	A2) crossed ridge	A3) flight crossed depression or saddle	B) upper slope	C) lower slope	D) over valley
No. of position observations (n=330)	41	38	2	117	120	140
Average minimum flight height (m)	122	214	200	188	194	159

From the WOS, 5 observations (10%) occurred within the Project area within topographical positions where the turbines are to be sited (positions A, B, and C). Of these birds, 3 birds (60% of the 5 in the Project area) occurred at flight heights below the proposed maximum turbine height (Figure 2-13a, Appendix A Table 8). At the EOS, 239 observations (81%) occurred within the Project area within topographical positions where the turbines are to be sited (positions A, B, and C). Of these birds, 159 (67%) occurred at flight heights below the proposed maximum turbine height of 150 m (Figure 2-13b, Appendix A Table 8).

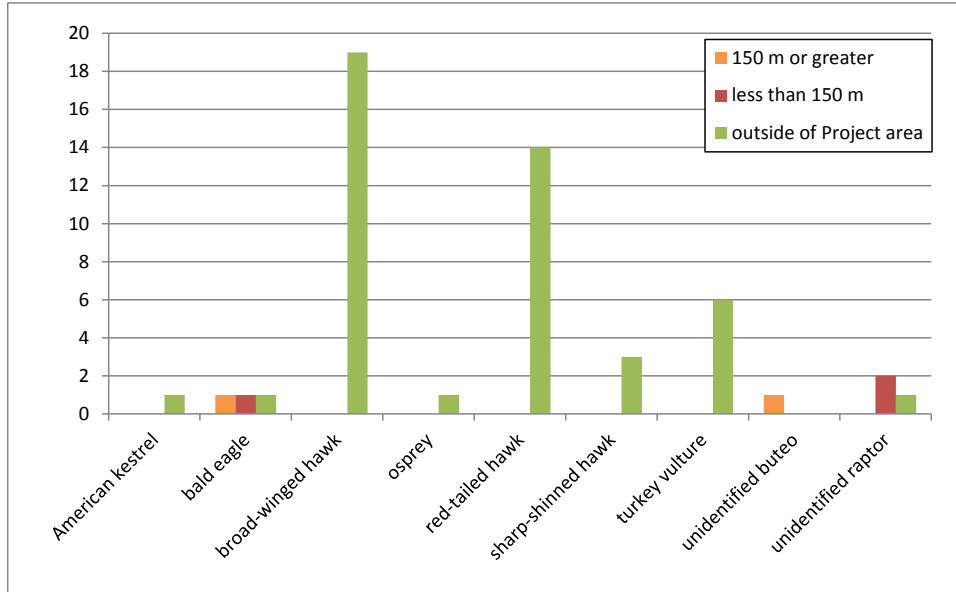


Figure 2-13a. Number of observations of raptor species observed within proposed turbine areas at heights above and below 150 m as seen from the WOS during fall 2010 surveys at the Wild Meadows Wind Project.

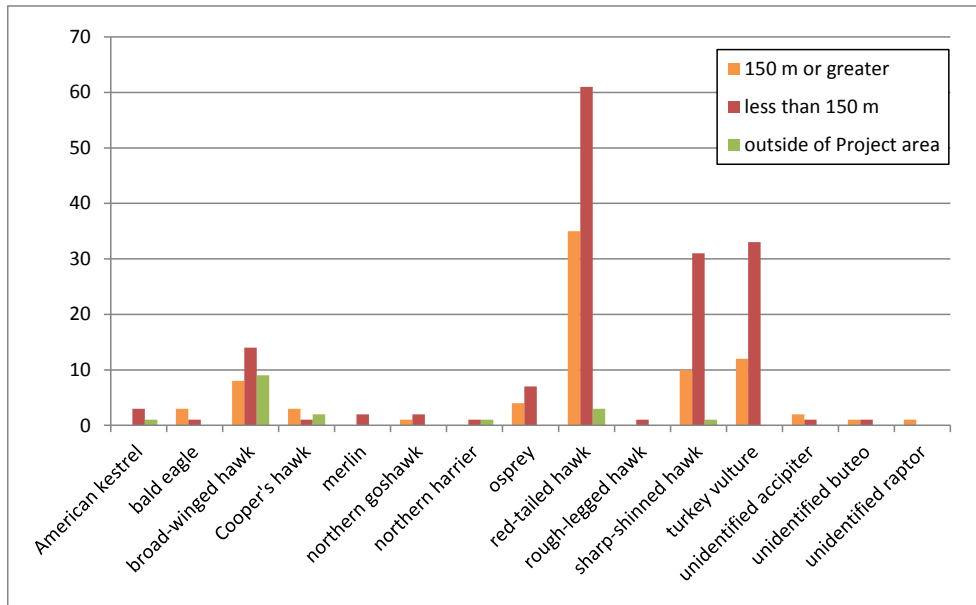


Figure 2-13b. Number of observations of raptor species observed within proposed turbine areas at heights above and below 150 m as seen from the EOS during fall 2010 surveys at the Wild Meadows Wind Project.

2.5.8 Fall Rare Threatened and Endangered Species

Four species of conservation concern were observed during the fall 2010 surveys: state endangered northern harrier (*Circus cyaneus*) (n=2), state threatened bald eagle (n=7), state species of special concern osprey (n=12), and state species of special concern

American kestrel (n=7). No federally listed species were observed. Six of the bald eagle observations occurred within the Project area, and two flew at heights below the proposed turbines. One of the northern harrier observations occurred in the Project area and flew below the height of the proposed turbines. Eleven of the osprey observations occurred in the Project area, and seven flew at heights below the proposed turbines. Location inside or outside of the Project area was not recorded for two of the American kestrel observations. Three of the American kestrel observations occurred in the Project area and were flying at heights below the proposed turbines.

2.5.9 Fall Incidental Bird Observations

A total of 20 species (not including one unidentified passerine) were documented as incidental observations during the course of the raptor surveys at both observation locations combined (Table 2-12). These incidental observations included non-raptors observed in the Project area before, during, and after raptor surveys, as well as raptors observed outside the formal survey hours. No listed species were observed incidentally during the fall 2010 surveys.

Species Common Name	Species Scientific Name	WOS	EOS
American crow	<i>Corvus brachyrhynchos</i>	X	X
American goldfinch	<i>Spinus tristis</i>	X	
American robin	<i>Turdus migratorius</i>	X	
black-capped chickadee	<i>Poecile atricapillus</i>	X	
blue jay	<i>Cyanocitta cristata</i>	X	X
brown creeper	<i>Certhia americana</i>	X	
Canada goose	<i>Branta canadensis</i>	X	X
common raven	<i>Corvus corax</i>	X	X
dark-eyed junco	<i>Junco hyemalis</i>		
downy woodpecker	<i>Picoides pubescens</i>		X
eastern bluebird	<i>Sialia sialis</i>		X
golden-crowned kinglet	<i>Regulus satrapa</i>	X	
hairy woodpecker	<i>Picoides villosus</i>	X	X
mourning dove	<i>Zenaidura macroura</i>		X
myrtle warbler	<i>Setophaga coronata coronata</i>	X	
pileated woodpecker	<i>Dryocopus pileatus</i>	X	X
unidentified passerine	<i>n/a</i>	X	
white-breasted nuthatch	<i>Sitta carolinensis</i>		X
white-throated sparrow	<i>Zonotrichia albicollis</i>	X	
wild turkey	<i>Meleagris gallopavo</i>		X
yellow-rumped warbler	<i>Setophaga coronata</i>		

2.6 DISCUSSION

The objective of the spring and fall 2010 raptor migration study was to obtain site-specific species composition and behavioral data for migrant and seasonally local

raptors during baseline conditions at the Project. The surveys represent a sample of migrant and local raptor activity during spring and fall migration. Observations of raptor activity were limited to those days that were surveyed, and the portions of the Project area that were visible from the observation sites. While the results cannot describe raptor activity for the entire migration season or describe activity across the entire Project area, they provide a sample of activity during the study timeframe and for the majority of the area of interest. This survey effort was standard for raptor migration surveys at potential wind sites in the region. The spring and fall survey periods overlapped with the peak migration periods for all species of raptor that typically occur in the northeast (Figures 2-2 and 2-8).

Of the 266 raptor observations made in the Study Area during the spring surveys from both observations sites combined, 65 percent occurred within the Project area. The locations where raptors were observed in the Study Area are subject to observer bias. Birds in closer proximity to the observation locations are more likely to be seen than birds occurring at greater distances from the observer. Also, birds that travel outside of the observers' view sheds may go undetected. The majority of observations in the spring and fall were made from the EOS, and detection was likely influenced by a variety of factors such as differences in visibility among survey locations and variable raptor activity in the different habitats that characterize the observations sites. The presence of seasonally local raptors at the Grants Pond site also likely influenced the higher passage rate at this site, as 72 percent of raptors observed from this location were not suspected to be actively migrating. Multiple observations of seasonally local birds were observed repeatedly throughout survey days at this site, and to a lesser degree at the WOS.

The passage rates and flight path locations of raptors observed varied between survey dates and were likely influenced by varying wind direction and weather, as well as seasonal timing of peaks in raptor activity. Seasonal timing of surveys and weather likely influenced the daily activity rates at Wild Meadows in the spring and fall 2010. During raptor migration, flight pathways and flight heights along ridges, side slopes, and across valleys may vary seasonally, daily, or hourly. Raptors may shift and use different ridgelines and cross different valleys from year to year or season to season.

Weather and wind are major factors that influence migration activity, flight paths, and flight heights. Flight heights are largely influenced by raptor activity. Local birds may fly at lower altitudes while making small scale movements between foraging locations (Barrios and Rodriguez 2004); actively migrating birds can fly at great heights while soaring in thermals. The majority of raptors observed within the Project area, at all observations sites, were below the proposed maximum turbine height of the turbines.

The results of the spring and fall raptor migration studies conducted at the Project are consistent with the results of other pre-construction raptor migration studies in the Northeast (Appendix B Tables 1 and 2). Currently, there is no clear relationship between pre-construction and post-construction raptor behavior and activity data for the prediction of raptor collision risk at wind sites. Passage rates and percentages of birds below turbine height determined during pre-construction surveys have not been directly

correlated to the actual number of raptors that have been found during post-construction fatality studies at existing wind farms. However, comparisons may be made to other operational projects in the region at which pre-construction raptor surveys and post-construction fatality surveys have been conducted, and for which publicly available data are available.

There have been more than 100 raptor fatalities documented per year at some western projects such as the Altamont Pass, with mortality estimates as high as thousands of raptors killed annually at that project alone. This project, as well as other California projects, is located in an area with high raptor density. In comparison, several recent studies conducted in the eastern U.S. have documented relatively low raptor mortality. Modern projects constructed within the last 5 to 10 years have significantly different characteristics than those found at older projects such as the Altamont Pass and other projects in California. In general, more recent projects have been located in areas with much lower raptor density and probably lower prey densities (Erickson *et al.* 2002). Further, newer facilities have widely spaced turbines, smooth tubular towers, and blades that spin slowly so that they remain visible even at high wind speeds. These factors are thought to have contributed to lower rates of raptor mortality at more modern projects, located outside of California.

There have been 51 raptor fatalities reported among 45 studies at 31 operational projects in the eastern U.S. between 1997 and 2012. Species of raptor involved in collisions in the eastern U.S. include American kestrel, broad-winged hawk, Cooper's hawk, osprey, red-tailed hawk, sharp-shinned hawk, turkey vulture, and unidentified raptor (Table 2-13). Four of these raptor fatalities occurred in New England (1 raptor has been documented in New Hampshire); however, the red-tailed hawk discovered at the Stetson I Project in Maine was electrocuted by a powerline.

Table 2-13. Publicly available raptor fatality results at operational wind projects in the eastern U.S. from 1997-2012.

Massachusetts	1
osprey	1
Maine	1
red-tailed hawk	1
New York	38
American kestrel	2
broad-winged hawk	3
Cooper's hawk	1
red-tailed hawk	25
sharp-shinned hawk	6
turkey vulture	1
New Hampshire	1
red-tailed hawk	1
Vermont	1
sharp-shinned hawk	1
Maryland	3
turkey vulture	2
unidentified raptor	1
Pennsylvania	0
Tennessee	0
West Virginia	6
red-tailed hawk	1
sharp-shinned hawk	1
turkey vulture	4
TOTAL	51

Table 2-14. Projects with raptor fatality results included in Table 2-13

Project	Study Year (s)	No. turbines	Reference
Altona, New York	2010	65	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2011. Annual Report for the Noble Altona Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC.
Bliss, NY	2008	67	Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Quant, D. Pursell. 2009. Annual Report for the Noble Bliss Windpark, LLC. Postconstruction Bird and Bat Fatality Study – 2008. Prepared by Curry and Kerlinger, LLC.
Bliss, NY	2009	67	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2010. Annual Report for the Noble Bliss Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC.
Buffalo Mtn, Tennessee	2005	18	Fiedler, J.K., T.H. Henry, R.D. Tankersley, and C.P. Nicholson 2007. Results of Bat and Bird Mortality Monitoring at the Expanded Buffalo Mountain Windfarm, 2005 June 28, 2007. Prepared for Tennessee Valley Authority.
Casselman, Somerset Cty, PA	2008	23	Arnett, E.B., M. Schirmacher, M.P. Huso, J.P. Hayes. 2010. Effectiveness of changing wind turbine cut-in speed to reduce bat fatalities at wind facilities. A final report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International. Austin, Texas, USA.
Casselman, Somerset Cty, PA	2009	23	Arnett, E.B., M. Schirmacher, M.P. Huso, J.P. Hayes. 2010. Effectiveness of changing wind turbine cut-in speed to reduce bat fatalities at wind facilities. A final report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International. Austin, Texas, USA.
Chateaugay, NY	2010	71	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2011. Annual Report for the Noble Chateaugay Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC.
Clinton, NY	2008	67	Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Histed, and J. Meacham. 2009. Annual Report for the Noble Clinton Windpark, LLC. Postconstruction Bird and Bat Fatality Study – 2008. Prepared by Curry and Kerlinger, LLC.
Clinton, NY	2009	67	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2010. Annual Report for the Noble Clinton Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC.
Cohocton and Dutch Hill, NY	2009	50	Stantec Consulting. 2009. Cohocton and Dutch Hill Wind Farms Year 1 Post-Construction Monitoring Report, 2009 for the Cohocton and Dutch Hill Wind Farms. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC.

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 Wild Meadows Wind Project, NH
 July 2011 (REV October 2013)

Project	Study Year (s)	No. turbines	Reference
Cohocton and Dutch Hill, NY	2010	50	Stantec Consulting. 2011. Cohocton and Dutch Hill Wind Farms Year 2 Post-Construction Monitoring Report, 2010 for the Cohocton and Dutch Hill Wind Farms In Cohocton, New York. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC.
Criterion, MD	2012	28	Young, D., C. Nations, M. Lout, and K. Bay. 2013. 2012 Post-Construction Monitoring Study Criterion Wind Project Garrett County, Maryland, April-November 2012. Technical report prepared for: Criterion Power Partners, LLC, Oakland, Maryland. Prepared by: Western EcoSystems Technology, Inc., Cheyenne, Wyoming and Waterbury, Vermont.
Ellenburg, NY	2008	54	Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, A. Fuerst, and C. Hansen. 2009. Annual Report for the Noble Ellenburg Windpark, LLC. Postconstruction Bird and Bat Fatality Study – 2008. Prepared by Curry and Kerlinger, LLC.
Ellenburg, NY	2009	54	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2010. Annual Report for the Noble Ellenburg Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC.
Granite Reliable, NH	2012	33	Curry and Kerlinger. 2013. Post-construction mortality study Granite Reliable Power Wind Park, Coos County, New Hampshire, Annual Report January 2013. Prepared for Granite Reliable Power, LLC.
Groton, NH	2013	24	<i>West 2013 preliminary data</i>
Hardscrabble, NY	2012	37	West. 2013. 2012 Post-Construction Study and AnaBat Study Hardscrabble Wind Project Herkimer County, New York April 15 – October 15, 2012. Prepared for: Iberdrola Renewables, LLC.
Howard, NY	2012	27	West. 2013. 2012 Post-Construction Monitoring Studies for the Howard Wind Project Steuben County, New York. Prepared for Howard Wind, LLC.
Kibby Mountain, ME	2011	44	Stantec Consulting. 2011. 2011 Post-Construction Monitoring Report Kibby Wind Power Project, Franklin County, Maine. Prepared for TransCanada Hydro Northeast, Inc.
Lempster, NH	2009	12	Tidhar, D. 2009. Post-construction Wildlife Monitoring Study; Study Plan and Spring 2009 Interim Report. Lempster Wind Project, Sullivan County, New Hampshire. Prepared for Lempster Wind LLC Lempster Wind Technical Advisory Committee, Iberdrola Renewables. Prepared by Western EcoSystems Technology, Inc. Waterbury, VT.
Lempster, NH	2010	12	Tidhar, D., W. Tidhar, L. McManus, and Z. Courage. 2011. 2010 Post-Construction Fatality Surveys for Lempster Wind Project. Prepared for Lempster Wind, LLC.

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Project	Study Year (s)	No. turbines	Reference
Maple Ridge, NY	2006	120	Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2007. Annual Report for the Maple Ridge Wind Power Project Postconstruction Bird and Bat Fatality Study – 2006 FINAL REPORT June 25, 2007. Prepared for PPM Energy and Horizon Energy and Technical Advisory Committee (TAC for the Maple Ridge Project Study).
Maple Ridge, NY	2007	195	Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2008. Annual Report for the Maple Ridge Wind Power Project Postconstruction Bird and Bat Fatality Study – 2007 (May 2, 2008). Prepared for PPM Energy and Horizon Energy and Technical Advisory Committee (TAC for the Maple Ridge Project Study).
Maple Ridge, NY	2008	195	Jain, A., and P. Kerlinger, R. Curry, L. Slobodnik, and M. Lehman. 2009. Annual Report for the Maple Ridge Wind Power Project Postconstruction Bird and Bat Fatality Study – 2008 (May 14, 2009).
Maple Ridge, NY	2012	195	Tidhar, D., J. Ritzert, M. Sonnenberg, M. Lout, and K. Bay. 2013. 2012 Post-construction Fatality Monitoring Study for the Maple Ridge Wind Farm, Lewis County, New York. Final Report: July 12 – October 15, 2012. Prepared for EDP Renewables North America by Western EcoSystems Technology, Inc. NE/Mid-Atlantic Branch, Waterbury, Vermont.
Mars Hill, ME	2007	28	Stantec Consulting. 2008. 2007 Spring, Summer, and Fall Post 2007 Spring, Summer, and Fall Post-construction Bird and Bat Mortality Study at the Mars Hill Wind Farm, Maine. Unpublished report prepared for UPC Wind Management, LLC.
Mars Hill, ME	2008	28	Stantec Consulting. 2009. Post-construction monitoring at the Mars Hill Wind Farm, Maine – Year 2 2008. Prepared for First Wind Management, LLC.
Meyersdale, Pennsylvania	2004	20	Arnett, E.B., W.P. Erickson, J. Kerns, and J. Horn. 2005. Relationships between bats and wind turbines in Pennsylvania and West Virginia: an assessment of fatality search protocols, patterns of fatality, and behavioral interactions with wind turbines. Bats and Wind Energy Cooperative.
MMA turbine, Massachusetts	2006	1	Vlietstra, L.S. 2007. Potential Impact of the Massachusetts Maritime Academy Wind Turbine on Common and Roseate Terns
Mount Storm, West Virginia	2008	82	Young, D.P., W.P. Erickson, K. Bay, S. Normani, W. Tidhar. 2009. Mount Storm Wind Energy Facility, Phase 1: Post-construction Avian and Bat Monitoring. Prepared for: NedPower Mount Storm, LLC.
Mount Storm, West Virginia	2010	82	Young, D.P., S. Normani, W. Tidhar, and K. Bay. 2010. Mount Storm Wind Energy Facility Post-construction Avian and Bat Monitoring, July-October 2010. Prepared for NedPower Mount Storm, LLC.
Mountaineer, West Virginia	2003	44	Kerns, J., and P. Kerlinger. 2004. A study of bird and bat collision fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia, USA: annual report for 2003. < http://www.responsiblewind.org/docs/MountaineerFinalAvianRpt3-15-04PKJK.pdf >. (Accessed 30 September 2007).

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Project	Study Year (s)	No. turbines	Reference
Mountaineer, West Virginia	2004	44	Arnett, E.B., W.P. Erickson, J. Kerns, and J. Horn. 2005. Relationships between bats and wind turbines in Pennsylvania and West Virginia: an assessment of fatality search protocols, patterns of fatality, and behavioral interactions with wind turbines. Bats and Wind Energy Cooperative.
Munnsville, NY	2008	23	Stantec Consulting. 2009. Post-construction monitoring at the Munnsville Wind Farm, New York, 2008. Prepared for E.ON Climate and Renewables.
Record Hill, ME	2012	22	Stantec Consulting. 2012. Record Hill Wind Project Post-Construction Monitoring Report, 2012. Prepared for Record Hill Wind, LLC.
Rollins, ME	2012	40	Stantec Consulting. 2012. RollinsWind Project Post-Construction Monitoring Report, 2012. Prepared for First Wind, LLC.
Searsburg, VT	1997	11	Kerlinger, P. 2002. An Assessment of the Impacts of Green Mountain Power Corporation's Wind Power Facility on Breeding and Migrating Birds in Searsburg, Vermont. Prepared for the Vermont Department of Public Service Montpelier, Vermont. Subcontractor report for the National Renewable Energy Laboratory NREL/SR-500-28591.
Sheffield, Vermont	2012	16	Martin, C., E. Arnett, M. Wallace. 2013. Evaluating Bird and Bat Post-Construction Impacts at the Sheffield Wind Facility, Vermont 2012 Annual Report. Prepared for Bat Conservation International and First Wind.
Somerset County, Pennsylvania	2000	8	Kerlinger, P. 2006. Supplement to the Phase I Avian Risk Assessment and Breeding Bird Study for the Deerfield Wind Project, Bennington County, Vermont. Prepared for Deerfield Wind, LLC.
Steel Winds I & II, NY	2012	14	Stantec. 2013. Steel Winds I and II Post-Construction Monitoring Report, 2012. Prepared for First Wind Management, LLC.
Stetson I, ME	2009	38	Stantec Consulting. 2009. Stetson I Mountain Wind Project Year 1 Post-Construction Monitoring Report, 2009, for the Stetson Mountain Wind Project. Prepared for First Wind Management, LLC.
Stetson I, ME	2011	38	Normandeau Associates. 2010. Year 3 Post-construction avian and bat casualty monitoring at the Stetson I Wind Farm. Prepared for First Wind, LLC.

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Project	Study Year (s)	No. turbines	Reference
Stetson II, ME	2010	17	Normandeau Associates. 2010. Stetson Mountain II Wind Project Year 1 Post-Construction. Prepared for First Wind, LLC. Avian and Bat Mortality Monitoring Study T8 R4 NBPP, Maine
Stetson II, ME	2010	17	Stantec Consulting. 2012. Stetson II Wind Project Post-Construction Monitoring Report, 2012. Prepared for First Wind, LLC.
Wethersfield, NY	2010	84	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K., Harte, A. 2011. Annual Report for the Noble Wethersfield Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC.

3.0 Literature Cited

Barrios, L. and A. Rodriguez. 2004. Behavioral and environmental correlates of soaring-bird mortality at on-shore wind turbines. *Journal of Applied Ecology* 41: 72-81.

Drennan, S. R. 1981. Where to find birds in New York State The Top 500 Sites. Part II: Hawk Migration pp. 459-480. Syracuse University Press, New York.

Erickson, W., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay and K. Sernka. 2002. Synthesis and comparison of baseline avian and bat use, raptor nesting and mortality information from proposed and existing wind developments. Bonneville Power Administration, Portland, Oregon.
http://www.bpa.gov/power/pgc/wind/Avian_and_Bat_Study_12-2002.pdf.

Sperduto, D.D. and W. F. Nichols. 2004. Natural Communities of New Hampshire. NH Natural Heritage Bureau, Concord, NH. Pub. UNH Cooperative Extension, Durham NH.

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Appendix A

Spring and Fall 2010 Raptor Data Tables

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Appendix A Table 1. Daily Total Observations of Raptor Species and Daily Passage Rates as Seen from WOS and EOS at the Wild Meadows Wind Project, Spring 2010												
WOS												
Species	4/15/2010	4/29/2010	4/30/2010	5/5/2010	5/6/2010	5/13/2010	5/17/2010	5/18/2010	5/20/2010	5/25/2010	5/26/2010	Entire Season
American kestrel	2	1	3		1							7
bald eagle										1		1
broad-winged hawk		1							1			2
Cooper's hawk				1							1	2
northern goshawk												0
osprey		1		2								3
red-shouldered hawk	1						1					2
red-tailed hawk						1	1	2				4
sharp-shinned hawk				1	1							2
turkey vulture	7	2		4	2	4	3	3	7	1	1	34
unidentified accipiter						1						1
unidentified buteo				2								2
unidentified raptor							1		1			2
Total	10	5	3	10	4	6	6	5	9	2	2	62
EOS												
Species	4/15/2010	4/29/2010	4/30/2010	5/5/2010	5/6/2010	5/13/2010	5/17/2010	5/18/2010	5/20/2010	5/25/2010	5/26/2010	Entire Season
American kestrel			1									1
bald eagle										1		1
Cooper's hawk												0
broad-winged hawk		1	6	1	4	1				2		15
northern goshawk		1										1
osprey		3	1	3	2	2						11
red-shouldered hawk								1				1
red-tailed hawk		4		9	9	6	5	1	2	7	1	44
sharp-shinned hawk	1		3	3		1						8
turkey vulture	1	8	9	23	14	9	4	8	12	9	10	107
unidentified accipiter												0
unidentified buteo												0
unidentified raptor		5	5	3	1				1			15
Total	2	22	25	42	30	19	9	10	15	19	11	204

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Appendix A Table 2. Hourly Summary of Raptor Observations as Seen from WOS and EOS at the Wild Meadows Wind Project, Spring 2010								
WOS								
Species	9:00-10:00	10:00-11:00	11:00-12:00	12:00-1:00	1:00-2:00	2:00-3:00	3:00-4:00	Total
American kestrel	1	1	1		2	1	1	7
bald eagle					1			1
broad-winged hawk		1			1			2
Copper's hawk			1				1	2
osprey			1			1	1	3
red-shouldered hawk		1			1			2
red-tailed hawk		2	1				1	4
sharp-shinned hawk			1			1		2
turkey vulture	1	5	2	4	10	8	4	34
unidentified accipiter						1		1
unidentified buteo	1	1						2
unidentified raptor			1			1		2
Total	3	11	8	4	15	13	8	62
EOS								
Species	9:00-10:00	10:00-11:00	11:00-12:00	12:00-1:00	1:00-2:00	2:00-3:00	3:00-4:00	Total
American kestrel					1			1
bald eagle					1			1
broad-winged hawk	3	1	3	3		1	4	15
northern goshawk	1							1
osprey	2	1	1	2	1	3	1	11
red-shouldered hawk		1						1
red-tailed hawk	5	9	7	4	7	6	6	44
sharp-shinned hawk		2	1	3	1		1	8
turkey vulture	2	10	11	24	20	19	21	107
unidentified raptor	2	2	1	9	1			15
Total	15	26	24	45	32	29	33	204

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Appendix A Table 3. Total Observations of Raptor Species at Locations within the Study Area as Seen from WOS and EOS at the Wild Meadows Wind Project, Spring 2010

WOS								
Species	Barber Mountain	Brown Mountain	Melvin Mountain	Grants Pond	other valleys	Saddle btw Melvin and Barber	Tinkham Hill	Total
American kestrel			6		1			7
bald eagle				1				1
broad-winged hawk			2					2
Cooper's hawk			2					2
osprey			2		1			3
red-shouldered hawk			2					2
red-tailed hawk			3			1		4
sharp-shinned hawk			2					2
turkey vulture	1	2	14		8	5	4	34
unidentified accipiter			1					1
unidentified buteo			1		1			2
unidentified raptor		1			1			2
Total	1	3	35	1	12	6	4	62
EOS								
Species	Barber Mountain	Brown Mountain	Melvin Mountain	Grants Pond	other valleys	Saddle btw Melvin and Barber	Tinkham Hill	Total
American kestrel				1				1
bald eagle				1				1
broad-winged hawk				7	1		7	15
northern goshawk							1	1
osprey					1		10	11
red-shouldered hawk				1				1
red-tailed hawk				10			34	44
sharp-shinned hawk				3			5	8
turkey vulture			1	20	4		82	107
unidentified raptor			1				14	15
Total			2	43	6		153	204

Appendix A Table 4. Number of Individuals of Species Observed within Project Area at Heights Greater or Less than 150 m at the Wild Meadows Wind Project, Spring 2010				
WOS				
Species	150 m or greater	less than 150 m	outside of Project area	Total
American kestrel			7	7
bald eagle			1	1
broad-winged hawk			2	2
Cooper's hawk			2	2
osprey			3	3
red-shouldered hawk			2	2
red-tailed hawk			4	4
sharp-shinned hawk			2	2
turkey vulture	1	5	28	34
unidentified accipiter			1	1
unidentified buteo			2	2
unidentified raptor			2	2
Total	1	5	56	62
EOS				
Species	150 m or greater	less than 150 m	outside of Project area	Total
American kestrel			1	1
bald eagle			1	1
broad-winged hawk	1	6	8	15
northern goshawk		1		1
osprey	3	7	1	11
red-shouldered hawk		1		1
red-tailed hawk	1	40	3	44
sharp-shinned hawk	2	3	3	8
turkey vulture	19	72	16	107
unidentified raptor		12	3	15
Total	26	142	36	204

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Appendix A Table 5. Daily Total Observations of Raptor Species and Daily Passage Rates as Seen from WOS and EOS at the Wild Meadows Wind Project, Fall 2010											
WOS											
Species	9/14/2010	9/15/2010	9/21/2010	9/22/2010	9/29/2010	10/6/2010	10/7/2010	10/8/2010	10/12/2010	10/13/2010	Total
American kestrel	1										1
bald eagle						1	1	1			3
broad-winged hawk	18							1			19
Cooper's hawk											0
merlin											0
northern goshawk											0
northern harrier											0
osprey									1		1
red-tailed hawk				2	4		1	3	3	1	14
rough-legged hawk											0
sharp-shinned hawk			1		1		1				3
turkey vulture		1	2	2	1						6
unidentified accipiter											0
unidentified buteo									1		1
unidentified raptor										3	3
Total	19	1	3	4	6	1	3	5	5	4	51
EOS											
Species	9/14/2010	9/15/2010	9/21/2010	9/22/2010	9/29/2010	10/6/2010	10/7/2010	10/8/2010	10/12/2010	10/13/2010	Total
American kestrel	2	1	2					1			6
bald eagle						2	1		1		4
broad-winged hawk	22	17	3		1						43
Cooper's hawk	1	1		2	3						7
merlin		1				1					2
northern goshawk	1		1						1		3
northern harrier	1			1							2
osprey				1	6	1	1	1	1		11
red-tailed hawk	7	6	9	17	13		3	11	18	26	110
rough-legged hawk										1	1
sharp-shinned hawk	9	3	5		18		2	7	3		47
turkey vulture	6	4	14		18			4	1	6	53
unidentified accipiter					2		1				3
unidentified buteo					1		1				2
unidentified raptor									1		1
Total	49	33	34	21	62	4	9	24	26	33	295

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Appendix A Table 6. Hourly Summary of Raptor Observations as Seen from WOS and EOS at the Wild Meadows Wind Project, Fall 2010								
WOS								
Species	9:00-10:00	10:00-11:00	11:00-12:00	12:00-1:00	1:00-2:00	2:00-3:00	3:00-4:00	Total
American kestrel						1		1
bald eagle		1	1				1	3
broad-winged hawk					1		18	19
osprey				1				1
red-tailed hawk		5	2	2	1	3	1	14
sharp-shinned hawk	1		1	1				3
turkey vulture			1	1	3	1		6
unidentified buteo		1						1
unidentified raptor	2		1					3
Total	3	7	6	5	5	5	20	51
EOS								
Species	9:00-10:00	10:00-11:00	11:00-12:00	12:00-1:00	1:00-2:00	2:00-3:00	3:00-4:00	Total
American kestrel	1	1		2	2			6
bald eagle		2				1	1	4
broad-winged hawk	15	7	3	11	2	2	3	43
Cooper's hawk		1		3	2	1		7
merlin		1			1			2
northern goshawk	1			1	1			3
northern harrier	1		1					2
osprey		3	1	1		2	4	11
red-tailed hawk	7	18	16	18	18	11	22	110
rough-legged hawk							1	1
sharp-shinned hawk	13	14	6	2	6	4	2	47
turkey vulture			12	2	16	11	12	53
unidentified accipiter					2	1		3
unidentified buteo					2			2
unidentified raptor						1		1
Total	38	47	39	40	52	34	45	295

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Appendix A Table 7. Total Observations of Raptor Species at Locations Within the Study Area as Seen from WOS and EOS at the Wild Meadows Wind Project, Fall 2010									
WOS									
Species	Barber Mountain	Braley Hill	Brown Mountain	Grants Pond	Melvin Mountain	Tinkham Hill	not recorded*	Total	
American kestrel					1			1	
bald eagle					1	2		3	
broad-winged hawk					19			19	
osprey					1			1	
red-tailed hawk	1	1		1	11			14	
sharp-shinned hawk	1				2			3	
turkey vulture			1		4		1	6	
unidentified buteo						1		1	
unidentified raptor			1			2		3	
Total	2	1	2	1	39	5	1	51	
EOS									
Species	Braley Hill	Grants Pond	Melvin Mountain	The Pinnacle	Tinkham Hill	Tinkham Hill & Grants Pond	Tinkham Hill & Melvin Mountain	not recorded*	Total
American kestrel		6							6
bald eagle		3			1				4
broad-winged hawk		7			28			8	43
Cooper's hawk		5			2				7
merlin		2							2
northern goshawk		3							3
northern harrier	1	1							2
osprey		9			2				11
red-tailed hawk		46	1		61	1	1		110
rough-legged hawk					1				1
sharp-shinned hawk		27			20				47
turkey vulture		30		1	19	2	1		53
unidentified accipiter					3				3
unidentified buteo					2				2
unidentified raptor					1				1
Total	1	139	1	1	140	3	2	8	295

* Location within study area not recorded.

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Appendix A Table 8. Number of Individuals of Species Observed within Project Area at Heights Greater or Less than 150 m at the Wild Meadows Wind Project, Fall 2010					
WOS					
Species	150 m or greater	less than 150 m	outside of Project area	not recorded*	Total
American kestrel			1		1
bald eagle	1	1	1		3
broad-winged hawk			19		19
osprey			1		1
red-tailed hawk			14		14
sharp-shinned hawk			3		3
turkey vulture			6		6
unidentified buteo	1				1
unidentified raptor		2	1		3
Total	2	3	46	0	51
EOS					
Species	150 m or greater	less than 150 m	outside of Project area	not recorded*	Total
American kestrel		3	1	2	6
bald eagle	3	1			4
broad-winged hawk	8	14	9	12	43
Cooper's hawk	3	1	2	1	7
merlin		2			2
northern goshawk	1	2			3
northern harrier		1	1		2
osprey	4	7			11
red-tailed hawk	35	61	3	11	110
rough-legged hawk		1			1
sharp-shinned hawk	10	31	1	5	47
turkey vulture	12	33		8	53
unidentified accipiter	2	1			3
unidentified buteo	1	1			2
unidentified raptor	1				1
Total	80	159	17	39	295

* Position inside or outside of Project area not recorded.

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Appendix B

Summary of Publicly Available Spring and Fall Raptor Survey Data at Wind Sites
in the East
(1996-present)

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Appendix B Table 1. Summary of publically available spring raptor data at proposed wind sites in the East (1999-present)									
Project Site	Landscape	Survey Period	# of Survey Days	# of Survey Hours	Total # Observed	# of Species Observed	Seasonal Average Passage Rate (raptors/hr)	(Turbine Ht) and % Raptors Below Turbine Height	Reference
Spring 1999									
Wethersfield, Wyoming Cty, NY	Agricultural plateau	April 20 - May 24	24	97	348	12	3.6	n/a (23 m mean flight height)	Cooper, B.A., and T.J. Mabee. 1999. Bird migration near proposed wind turbine sites at Wethersfield and Harrisburg, New York. Unpublished report prepared for Niagara-Mohawk Power Corporation, Syracuse, NY, by ABR, Inc., Forest Grove, OR. 46 pp.
Spring 2003									
Westfield, Chautauqua Cty, NY	Great Lakes Shore	April 16 - May 15	50	100.7	2,578	17	25.6	n/a (278 m mean flight height)	Cooper, B.A., A.A. Stickney, J.J. Mabee. 2004. A visual and radar study of 2003 spring bird migration at the proposed Chautauqua wind energy facility, New York. 2004. Final Report prepared by ABR Inc. Chautauqua Windpower LLC.
Spring 2005									
Churubusco, Clinton Cty, NY	Great Lakes plain/ADK foothills	Spring 2005	10	60	170	11	2.83	(120 m) 69% ¹	Woodlot Alternatives, Inc. 2005. A Spring Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Marble River Wind Project in Clinton and Ellenburg, New York. Prepared for AES Corporation.
Clinton/Ellenburg, Clinton Cty, NY	Great Lakes plain/ADK foothills	April 18 to April 20	3	21	(2 non-migrant BWHA)	1	0.1 ²	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Dairy Hills, Clinton Cty, NY	Great Lakes Shore	April 15 to April 26	5	20	50	6	2.5	(125 m) 94.7 ^{1,3}	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Altona, Clinton Cty, NY	Great Lakes plain/ADK foothills	May 5 to May 6	3	21	(4 non-migrant TUVU)	1	0.19 ²	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Bliss Wind Park, Eagle, Wyoming Cty, NY	Agricultural and wooded plateau	April 21, 26, 28	3	21	19	3	0.9	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Alabama, Genesee Cty, NY	Great Lakes plain/ADK foothills	April 16-April 29	5	20	177	8	9	(125 m) 84.5% ^{1,3}	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
High Sheldon, Wyoming Cty, NY	Agricultural and wooded plateau	April 2 to May 14	7	37	119	7	3.2	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Wethersfield, Wyoming Cty, NY	Agricultural and wooded plateau	April 22 to April 29	3	21	5	3	0.1	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
New Grange, Chautauqua Cty, NY	Great Lakes plain/ADK foothills	April 16 to May	5	20	55	8	4.37	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Stockton, Chautauqua Cty, NY	Great Lakes plain/ADK foothills	April 16 to May 15	5	20	122	8	4.65	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Clayton, Jefferson Cty, NY	Agricultural plateau	March 30 - May 7	10	58	700	14	12.1	(150 m) 61% ¹	Woodlot Alternatives, Inc. 2005. A Spring 2005 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Clayton Wind Project in Clayton, New York. Prepared for PPM Atlantic Renewable.
Prattsburgh, Steuben Cty, NY	Agricultural plateau	Spring 2005	10	60	314	15	5.23	(125 m) 83% ¹	Woodlot Alternatives, Inc. 2005. A Spring 2005 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Windfarm Prattsburgh Project in Prattsburgh, New York. Prepared for UPC Wind Management, LLC.
Cohocton, Steuben Cty, NY	Agricultural plateau	Spring 2005	10	60	164	11	2.73	(125 m) 77% ¹	Woodlot Alternatives, Inc. 2005. Avian and Bat Information Summary and Risk Assessment for the Proposed Cohocton Wind Power Project in Cohocton, New York. Prepared for UPC Wind Management, LLC.
Munnsville, Madison Cty, NY	Agricultural plateau	April 5 to May 16	10	60	375	12	6.25	(118 m) 78% ¹	Woodlot Alternatives, Inc. 2005. A Spring 2005 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Munnsville Wind Project in Munnsville, New York. Prepared for AES-EHN NY Wind, LLC.
Moresville, Delaware County, NY	Forested ridge	March 28 to May 10	8	45	170	6	3.8	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Sheffield, Caledonia Cty, VT	Forested ridge	April to May	10	60	98	10	1.63	(125 m) 69% ¹	Woodlot Alternatives, Inc. 2006. Avian and Bat Information Summary and Risk Assessment for the Proposed Sheffield Wind Power Project in Sheffield, Vermont. Prepared for UPC Wind Management, LLC.
Deerfield, Bennington Cty, VT (Existing facility)	Forested ridge	April 9 to April 29	7	42	44	11 (for both sites combined)	1.05	(125 m) 83% (at both sites combined) ¹	Woodlot Alternatives, Inc. 2005. A Spring 2005 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Deerfield Wind Project in Searsburg and Readsboro, Vermont. Prepared for PPM Energy/Deerfield Wind, LLC.
Deerfield, Bennington Cty, VT (Western expansion)	Forested ridge	April 9 to April 29	7	42	38	11 (for both sites combined)	0.9	(125 m) 83% (at both sites combined) ¹	Woodlot Alternatives, Inc. 2005. A Spring 2005 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Deerfield Wind Project in Searsburg and Readsboro, Vermont. Prepared for PPM Energy/Deerfield Wind, LLC.
Spring 2006									
Mars Hill, Aroostook Cty, ME	Forested ridge	April 12 to May 18	10	60.25	64	9	1.06	(120 m) 48% ¹	Woodlot Alternatives, Inc. 2006. A Spring 2006 Radar, Visual, and Acoustic Survey of Bird Migration at the Mars Hill Wind Farm in Mars Hill, Maine. Prepared for Evergreen Windpower, LLC.
Lempster, Sullivan County, NH	Forested ridge	Spring 2006	10	78	102	n/a	1.3	(165 m) 56% ¹	The Louis Berger Group. 2006. Pre and Post-construction Avian Survey, Monitoring, and Mitigation at the Lempster, New Hampshire Wind Power Project. Prepared for Lempster Wind, LLC.
Howard, Steuben Cty, NY	Agricultural plateau	April 3 to May 19	9	52.5	260	11	4.95	(125 m) 64% ¹	Woodlot Alternatives, Inc. 2006. A Spring 2006 Survey of Bird and Bat Migration at the Proposed Howard Wind Power Project in Howard, New York. Prepared for EverPower Global.
Chateaugay, Franklin Cty, NY	Great Lakes plain/ADK foothills	April 19 to April 28	3	21	47	12	1.9	(121 m) 3% ¹	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
St. Lawrence, Jefferson Cty, NY	Great Lakes Shore	April 14 to May 12	4	12	91	8	7.5	(125 m) 81% ^{1,4}	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Cape Vincent, Jefferson Cty, NY	Great Lakes Shore	April 14 to May 12	4	12	79	10	6.5	(125 m) 72% ¹	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Stockton, Chautauqua Cty, NY	Great Lakes plain/ADK foothills	n/a	n/a	n/a	n/a	n/a	4.65	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Spring 2007									
St Lawrence, Jefferson Cty, NY	Great Lakes Shore	March 21 to May 1	7	21	232	8	15.4	(125 m) 81% ^{1,4}	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Cape Vincent, Jefferson Cty, NY	Great Lakes Shore	March 21 to May 1	7	21	205	9	9.8	(125 m) 72% ¹	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
New Grange, Chautauqua Cty, NY	Great Lakes plain/ADK foothills	April 26 to May 22	5	n/a	n/a	n/a	4.37	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Jericho Rise, Franklin Cty, NY	Great Lakes plain/ADK foothills	April 4 to May 28	8	32	112	10	3	(125 m) 74.6% ¹	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Stetson, Penobscot Cty, ME	Forested ridge	April 26 to May 4	9	59	34	10	0.6	(125 m) 65% ¹	Woodlot Alternatives, Inc. 2007. A Spring 2007 Survey of Bird and Bat Migration at the Stetson Wind Project, Washington County, Maine. Prepared for Evergreen Wind V, LLC.
Laurel Mountain, Preston Cty, WV	Forested ridge	March 30 to May 17	10	63.75	266	12	4.17	(125 m) 55% ⁵	Stantec Consulting. 2008. A Spring 2007 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Laurel Mountain Wind Energy Project near Elkins, West Virginia – November 2007. Prepared for AES Laurel Mountain, LLC.
Spring 2008									
Oakfield, Aroostook Cty, ME	Forested ridge	April 25- May 30	12	79	58	9	0.7	(120 m) 80% ⁵	Stantec Consulting. 2008. Spring and Summer 2008 Bird and Bat Migration Survey Report Visual, Radar, and Acoustic Bat Surveys for the Oakfield Wind Project in Oakfield, Maine. Prepared for First Wind Management, LLC.
Record Hill, Oxford Cty, ME	Forested ridge	March 11 to May 27	15	97	118	12	1.2	n/a	Stantec Consulting. 2008. Spring 2008 Bird and Bat Migration Survey Report Breeding Bird, Raptor, and Acoustic Bat Surveys for the Record Hill Wind Project Roxbury, Maine. Prepared for Record Hill Wind, LLC.
Greenland, Grant Cty, WV	Forested ridge	March 21 to May 14	10	68	212	9	3.12	(125 m) 68% ⁵	Stantec Consulting. 2008. Spring, Summer, and Fall 2008 Bird and Bat Migration Survey Report Visual, Radar, and Acoustic Bat Surveys for the New Creek Mountain Project West Virginia. Prepared for AES New Creek, LLC.
Buckeye, Champaign Cty, OH	Agricultural plateau	March 1 to May 15	32	216	1476	12	6.8	(150 m) 95% ¹	Stantec Consulting. 2009. Spring, Summer and Fall 2008 Bird and Bat Survey Report. Prepared for EverPower Wind Holdings, Inc.
Allegany, Cattaraugus Cty, NY	Forested ridge	March 23 to May 8	10	75	134	10	1.8	(150 m) 87% ⁵	Stantec Consulting. 2008. Spring 2008 Bird and Bat Migration Survey Report: Visual, Radar, and Acoustic Bat Surveys for the Allegany Wind Project. Prepared for EverPower Renewables
Rollins Mountain, Penobscot Cty, ME	Forested ridge	Apr 3 to Jun 3	15	108	122	12	1.1	(125 m) 76% ⁵	Stantec Consulting. 2008. Spring 2008 Bird and Bat Migration Survey Report: Visual, Radar and Acoustic Bat Surveys for the Rollins Wind Project. Prepared for First Wind, LLC.

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Appendix B Table 1 cont. Summary of publically available spring raptor data at proposed wind sites in the East (1999-present)									
Spring 2009									
Stetson, Penobscot Cty, ME	Forested ridge	April 27 to May 5	4	20	34	11	1.7	(119 m) 67% ^{3,5}	Stantec Consulting. 2009. Stetson I Mountain Wind Project Year 1 Post-Construction Monitoring Report, 2009. Prepared for First Wind Management, LLC
Groton Wind, Grafton Cty, NH	Forested ridge	March 26 to May 23	11 ⁶	125 ⁶	175 ⁶	11	1.4 ⁶	(121 m) 25% ⁵	Stantec Consulting Services Inc. 2009. 2009 Spring, Summer, and Fall Avian and Bat Surveys for the Groton Wind Project. Prepared for Groton Wind, LLC.
Highland, Somerset Cty, ME	Forested ridge	March 25 to May 19	20	139	260	10	1.87	(130.5 m) Whitham 80% Briggs 86% ⁵	Stantec Consulting Services Inc. 2009. Spring 2009 Ecological Surveys. Prepared for Highland Wind LLC.
Kingdom Community, Orleans Cty, VT	Forested ridge	April 15 to June 1	10	74	134	10	1.81	(125 m) 67% ¹	Stantec Consulting. 2009. Spring and Summer 2009 Raptor Surveys for the Kingdom Community Wind Project. Prepared for Vermont Environmental Research Associates
Spring 2010									
Granite Reliable Power, Coos County, NH (Dixville peak)	Forested ridge	April 1 to May 11	10	67.52	14	8	0.21	(125 m) 64% ¹	Stantec Consulting. 2010. Fall 2009 and Spring 2010 Raptor Migration Surveys For the Granite Reliable Power Project. Prepared for Granite Reliable Power, LLC
Granite Reliable Power, Coos County, NH (Owl head mtn)	Forested ridge	April 1 to May 11	10	62.45	29	8	0.46	(125 m) 76% ¹	Stantec Consulting. 2010. Fall 2009 and Spring 2010 Raptor Migration Surveys For the Granite Reliable Power Project. Prepared for Granite Reliable Power, LLC
Bull Hill, Hancock Cty, ME	Forested ridge	March 19 to May 23	15	104.25	55	9	0.53	(145 m) 100% ⁵	Stantec Consulting. 2010. Spring 2010 Avian and Bat Survey Report for the Bull Hill Wind Project. Prepared for Blue Sky East Wind, LLC
Bingham, Somerset Cty, ME (Kingsbury Ridge)	Forested ridge	March 19 to May 21	10	70	19	9	0.27	(152 m) 77% ⁵	Stantec Consulting Services Inc. 2010. Spring 2010 Avian and Bat Survey Report for the Bingham Wind Project. Prepared for Blue Sky East Wind LLC.
Bingham, Somerset Cty, ME (Johnson Ridge)	Forested ridge	March 19 to May 21	5	35	37	9	1.06	(152 m) 95% ⁵	Stantec Consulting Services Inc. 2010. Spring 2010 Avian and Bat Survey Report for the Bingham Wind Project. Prepared for Blue Sky East Wind LLC.
Bowers, Washington Cty, ME	Forested ridge	April 21 to May 26	12	84	131	9	1.56	(131 m) 75% ⁵	Stantec Consulting. 2010. 2010 Spring Avian and Spring/Summer Bat Surveys for the Bowers Wind Project. Prepared for Champlain Wind Energy, LLC
Melvin Mountain, Grafton and Merrimack Counties, NH	Forested ridge	April 15 to May 26	11 (simultaneous with Grants Pond Field)	75.5	62	9	0.82	(150 m) 83% ⁵	<i>this report</i>
Grants Pond Field, Grafton and Merrimack Counties, NH	Field in valley	April 15 to May 26	11 (simultaneous with Melvin Mountain)	77	204	9	2.65	(150 m) 84% ⁵	<i>this report</i>
Spring 2011									
Antrim, Hillsborough Cty, NH	Forested ridge	March 25 to May 15	9	65	441	11	6.78	(unknown) 37% between 50-500 ft above ground ¹	TRC Engineers and Stantec Consulting Services Inc. 2011. Avian and Bat Protection Plan for the Antrim Wind Energy Project. Prepared for Antrim Wind Energy, LLC.
Passadumkeag, Grand Falls Twp, ME	Forested ridge	Apr 29 to May 27	12	84	67	6	0.8	(140 m) 46% ¹	Stantec Consulting Services Inc. 2011. Spring and Summer 2011 Avian and Bat Survey Report for the Passadumkeag Wind Project in Grand Falls Township, Maine. Prepared for Noble Passadumkeag Windpark LLC.

¹ Percent below turbine height calculated for all observations within study area.

² Non-migrants were not included in seasonal passage rates in NYSDEC 2008 table but were included in passage rates here.

³ Calculated for spring and fall combined.

⁴ Calculated for spring and fall 2006 and 2007 combined.

⁵ Percent below turbine height calculated for those observations within project area (locations within study area where turbines could possibly be located).

⁶ 5 of the 11 survey days were conducted simultaneously by 2 observers at 2 survey locations; however, results are combined for both sites which inflates the number of raptors observed for this site.

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Appendix B Table 2. Summary of available fall raptor survey results at wind sites in the East (1996-present)									
Project Site	Landscape	Survey Period	# of Survey Days	# of Survey Hours	Total # Observed	# of Species Observed	Seasonal Average Passage Rate (raptors/hr)	(Turbine Ht) and % Raptors Below Turbine Height	Reference
Fall 1996									
Searsburg, Bennington County, VT	Forested ridge	Sept. 11 - Nov. 3	20	80	430	12	5.4	n/a	Kerlinger, Paul. 1996. A Study of Hawk Migration at Green Mountain Power Corporation's Searsburg, Vermont, Wind Powered Site: Autumn 1996. Prepared for the Vermont Public Service Board, Green Mountain Power, National Renewable Energy Laboratory, VERA.
Fall 1998									
Harrisburg, Lewis County, NY	Great Lakes plain/ADK foothills	Sept. 2 - Oct. 1	13	68	554	12	8.1	n/a (48 m mean flight height)	Cooper, B.A., and T.J. Mabee. 1999. Bird migration near proposed wind turbine sites at Wethersfield and Harrisburg, New York. Unpublished report prepared for Niagara-Mohawk Power Corporation, Syracuse, NY, by ABR, Inc., Forest Grove, OR. 46 pp.
Wethersfield, Wyoming Cty, NY	Agricultural plateau	Sept. 2 - Oct. 1	24	107	256	12	2.4	n/a (47 m mean flight height)	Cooper, B.A., and T.J. Mabee. 1999. Bird migration near proposed wind turbine sites at Wethersfield and Harrisburg, New York. Unpublished report prepared for Niagara-Mohawk Power Corporation, Syracuse, NY, by ABR, Inc., Forest Grove, OR. 46 pp.
Fall 2004									
Prattsburgh, Steuben Cty, NY	Agricultural plateau	Sept. 2 - Oct. 28	13	73	220	10	3.0	(125 m) 62% ¹	Woodlot Alternatives, Inc. 2005. A Fall 2004 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Windfarm Prattsburgh Project in Prattsburgh, New York. Prepared for UPC Wind Management, LLC.
Cohocton, Steuben, Cty, NY	Agricultural plateau	Sept. 2 - Oct. 28	8	41.3	128	8	3.1	(125 m) 80% ¹	Woodlot Alternatives, Inc. 2005. Avian and Bat Information Summary and Risk Assessment for the Proposed Cohocton Wind Power Project in Cohocton, New York. Prepared for UPC Wind Management, LLC.
Deerfield, Bennington Cty, VT (Existing Facility)	Forested ridge	Sept. 2 - Oct. 31	10	60	147	n/a	2.5	n/a	Woodlot Alternatives, Inc. 2005. Fall 2004 Avian Migration Surveys at the Proposed Deerfield Wind/Searsburg Expansion Project in Searsburg and Readsboro, Vermont. Prepared for Deerfield Wind, LLC and Vermont Environmental Research Associates.
Deerfield, Bennington Cty, VT (Western Expansion)	Forested ridge	Sept. 2 - Oct. 31	10	57	725	n/a	12.7	n/a	Woodlot Alternatives, Inc. 2005. Fall 2004 Avian Migration Surveys at the Proposed Deerfield Wind/Searsburg Expansion Project in Searsburg and Readsboro, Vermont. Prepared for Deerfield Wind, LLC and Vermont Environmental Research Associates.
Sheffield, Caledonia Cty, VT	Forested ridge	Sept. 11 - Oct. 14	10	60	193	10	3.2	(125 m) 31% ¹	Woodlot Alternatives, Inc. 2006. Avian and Bat Information Summary and Risk Assessment for the Proposed Sheffield Wind Power Project in Sheffield, Vermont. Prepared for UPC Wind Management, LLC.
Fall 2005									
Alabama, Genesee Cty, NY	Great Lakes plain/ADK foothills	Sept. 11 - Oct. 10	5	19	148	4	8.0	(125 m) 84.5% ^{1,2}	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
High Sheldon, Wyoming Cty, NY	Agricultural and wooded plateau	Aug. 29 - Nov. 4	8	53.5	168	9	3.1	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Wethersfield, Wyoming Cty, NY	Agricultural plateau	Sept. 13 - Sept. 18	3	21	0	0	0	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Bliss, Wyoming Cty, NY	Agricultural and wooded plateau	Sept. 12 - Sept. 17	2	21	0	0	0	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Cohocton, Steuben, Cty, NY	Agricultural plateau	Sept. 7 - Oct. 1	7	40.12	131	10	3.3	(125 m) 63% ¹	Woodlot Alternatives, Inc. 2005. Avian and Bat Information Summary and Risk Assessment for the Proposed Cohocton Wind Power Project in Cohocton, New York. Prepared for UPC Wind Management, LLC.
West Hill, Madison Cty, NY	Agricultural plateau	Sept. 6 - Oct. 31	11	65	369	14	5.7	(118 m) 51% ¹	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Clinton / Ellenburg, Clinton Cty, NY	Agricultural plateau	Sept. 23 - Sept. 28	3	21	0	0	0	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Altona, Clinton Cty, NY	Great Lakes plain/ADK foothills	Sept. 24 - Sept. 30	3	21	0	0	0	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Marble River, Clinton Cty, NY	Great Lakes plain/ADK foothills	Sept. 6 - Oct. 22	10	60	217	15	3.6	(120 m) 69% ¹	Woodlot Alternatives, Inc. 2005. A Fall 2005 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Marble River Wind Project in Clinton and Ellenburg, New York. Prepared for AES Corporation.
New Grange, Chautauqua Cty, NY	Forested ridge	Sept. 17 - Oct. 15	6	18	49	5	4.37 ³	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Moresville, Delaware Cty, NY	Forested ridge	Aug. 31 - Nov. 3	11	72	228	11	3.2	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Dairy Hills, Wyoming Cty, NY	Agricultural plateau	Sept. 11 - Oct. 10	4	16	48	6	3.0	(125 m) 94.7% ^{1,2}	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Howard, Steuben Cty, NY	Agricultural plateau	Sept. 1 - Oct. 28	10	57	206	12	3.6	(91 m) 65% ¹	Woodlot Alternatives, Inc. 2005. A Fall 2005 Survey of Bird and Bat Migration at the Proposed Howard Wind Power Project in Howard, New York. Prepared for Everpower Global.
Munnsville, Madison Cty, NY	Agricultural plateau	Sept. 6 - Oct. 31	11	65	369	14	5.7	(118 m) 51% ¹	Woodlot Alternatives, Inc. 2005. Summer and Fall 2005 Bird and Bat Surveys at the Proposed Munnsville Wind Project in Munnsville, New York. Prepared for AES-EHN NY Wind, LLC.
Mars Hill, Aroostook Cty, ME	Forested ridge	Sept. 9 - Oct. 13	8	42.5	115	13	1.5	(120 m) 58% ¹	Woodlot Alternatives, Inc. 2005. A Fall 2005 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Mars Hill Wind Project in Mars Hill, Maine. Prepared for UPC Wind Management, LLC.
Lempster, Sullivan County, NH	Forested ridge	Fall 2005	10	80	264	10	3.3	(165 m) 20.8% ¹	The Louis Berger Group. 2006. Pre and Post-construction Avian Survey, Monitoring, and Mitigation at the Lempster, New Hampshire Wind Power Project. Prepared for Lempster Wind, LLC.
Clayton, Jefferson Cty, NY	Agricultural plateau	Sept. 9 - Oct. 16	11	63.5	575	13	9.1	(150 m) 89% ¹	Woodlot Alternatives, Inc. 2005. A Fall 2005 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Clayton Wind Project in Clayton, New York. Prepared for PPM Atlantic Renewable.
Fall 2006									
Stetson, Penobscot Cty, ME	Forested ridge	Sept. 14 - Oct. 26	7	42	86	11	2.1	(125 m) 63% ¹	Woodlot Alternatives, Inc. 2007. A Fall 2006 Survey of Bird and Bat Migration at the Proposed Stetson Mountain Wind Power Project in Washington County, Maine. Prepared for Evergreen Wind V, LLC.
Wethersfield, Wyoming Cty, NY	Agricultural plateau	Sept. 21 - Nov. 11	3	21	231	11	9.7	(122 m) 27% ¹	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Chateaugay, Franklin Cty, NY	Great Lakes plain/ADK foothills	Sept. 6 - Oct. 26	2	24	42	5	1.6	(122 m) 31% ¹	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
St. Lawrence, Jefferson Cty, NY	Great Lakes Shore	April 14 to May 12	4	12	91	8	7.5	(125 m) 81% ^{1,4}	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Jordanville, Herkimer Cty, NY	Agricultural plateau	Oct. 13 - Nov. 30	44	234.7	629	12	2.7	(125 m) 67% ¹	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Rollins, Penobscot Cty, ME	Forested ridge	Sept. 13 - Oct. 16	12	89	144	12	1.8	(120 m) 82% ¹	Stantec Consulting. 2008. Fall 2007 Bird and Bat Migration Survey Report: Visual, Radar and Acoustic Bat Surveys for the Rollins Wind Project. Prepared for First Wind, LLC.

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Appendix B Table 2 cont. Summary of available fall raptor survey results at wind sites in the East (1996-present)									
Fall 2007									
Roxbury, Oxford Cty, ME	Forested ridge	Sept. 3 - Oct. 15	14	86	96	12	1.1	n/a	Stantec Consulting. 2008. Fall 2007 Migration Survey Report Visual, Acoustic, and Radar Surveys of Bird and Bat Migration conducted at the proposed Record Hill Wind Project in Roxbury, Maine. Prepared for Independence Wind, LLC.
Granite Reliable Power, Coos County, NH	Forested ridge	Sept. 5 - Oct. 16	11	68	44	9	0.7	n/a	Stantec Consulting. 2007. Fall 2007 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Windpark in Coos County, New Hampshire by Granite Reliable Power, LLC. Prepared for Granite Reliable Power, LLC.
Laurel Mountain, Preston Cty, WV	Forested ridge	Sept. 12 - Dec. 1	24	147	769	12	5.2	(125 m) 65% ¹	Stantec Consulting Services Inc. 2007. A Fall 2007 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Laurel Mountain Wind Energy Project near Elkins, West Virginia. Prepared for AES Laurel Mountain, LLC.
Greenland, Grant Cty, WV	Forested ridge	Sept. 12 - Dec. 1	27		858	13	5.9	(125 m) 67% ¹	Stantec Consulting Services Inc. 2008. A Fall 2007 Survey of Bird and Bat Migration at the New Creek Wind Project, West Virginia. Prepared for AES New Creek, LLC.
New Grange, Chautauqua Cty, NY	Forested ridge	Sept. 21 - Oct. 28	6	n/a	n/a	n/a	4.4	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Allegany, Cattaraugus Cty, NY	Forested ridge	Sept. 8 - Oct. 11	11	63.78	125	10	2.0	(150 m) 78% ⁵	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Jericho Rise, Franklin Cty, NY	Great Lakes plain/ADK foothills	Sept. 12 - Oct. 26	7	28	59	7	2.0	n/a	New York State Department of Environmental Conservation. 2008. Publicly Available Raptor Migration Data for Proposed Wind Sites in NYS. Available at http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum . Accessed November 7, 2008.
Fall 2008									
Oakfield, Aroostook Cty, ME	Agricultural plateau	Sept. 26 - Oct. 14	12	84	60	8	0.7	(120 m) 67% ⁵	Woodlot Alternatives, Inc. 2008. A Fall 2008 Survey of Bird and Bat Migration at the Oakfield Wind Project, Washington County, Maine. Prepared for Evergreen Wind, LLC.
Moresville, Delaware Cty, NY	Forested ridge	Oct 14 - Dec 18	19	132	100	12	0.8	(125 m) 74% ⁵	Stantec Consulting. 2009. 2008 Late-Fall Raptor Migration Survey Report. Prepared for Moresville Energy LLC.
Buckeye, Champaign Cty, OH	Agricultural plateau	Sept 1 - Nov 15	24	84	581	7	3.5	(150 m) 93% ¹	Stantec Consulting. 2009. Spring, Summer and Fall 2008 Bird and Bat Survey Report. Prepared for EverPower Wind Holdings, Inc.
Highland, Somerset Cty, ME	Forested ridge	Sept 3 to Oct 31	15	135	301	10	2.2	(128 m) 43% ⁵	Stantec Consulting Services. 2009. Fall 2008 Bird and Bat Migration Survey Report: Radar and Acoustic Avian and Bat Surveys for the Highland Wind Project Highland Plantation, Maine. Prepared for Highland Wind LLC.
Fall 2009									
Granite Reliable Power, Coos County, NH (Dixville peak)	Forested ridge	Aug 27 to Oct 27	10	68.33	113	11	1.65	(125 m) 76% ⁵	Stantec Consulting Services Inc. 2009. Summary of Fall 2009 Raptor Survey Results at the Proposed Granite Reliable Power Project. Prepared for Noble Environmental Power.
Granite Reliable Power, Coos County, NH (Owl head mtn)	Forested ridge	Aug 27 to Oct 27	10	70	129	10	1.84	(125 m) 82% ⁵	Stantec Consulting Services Inc. 2009. Summary of Fall 2009 Raptor Survey Results at the Proposed Granite Reliable Power Project. Prepared for Noble Environmental Power.
Groton Wind, Grafton Cty, NH (Tenney ridge)	Forested ridge	Aug 24 to Oct 26	10	79	326	11	4.13	(121 m) 58% ⁵	Stantec Consulting Services Inc. 2009. 2009 Spring, Summer, and Fall Avian and Bat Surveys for the Groton Wind Project. Prepared for Groton Wind, LLC.
Groton Wind, Grafton Cty, NH (Crosby and Bald Mtns)	Forested ridge	Aug 24 to Oct 26	10	78	370	14	4.74	(121 m) 79% ⁵	Stantec Consulting Services Inc. 2009. 2009 Spring, Summer, and Fall Avian and Bat Surveys for the Groton Wind Project. Prepared for Groton Wind, LLC.
Stetson, Penobscot Cty, ME	Forested ridge	Sept 2 to Oct 14	8	50	45	11	0.9	n/a	Stantec Consulting. 2009. Stetson I Mountain Wind Project Year 1 Post-Construction Monitoring Report, 2009. Prepared for First Wind Management, LLC
Bowers, Washington Cty, ME	Forested ridge	Sept 9 to Oct 14	15	105	95	9	0.9	(119 m) 69% ¹	Stantec Consulting. 2009. Fall 2009 Avian and Bat Surveys for the Bowers Wind Project in Washington County, Maine. Prepared for Champlain Wind Energy, LLC.
Bull Hill, Hancock Cty, ME	Forested ridge	Sept 2 to Oct 14	12	87	124	11	1.43	(145 m) 98% ⁵	Stantec Consulting. 2009. Summer and Fall 2009 Avian and Bat Survey Report for the Bull Hill Project in T16 MD, Maine. Prepared for Blue Sky East Wind, LLC.
Fall 2010									
Bingham, Somerset Cty, ME (Kingsbury Ridge)	Forested ridge	Sept 2 to Oct 13	12	84	57	11	0.68	(150 m) 85% ⁵	Stantec Consulting Services Inc. 2010. 2010 Spring Avian and Spring/Summer Bat Surveys for the Bowers Wind Project. Prepared for Champlain Wind Energy, LLC.
Bingham, Somerset Cty, ME (Johnson Ridge)	Forested ridge	Sept 2 to Oct 13	5	35	61	9	1.74	(150 m) 92% ⁵	Stantec Consulting Services Inc. 2010. 2010 Spring Avian and Spring/Summer Bat Surveys for the Bowers Wind Project. Prepared for Champlain Wind Energy, LLC.
Melvin Mountain, Grafton and Merrimack Counties, NH	Forested ridge	Sept 14 to Oct 13	10 (simultaneous with Grants Pond Field)	67.5	51	7	0.76	(150 m) 60% ⁵	this report
Grants Pond Field, Grafton and Merrimack Counties, NH	Field in valley	Sept 14 to Oct 13	10 (simultaneous with Melvin Mountain)	70	295	12	4.2	(150 m) 67% ⁵	this report
Fall 2011									
Antrim, Hillsborough Cty, NH	Forested ridge	Sept 1 to Nov 20	21	147.5	978	10	6.63	(unknown) 37% between 50-500 ft above ground ¹	TRC Engineers and Stantec Consulting Services Inc. 2011. Avian and Bat Protection Plan for the Antrim Wind Energy Project. Prepared for Antrim Wind Energy, LLC.
Passadumkeag, Grand Falls Twp, ME	Forested ridge	Sept 9 to Oct 12	12	84	171	11	2.04	(140m) 58% ⁵	Stantec Consulting Services Inc. 2011. Summer and Fall 2011 Avian and Bat Survey Report for the Passadumkeag Wind Project in Grand Falls Township, Maine. Prepared for Passadumkeag Windpark LLC.

¹ Percent below turbine height calculated for all observations within study area.

² Calculated for spring and fall combined.

³ Non-migrants were not included in seasonal passage rates in NYSDEC 2008 table but were included in passage rates here.

⁴ Calculated for spring and fall 2006 and 2007 combined.

⁵ Percent below turbine height calculated for those observations within project area (locations within study area where turbines could possibly be located).