# Appendix F
# Triple H Wind Project Bat Activity Studies

# Bat Activity Studies for the Triple H Wind Project Hughes and Hyde Counties, South Dakota

## Final Report

## May 26 – October 21, 2016

**Prepared for:**

**Triple H Wind Project, LLC**

3760 State Street, Suite 200
Santa Barbara, California 93105

**Prepared by:**

**Brian Heath, Kristina Hammond, Donald Solick**

Western EcoSystems Technology, Inc.
415 West 17th Street, Suite 200
Cheyenne, Wyoming 82001

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# EXECUTIVE SUMMARY

In May 2016, Western EcoSystems Technology, Inc. initiated a bat acoustic survey for the proposed Triple H Wind Project (Project) in Hughes and Hyde counties, South Dakota. The bat acoustic survey conducted at the Project was designed to estimate levels of bat activity throughout the project during summer and fall.

Acoustic surveys were conducted at four ground stations located in grassland or cropland habitat near features that could be attractive to bats (e.g., along hedge rows, deciduous trees, near ponds, etc.) from May 26 through October 21, 2016. The four monitoring stations used AnaBat SD2 ultrasonic detectors placed 1.5 meters (4.9 feet) above the ground to minimize insect noise. Station locations were selected to provide spatial coverage throughout the Project.

The AnaBat units recorded 1,663 bat passes during 291 detector-nights. All units recorded a combined mean (± standard error) of 5.64 ± 1.61 bat passes per detector-night. For all stations, 57.7% of bat passes were classified as high-frequency (HF; e.g., eastern red bats, and little brown bats), while 42.3% of bat passes were classified as low-frequency (LF; e.g., big brown bats, hoary bats, and silver-haired bats).

Bat activity varied between seasons, with lower activity in the summer and higher activity in fall. At these stations, LF and HF bat pass rates peaked during the first part September. Higher activity during the late summer and early fall may be due to the presence of migrating bats passing through the area.

Bat activity recorded at the Project by ground detectors during the standardized Fall Migration Period (July 30 – October 14; 9.08 ± 3.23 bat passes per detector-night) was similar to activity observed at publicly available and comparable studies at facilities in the Midwest, and the Project is expected to experience similar fatality rates to these other Midwestern facilities.

## STUDY PARTICIPANTS

### Western EcoSystems Technology

| | |
|---|---|
| Brian Heath | Project Manager |
| Chris Fritchman | Field Supervisor |
| Donald Solick | Bat Biologist |
| Kristina Hammond | Bat Biologist/Bat Data Analyst |
| Carmen Boyd | Data and Report Manager |
| Matt Kwit | Statistician |
| Jon Cicarelli | GIS Technician |
| Kristina Hammond | Report Compiler |
| Andrea Palochak | Technical Editor |
| Carissa Goodman | Technical Editor |
| Brenda Jarski-Weber | Field Technician |

## REPORT REFERENCE

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# INTRODUCTION

Triple H Wind Project, LLC is considering the development of the Triple H Wind Project (Project) in Hughes and Hyde counties, South Dakota. Triple H Wind Project, LLC contracted Western EcoSystems Technology, Inc. (WEST) to complete a study of bat activity following the recommendations of the US Fish and Wildlife Service's (USFWS) *Land-Based Wind Energy Guidelines* (USFWS 2012a) and Kunz et al. (2007a). WEST conducted acoustic monitoring surveys to estimate levels of bat activity throughout the Project during the summer and fall. The following report describes the results of acoustic monitoring surveys conducted at the Project between May 26 and October 21, 2016.

# STUDY AREA

The proposed 39,069-acre (ac; 15,811-hectare [ha]) Project is located in central South Dakota and is situated northeast of the Missouri River (Figure 1). According to the US Geological Survey (USGS) National Land Cover Dataset (NLCD; USGS NLCD 2011; Homer et al. 2015), the Project is dominated by herbaceous plants (25,312 ac [10,243 ha; 64.8%]) and cultivated crops (12,373 ac [5,007 ha; 31.7%]; Figure 2, Table 1). Developed areas compose approximately 834 ac (341 ha; 2.1%) of the Project. The Project contains approximately 83 ac (34 ha; 0.2%) of emergent herbaceous wetlands, but only 1.44 ac (0.58 ha; less than 0.1%) of deciduous forest habitat (Table 1). Both emergent herbaceous wetlands and deciduous forest provide potential habitat for several bat species, including the federally threatened northern long-eared bat (*Myotis septentrionalis*; USFWS 2015a). The remainder of the Project is composed of approximately 266 ac (108 ha; 0.7%) of open water, 125 ac (51 ha; 0.3%) of pasture and hay fields, and 18 ac (7.2 ha; less than 0.1%) of barren land (Figure 2, Table 1).

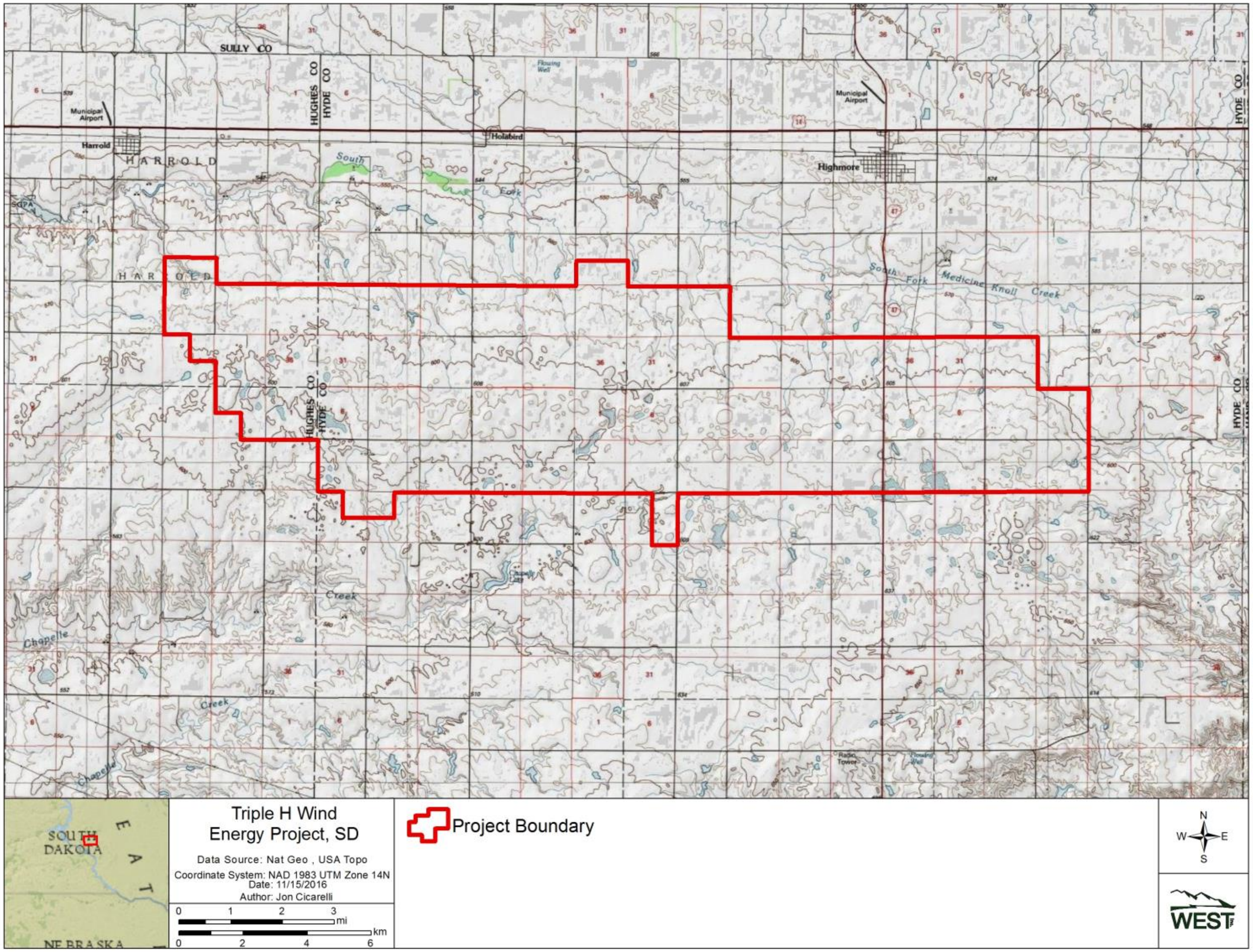

**Figure 1. Topographic map showing the location of the Triple H Wind Project.**

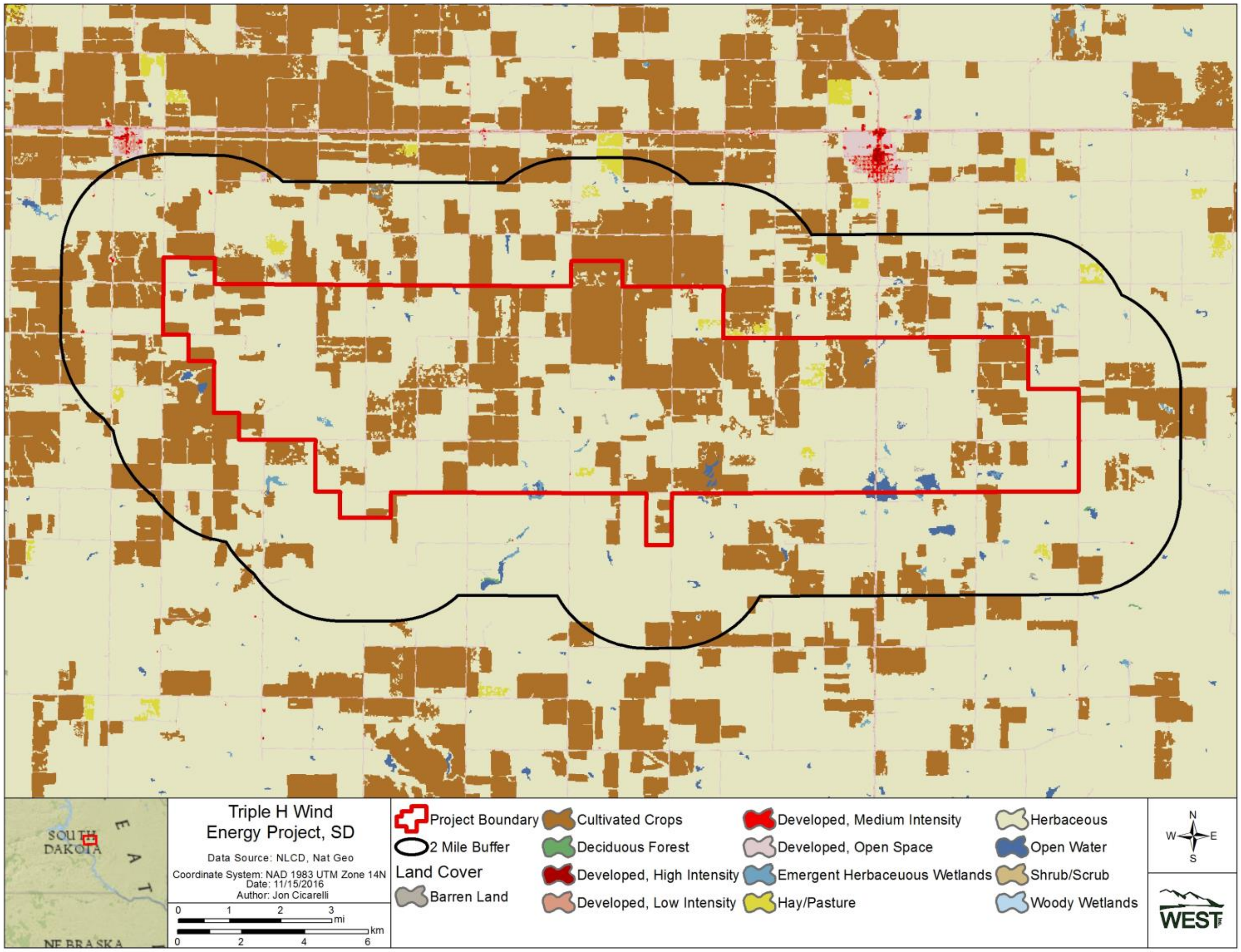

**Figure 2. Land cover in the Triple H Wind Project (US Geological Survey National Land Cover Database [USGS] 2011, Homer et al. 2015).**

**Table 1. Land cover in the Triple Wind Project according to the United States Geological Survey (USGS) National Land Cover Dataset (NLCD; USGS NLCD 2011, Homer et al. 2015).**

| Land Cover | Acres | % Composition |
|---|---|---|
| Herbaceous | 25,312.31 | 64.8 |
| Cultivated Crops | 12,373.00 | 31.7 |
| Developed, Open Space | 826.81 | 2.1 |
| Open Water | 265.92 | 0.7 |
| Hay/Pasture | 125.26 | 0.3 |
| Emergent Herbaceous Wetlands | 82.53 | 0.2 |
| Developed, Low Intensity | 58.28 | 0.1 |
| Barren Land | 17.63 | <0.1 |
| Developed, Medium Intensity | 5.71 | <0.1 |
| Deciduous Forest | 1.44 | <0.1 |
| **Total** | **39,068.90** | **100** |

## Overview of Bat Diversity

Seven species of bats potentially occur at the Project (Table 2). The northern long-eared bat is listed as a federally threatened species (USFWS 2015b). The range of the northern long-eared bat is considered to be across all of South Dakota, including Hughes and Hyde counties. Due to the relatively low presence of water and deciduous forest, it is unlikely the Project would be an area of high use by the northern long-eared bat. The Project is outside of the White-Nose Syndrome (WNS) Zone per the Final 4(d) Rule (USFWS 2016a), and therefore presence/probable absence surveys were not performed.

**Table 2. Bat species with potential to occur within the Triple H Wind Project (International Union for Conservation of Nature [IUCN] 2016, US Fish and Wildlife Service [USFWS] 2016d) categorized by echolocation call frequency.**

| Common Name | Scientific Name |
|---|---|
| **High-Frequency (> 30 kHz)** | |
| eastern red bat[1,3] | *Lasiurus borealis* |
| western small-footed bat | *Myotis ciliolabrum* |
| little brown bat[1] | *Myotis lucifugus* |
| northern long-eared bat[1,2] | *Myotis septentrionalis* |
| **Low-Frequency (< 30 kHz)** | |
| big brown bat[1] | *Eptesicus fuscus* |
| silver-haired bat[1,3] | *Lasionycteris noctivagans* |
| hoary bat[1,3] | *Lasiurus cinereus* |

[1] species known to have been killed at wind energy facilities (Kunz et al. 2007b);
[2] federally threatened species (USFWS 2015b); and
[3] long-distance migrant.

## White-Nose Syndrome

Bats that hibernate in North America are being severely impacted by WNS, an infectious mycosis in which bats are infected with a psychrophilic fungus from Europe (*Pseudogymnoascus* [formerly *Geomyces*] *destructans*) that is thought to act as a chronic disturbance during hibernation (USGS 2010, Minnis and Lindner 2013). Infected bats arouse frequently from hibernation, leading to premature loss of fat reserves and atypical behavior, which in turn leads to starvation prior to spring emergence (Boyles and Willis 2010, Reeder et al. 2012, Warnecke et al. 2012). WNS was first discovered in New York State in 2006 (Frick et al. 2010, USFWS 2011) and by 2010 had rapidly spread to over 115 caves and mines (Frick et al. 2010); WNS is now confirmed in 29 states and the causative fungus has been identified in an additional three states (White-Nose Syndrome.org 2016). To date, the WNS infection in bats has spread north into five Canadian provinces, reaching as far south as Alabama and as far west as Washington (Heffernan 2016). Currently WNS has not been found in South Dakota and only 12 of the counties in the southeast part of the state are included in the WNS Zone per the Final 4(d) Rule (USFWS 2016a, 2016c). It is estimated that between 5.7 and 6.7 million bats have died as a result of WNS (USFWS 2012b). WNS is the primary reason the USFWS recently listed the northern long-eared bat as threatened under the Endangered Species Act (USFWS 2015b), and the USFWS is currently reviewing the status of the little brown bat (*Myotis lucifugus*; USFWS 2013, 2016b).

# METHODS

## Bat Acoustic Surveys

WEST conducted acoustic monitoring studies to estimate levels of bat activity throughout the Project during the study period. Although it remains unclear whether baseline acoustic data are able to adequately predict post-construction fatality (Hein et al. 2013c), ultrasonic detectors do collect information on the spatial distribution, timing, and species composition that can provide insights into the possible impacts of wind development on bats (Kunz et al. 2007a, Britzke et al. 2013) and inform potential mitigation strategies (Weller and Baldwin 2012).

### *Survey Stations*

Four AnaBat™ SD2 ultrasonic bat detectors (Titley Scientific™, Columbia, Missouri) were used during the study. Detectors were placed at four fixed survey locations and were placed at 1.5 meters (m; 4.9 feet [ft]) above ground level (Figure 3). Species activity levels and composition can vary with altitude (Barclay et al. 2007, Baerwald and Barclay 2009, Collins and Jones 2009, Müeller et al. 2013). All stations were located in grassland or cropland habitat near features that could be attractive to bats (i.e., “bat features”), such as deciduous forest or water, and were spatially distributed throughout the Project area.

Each AnaBat unit was inside a plastic weather-tight container that had a hole cut in the side through which the microphone extended. Each microphone was encased in a 45-degree angle poly-vinyl chloride (PVC) tube, and holes were drilled in the PVC tube to allow water to drain.

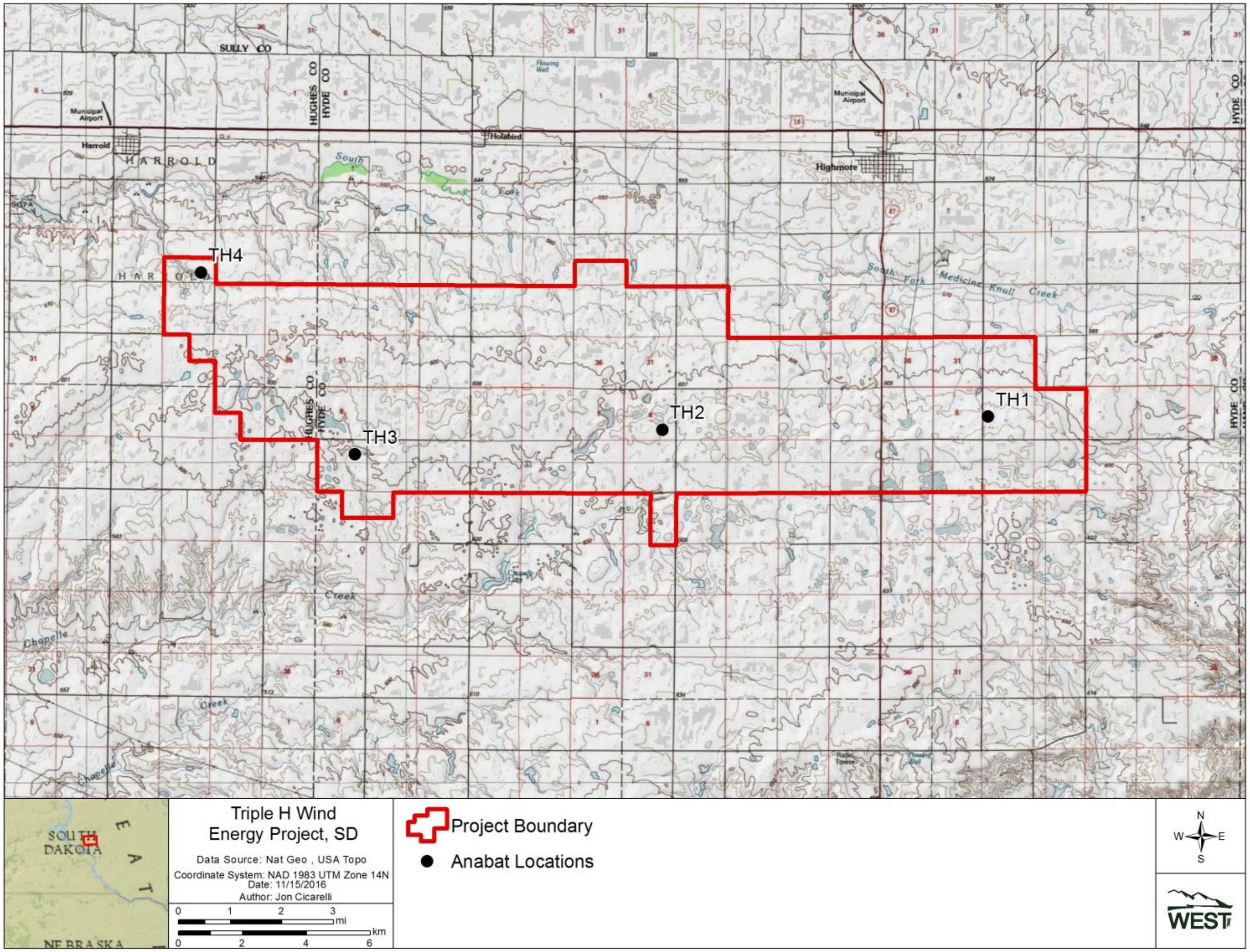

**Figure 3. Location of fixed AnaBat stations in the Triple H Wind Project.**

### *Survey Schedule*

Bats were surveyed in the Project from May 26 to October 21, 2016, and detectors were programmed to turn on approximately 30 minutes before sunset and turn off approximately 30 min after sunrise each night. To highlight seasonal activity patterns, the study was divided into two survey periods: summer (May 26 – August 15) and fall (August 16 – October 21). Mean bat activity was also calculated for a standardized Fall Migration Period (FMP), defined here as July 30 – October 14. The FMP was defined by WEST as a standard for comparison with activity from other wind energy facilities. During this time bats begin moving toward wintering areas, and many species of bats initiate reproductive behaviors (Cryan 2008). This period of increased landscape-scale movement and reproductive behavior is often associated with increased levels of bat fatalities at operational wind energy facilities (Arnett et al. 2008, Arnett and Baerwald 2013).

## Data Collection and Call Analysis

AnaBat detectors use a broadband high-frequency microphone to detect the echolocation calls of bats. Incoming echolocation calls are digitally processed and stored on a high-capacity compact flash card. The resulting files can be viewed in appropriate software (e.g., Analook© [2004]) as digital sonograms that show changes in echolocation call frequency over time. Frequency versus time displays were used to separate bat calls from other types of ultrasonic noise (e.g., wind, insects, etc.) and to determine the call frequency category and (when possible) the species of bat that generated the calls.

To standardize acoustic sampling effort across the Project, AnaBat units were calibrated and sensitivity levels were set to six (Larson and Hayes 2000), a level that balanced the goal of recording bat calls against the need to reduce interference from other sources of ultrasonic noise (Brooks and Ford 2005).

For each survey location, bat passes were sorted into two groups based on their call's minimum frequency. High-frequency (HF) bats, such as eastern red bats (*Lasiurus borealis*) and *Myotis* species have minimum frequencies greater than 30 kilohertz (kHz). Low-frequency (LF) bats, such as big brown bats (*Eptesicus fuscus*), silver-haired bats (*Lasionycteris noctivagans*), and hoary bats (*Lasiurus cinereus*), typically emit echolocation calls with minimum frequencies below 30 kHz. The HF and LF species that may occur in the Project area are listed in Table 2.

## Statistical Analysis

The standard metric used for measuring bat activity is the number of bat passes per detector-night, and this metric was used as an index of bat activity in the Project area. A bat pass was defined as a sequence of at least two echolocation calls (pulses) produced by an individual bat with no pause between calls of more than one second (Fenton 1980). A detector-night was defined as one detector operating for one entire night. The terms bat pass and bat call are used interchangeably. Bat passes per detector-night were calculated for all bats, and for HF and LF bats. Bat pass rates represent indices of bat activity and do not represent numbers of individuals. The number of bat passes was determined by an experienced bat biologist using Analook.

The period of peak sustained bat activity was defined as the 7-day period with the highest average bat activity. If multiple 7-day periods equaled the peak sustained bat activity rate, all dates in these 7-day periods were reported. This and all multi-detector averages in this report were calculated as an unweighted average of total activity at each detector.

### Risk Assessment

To assess potential for bat fatalities, bat activity in the Project was compared to existing data at other wind energy facilities in the Midwest region. Among studies measuring both activity and fatality rates, most data were collected during the fall using AnaBat detectors placed near the ground. Therefore, to make valid comparisons to the publicly available data, this report uses the activity rate recorded at fixed ground detectors during the FMP as a standard for comparison with activity data from other wind energy facilities. Given the relatively small number of publicly available studies and the significant ecological differences between geographically dispersed facilities, the risk assessment is qualitative, rather than quantitative.

## RESULTS

### Bat Acoustic Surveys

Bat activity was monitored at four sampling locations for a total of 291 detector-nights between May 26 and October 21, 2016. AnaBat units were operating for 50.2% of the sampling period (Figure 4). The primary cause of lost data was battery failures, and excessive insect noise in the fall may also have contributed to lost nights of data collection due to filling the compact flash cards or by blocking bat calls. AnaBat units at the fixed ground stations recorded 1,663 bat passes on 291 detector-nights for a mean (± standard error) of 5.64 ± 1.61 bat passes per detector-night (Table 3).

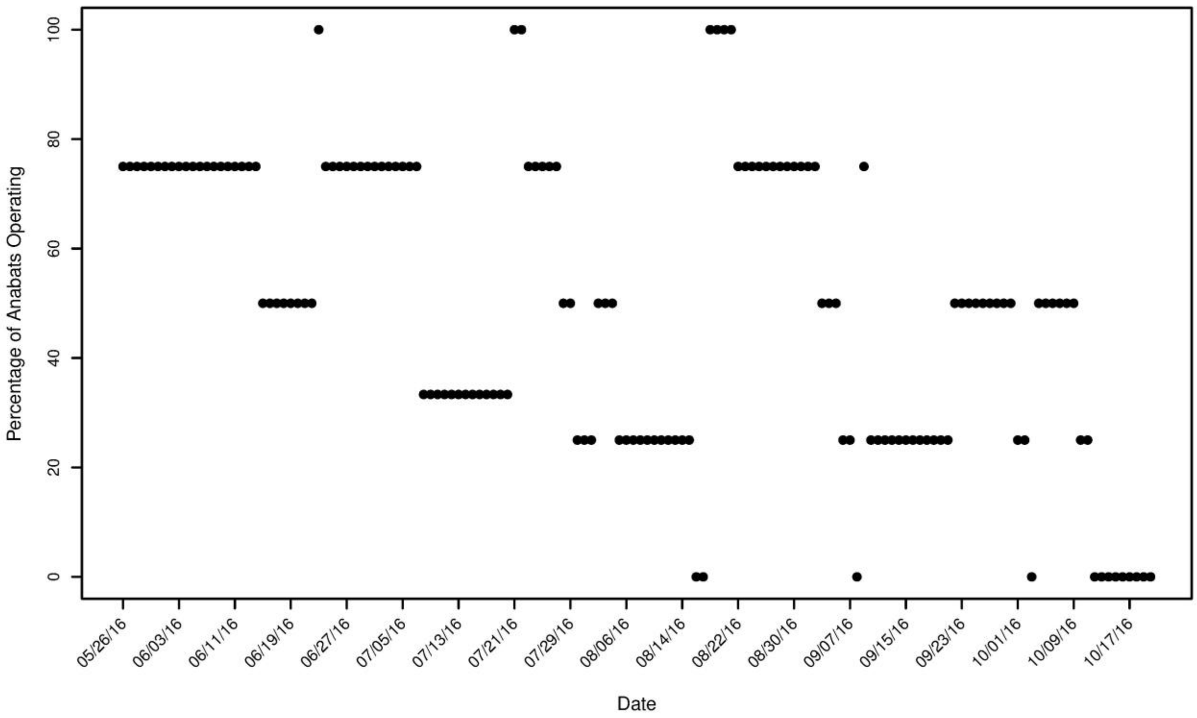

**Figure 4. Operational status of bat detectors (n = 4) operating at the Triple H Wind Project during each night of the study period May 26 to October 21, 2016.**

**Table 3. Results of acoustic bat surveys conducted at fixed stations within the Triple H Wind Project from May 26 to October 21, 2016. Passes are separated by call frequency: high frequency (HF) and low frequency (LF).**

| AnaBat Station | # of HF Bat Passes | # of LF Bat Passes | Total Bat Passes | Detector-Nights | Bat Passes/ Night[***] |
|---|---|---|---|---|---|
| TH1 | 540 | 461 | 999 | 84 | 11.89 ± 3.00 |
| TH2 | 244 | 95 | 339 | 51 | 6.65 ± 3.55 |
| TH3 | 128 | 95 | 223 | 95 | 2.35 ± 0.37 |
| TH4 | 49 | 53 | 102 | 61 | 1.67 ± 0.44 |
| **Total** | **961** | **704** | **1663** | **291** | **5.64 ± 1.61** |

[***] ± bootstrapped standard error.

### *Spatial Variation*

Bat activity in the Project was consistently higher at the TH1 and TH2 ground units compared to units TH3 and TH4 (Figure 5, Table 3). Units TH4 and TH3 recorded the fewest bat passes per detector-night (1.67 ± 0.44 and 2.35 ± 0.37 bat calls, respectively); unit TH2 recorded the second highest number of bat passes per detector-night (6.65 ± 3.55), while unit TH1 recorded the most (11.89 ± 3.00; Table 3).

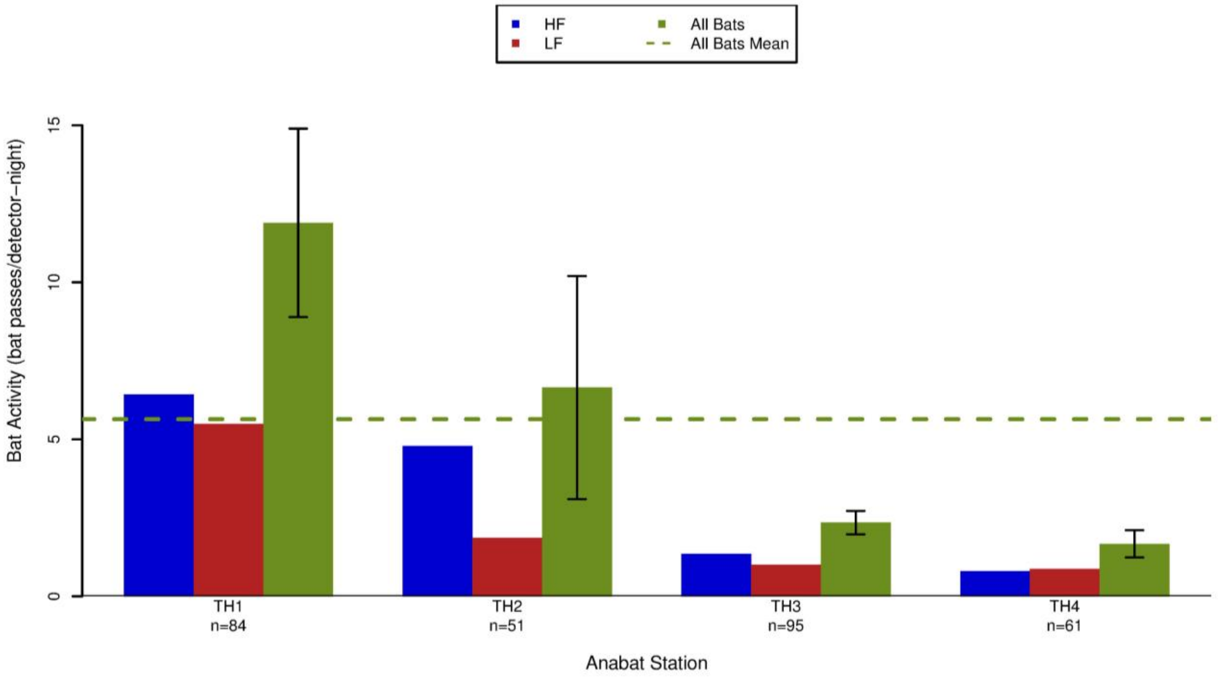

**Figure 5. Number of high-frequency (HF) and low-frequency (LF) bat passes per detector-night recorded at AnaBat stations in the Triple H Wind Project between May 26 to October 21, 2016. The bootstrapped standard errors are represented by the black error bars on the 'All Bats' columns.**

### *Temporal Variation*

Bat activity at fixed stations was relatively low in the summer and increased in the fall (Table 4, Figure 6). Weekly acoustic activity was relatively low from May through July (Figure 7), peaking from September 2 to September 8 (31.61 bat passes per detector-night; Table 5; Figure 7). Overall bat activity decreased again in late September through the remainder of the study period (Figure 7).

### *Species Composition*

At fixed stations, 42.3% of bat passes were classified as LF (e.g., big brown bats, hoary bats, and silver-haired bats), and 57.7% of bat passes were classified as HF (e.g., eastern red bats and *Myotis* species; Tables 2 and 3).

**Table 4. The number of bat passes per detector-night recorded at ground stations in the Triple H Wind Project during each season in 2016, separated by call frequency: high-frequency (HF), low-frequency (LF), and all bats (AB).**

| | | Summer | Fall | Fall Migration Period |
|---|---|---|---|---|
| **Station** | **Call Frequency** | **May 26 – Aug 15** | **Aug 16 – Oct 21** | **July 30 – Oct 14** |
| TH1 | LF | 3.56 | 7.33 | 7.07 |
| | HF | 4.41 | 8.35 | 8.67 |
| | AB | 7.98 | 15.63 | 15.7 |
| TH2 | LF | 1.07 | 3 | 3 |
| | HF | 1.2 | 9.9 | 9.9 |
| | AB | 2.27 | 12.9 | 12.9 |
| TH3 | LF | 0.92 | 1.16 | 1.16 |
| | HF | 0.51 | 3 | 3 |
| | AB | 1.43 | 4.16 | 4.16 |
| TH4 | LF | 0.88 | 0.85 | 0.75 |
| | HF | 0.42 | 2.23 | 2.81 |
| | AB | 1.29 | 3.08 | 3.56 |
| **Overall** | **LF** | **1.61 ± 0.28** | **3.08 ± 1.09** | **2.99 ± 0.98** |
| | **HF** | **1.63 ± 0.45** | **5.87 ± 2.34** | **6.10 ± 2.32** |
| | **AB** | **3.24 ± 0.60** | **8.94 ± 3.38** | **9.08 ± 3.23** |

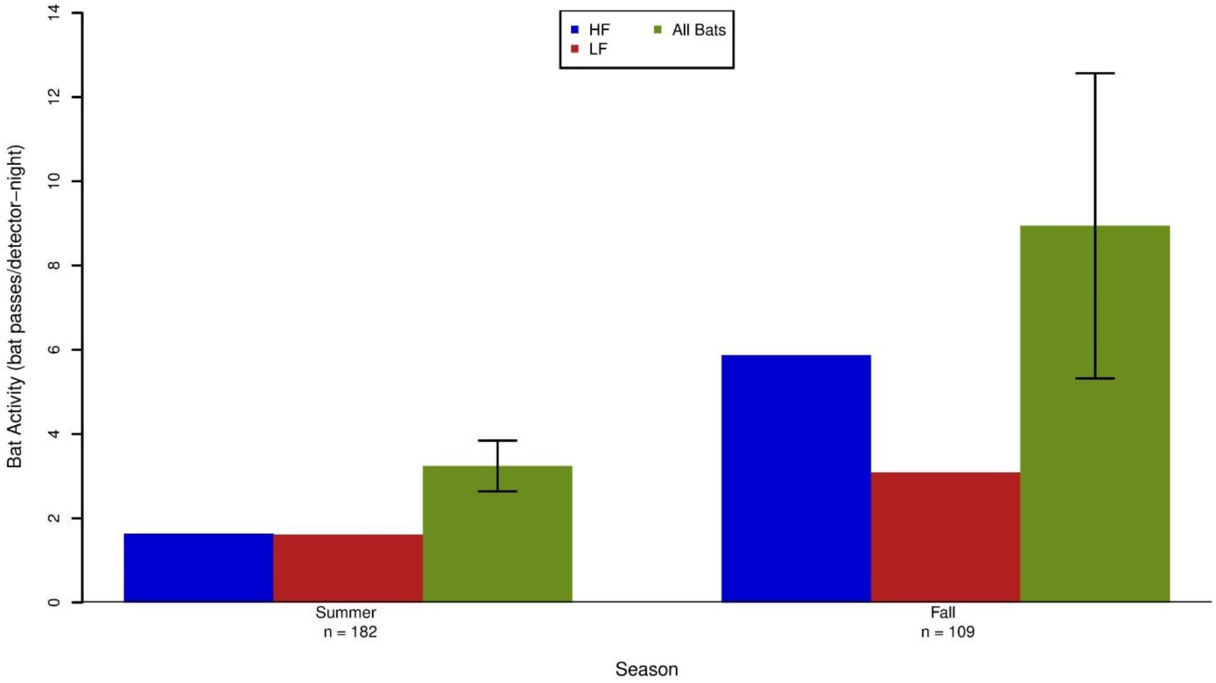

**Figure 6. Seasonal bat activity by high-frequency (HF), low-frequency (LF), and all bats at the Triple H Wind Project from May 26 to October 21, 2016. The bootstrapped standard errors are represented on the ‘All Bats’ columns.**

**Table 5. Periods of peak activity for high-frequency (HF), low-frequency (LF), and all bats at the Triple H Wind Project for the study period May 26 – October 21, 2016.**

| Species Group | Start Date of Peak Activity | End Date of Peak Activity | Bat Passes per Detector-Night |
|---|---|---|---|
| HF | 9/16/16 | 9/22/16 | 20.43 |
| LF | 9/5/16 | 9/11/16 | 12.17 |
| All Bats | 9/2/16 | 9/8/16 | 31.61 |

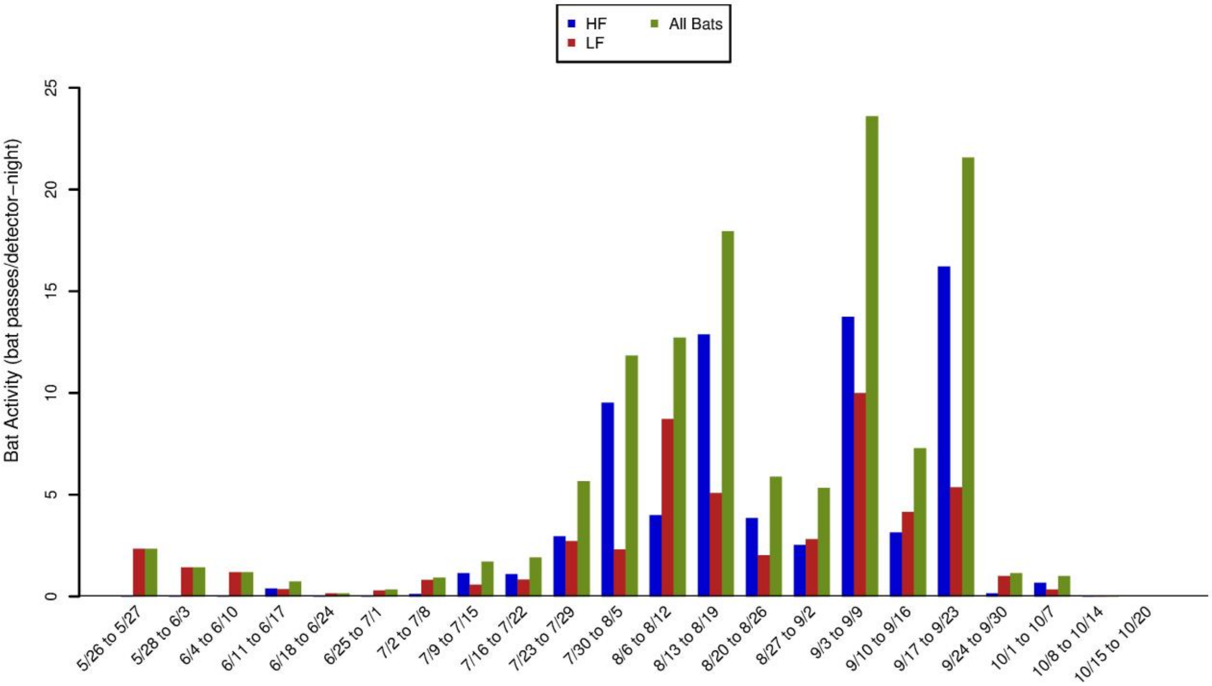

**Figure 7. Weekly patterns of bat activity by high-frequency (HF), low-frequency (LF), and all bats at the Triple H Wind Project for the study period May 26 to October 21, 2016.**

# DISCUSSION

Bat fatalities have been discovered at most wind energy facilities monitored in North America, ranging from zero (Chatfield and Bay 2014) to 40.2 bat fatalities per megawatt (MW) per year (Hein et al. 2013b; Appendix A). In 2012, an estimated 600,000 bats died as a result of interactions with wind turbines in the US (Hayes 2013). Proximate causes of bat fatalities are primarily due to collisions with moving turbine blades (Grodsky et al. 2011,Rollins et al. 2012), but to a limited extent may also be caused by barotrauma (Baerwald et al. 2008). The underlying reasons for why bats come near turbines are still largely unknown (Cryan and Barclay 2009). To date, post-construction monitoring studies of wind energy facilities show that a) migratory tree-roosting species (e.g., eastern red bat, hoary, and silver-haired bat) compose approximately 78% of reported bat fatalities; b) the majority of fatalities occur during the fall migration season (August and September); and c) most fatalities occur on nights with relatively low wind speeds (e.g., less than 6.0 m per second [m/s; 19.7 ft/s]; Arnett et al. 2008, 2013; Arnett and Baerwald 2013).

It is generally expected that pre-construction bat activity is positively related to post-construction bat fatalities (Kunz et al. 2007b). However, to date, few studies of wind energy facilities have recorded both bat passes per detector-night and bat fatality rates are publicly available (Appendix A). Given the limited availability of pre- and post-construction data sets, differences in protocols among studies (Ellison 2012), and significant ecological differences between geographically diverse facilities, the relationship between activity and fatalities has not yet been empirically established, though Baerwald and Barclay (2009) found a significant positive association between bat pass rates measured at 30 m (98 ft) above the ground and fatality rates for hoary and silver-haired bats across five sites in southern Alberta.

However, on a continental scale, a similar relationship has proven difficult to establish. The relatively few studies that have estimated both pre-construction activity and post-construction fatalities trend toward a positive association between activity and fatality rates, but they lack statistically significant correlations. Hein et al. (2013a) compiled data from wind projects that included both pre- and post-construction data from the same projects, as well as pre- and post-construction data from facilities within the same regions to assess if pre-construction acoustic activity predicted post-construction fatality rates. Based on data from 12 sites that had both pre- and post-construction data, they did not find a statistically significant relationship (p=0.07), although the trend was in the expected direction (i.e., low activity was generally associated with low fatalities and vice-versa). They concluded that pre-construction acoustic data could not currently predict bat fatalities, but acknowledged that the data set was limited and additional data may indicate a stronger relationship. Therefore, the current approach to assessing the risk to bats requires a qualitative analysis of activity levels, spatial and temporal relationships, species composition, and comparison to regional fatality patterns.

Activity by HF bat species composed 57.7% of bat passes recorded at stations in the Project. Eastern red bats are usually the most common HF species found during carcass searches (Arnett et al. 2008, Arnett and Baerwald 2013). *Myotis* species are recorded less commonly than other species in the rotor-swept zone or as fatalities at most post-construction studies of wind energy facilities (Kunz et al. 2007b, Arnett et al. 2008), with a few notable exceptions (Kerns and Kerlinger 2004, Jain 2005, Brown and Hamilton 2006a, Gruver et al. 2009). Approximately 42.3% of bat passes recorded in the Project were emitted by LF bats (Table 3). These LF species may become casualties because they typically fly at higher altitudes (Aldridge and Rautenbach 1987, Norberg and Rayner 1987, Fenton and Bogdanowicz 2002). Given that hoary bats, eastern red bats, and silver-haired bats are among the most commonly found bat fatalities at many facilities (Arnett et al. 2008,, Arnett and Baerwald 2013), it is expected that these three species would likely be the most common fatalities at the Project.

Mean bat activity during the FMP at the fixed ground detectors (9.08 ± 3.23 bat passes per detector-night; Table 4) was about average for the majority of studies available from the Midwest (Appendix A). Based on available studies in the Midwest, observed bat activity rates may be indicative of fatality rates ranging from 0.16 to 30.61 bats/MW/year, and the Project is expected to have a low to moderate fatality rate. Overall bat activity was highest within the

Project during the FMP, peaking in early September. This timing is consistent with peak fatality periods for most wind energy facilities in the US, and suggests that bat fatalities at the Project will be highest during late summer to early fall, and may consist largely of migrating individuals.

Given that over two-thirds of bat fatality studies in the Midwest report fewer than five bat fatalities/MW/year (Appendix A; Figure 8), it is possible that similar fatality rates could be recorded at the Project. However, some studies indicate that facilities in agricultural settings in the Midwest can produce higher levels of bat fatalities (Jain 2005, Baerwald 2008, Gruver et al. 2009). The closest operating wind-energy facility to the Project with public post-construction fatality data is the PrairieWinds SD1 facility, located approximately 78.1 kilometers (48.5 miles) from the Project. Both the PrairieWinds SD1 facility and the Project are located in landscapes consisting mostly of grasslands and croplands, with little topography and few woodlots. No publicly available pre-construction bat activity estimates from ground based detectors are available for the PrairieWinds SD1 facility. The fatality estimates reported at PrairieWinds SD1 range from 1.05-1.39 bats/MW/year (Derby et al. 2012d, 2013a). The pre-construction bat studies completed at the Project will add to the growing body of research regarding the impacts of wind energy development on bats and will provide a valuable comparison to post-construction studies to be completed at Project.

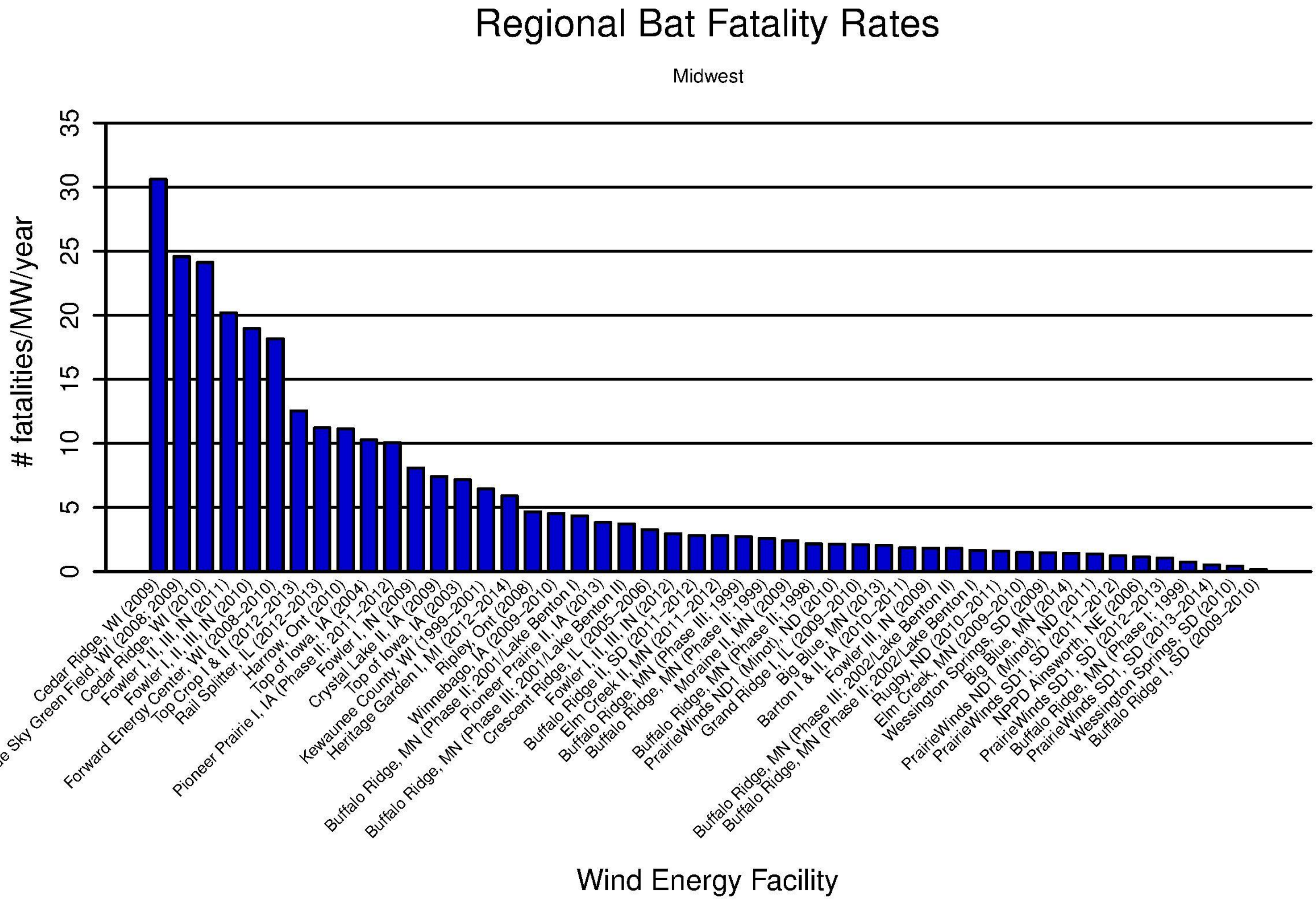

**Figure 8. Fatality rates for bats (number of bats per megawatt per year) from publicly available studies at wind energy facilities in the Midwest.**

**Figure 8 (*continued*). Fatality rates for bats (number of bats per megawatt per year) from publicly available studies at wind energy facilities in the Midwest.**

Data from the following sources:

| Facility, Location | Reference | Facility, Location | Reference | Facility, Location | Reference |
|---|---|---|---|---|---|
| Cedar Ridge, WI (09) | BHE Environmental 2010 | Ripley, Ont (08) | Jacques Whitford 2009 | Barton I & II, IA (10-11) | Derby et al. 2011a |
| Blue Sky Green Field, WI (08; 09) | Gruver et al. 2009 | Winnebago, IA (09-10) | Derby et al. 2010e | Fowler III, IN (09) | Johnson et al. 2010b |
| Cedar Ridge, WI (10) | BHE Environmental 2011 | Buffalo Ridge, MN (Phase II; 01/Lake Benton I) | Johnson et al. 2004 | Buffalo Ridge, MN (Phase III; 02/Lake Benton II) | Johnson et al. 2004 |
| Fowler I, II, III, IN (11) | Good et al. 2012 | Pioneer Prairie II, IA (13) | Chodachek et al. 2014 | Buffalo Ridge, MN (Phase II; 02/Lake Benton I) | Johnson et al. 2004 |
| Fowler I, II, III, IN (10) | Good et al. 2011 | Buffalo Ridge, MN (Phase III; 01/Lake Benton II) | Johnson et al. 2004 | Rugby, ND (10-11) | Derby et al. 2011b |
| Forward Energy Center, WI (08-10) | Grodsky and Drake 2011 | Crescent Ridge, IL (05-06) | Kerlinger et al. 2007 | Elm Creek, MN (09-10) | Derby et al. 2010c |
| Top Crop I & II (12-13) | Good et al. 2013a | Fowler I, II, III, IN (12) | Good et al. 2013c | Wessington Springs, SD (09) | Derby et al. 2010f |
| Rail Splitter, IL (12-13) | Good et al. 2013b | Buffalo Ridge II, SD (11-12) | Derby et al. 2012a | Big Blue, MN (14) | Fagen Engineering 2015 |
| Harrow, Ont (10) | Natural Resource Solutions Inc. (NRSI) 2011 | Elm Creek II, MN (11-12) | Derby et al. 2012b | PrairieWinds ND1 (Minot), ND (11) | Derby et al. 2012c |
| Top of Iowa, IA (04) | Jain 2005 | Buffalo Ridge, MN (Phase III; 99) | Johnson et al. 2000 | PrairieWinds SD1, SD (11-12) | Derby et al. 2012d |
| Pioneer Prairie I, IA (Phase II; 11-12) | Chodachek et al. 2012 | Buffalo Ridge, MN (Phase II; 99) | Johnson et al. 2000 | NPPD Ainsworth, NE (06) | Derby et al. 2007 |
| Fowler I, IN (09) | Johnson et al. 2010a | Moraine II, MN (09) | Derby et al. 2010d | PrairieWinds SD1, SD (12-13) | Derby et al. 2013a |
| Crystal Lake II, IA (09) | Derby et al. 2010a | Buffalo Ridge, MN (Phase II; 98) | Johnson et al. 2000 | Buffalo Ridge, MN (Phase I; 99) | Johnson et al. 2000 |
| Top of Iowa, IA (03) | Jain 2005 | PrairieWinds ND1 (Minot), ND (10) | Derby et al. 2011c | PrairieWinds SD1, SD (13-14) | Derby et al. 2014 |
| Kewaunee County, WI (99-01) | Howe et al. 2002 | Grand Ridge I, IL (09-10) | Derby et al. 2010g | Wessington Springs, SD (10) | Derby et al. 2011d |
| Heritage Garden I, MI (12-14) | Kerlinger et al. 2014 | Big Blue, MN (13) | Fagen Engineering 2014 | Buffalo Ridge I, SD (09-10) | Derby et al. 2010b |

# REFERENCES

AECOM. 2013. Annual Monitoring Report: July 2012 - June 2013. Solano Wind Project - Phase 3. Prepared for SMUD - Environmental Management, Sacramento, California. Prepared by AECOM, Sacramento, California. September 2013.

Aldridge, H. D. J. N. and I. L. Rautenbach. 1987. Morphology, Echolocation and Resource Partitioning in Insectivorous Bats. Journal of Animal Ecology 56: 763-778.

AnaLook. 2004. Bat call analysis program. © 2004, C. Corben.

Anderson, R., N. Neuman, J. Tom, W. P. Erickson, M. D. Strickland, M. Bourassa, K. J. Bay, and K. J. Sernka. 2004. Avian Monitoring and Risk Assessment at the Tehachapi Pass Wind Resource Area, California. Period of Performance: October 2, 1996 - May 27, 1998. NREL/SR-500-36416. National Renewable Energy Laboratory, Golden, Colorado. September 2004. http://www.nrel.gov/docs/fy04osti/36416.pdf

Anderson, R., J. Tom, N. Neumann, W. P. Erickson, M. D. Strickland, M. Bourassa, K. J. Bay, and K. J. Sernka. 2005. Avian Monitoring and Risk Assessment at the San Gorgonio Wind Resource Area. NREL/SR-500-38054. August 2005. Western EcoSytems Technology, Inc. (WEST). Cheyenne, Wyoming. Phase I and II Field Work. http://www.nrel.gov/docs/fy05osti/38054.pdf

ARCADIS U.S., Inc. 2013. Fall 2012 and Spring 2013 Avian and Bat Post-Construction Mortality Monitoring Report: Pioneer Trail Wind Farm. Prepared for E.On Climate & Renewables, North America. Prepared by ARCADIS U.S., Inc., Milwaukee, Wisconsin. August 2013.

Arnett, E. B. and E. F. Baerwald. 2013. Impacts of Wind Energy Development on Bats: Implications for Conservation. Chapter 21. Pp. 435-456. *In*: R. A. Adams and S. C. Pederson, eds. Bat Ecology, Evolution and Conservation. Springer Science Press, New York.

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. Prepared for the Bats and Wind Energy Cooperative. March 2005.

Arnett, E. B., K. Brown, W. P. Erickson, J. Fiedler, B. L. Hamilton, T. H. Henry, A. Jain, G. D. Johnson, J. Kerns, R. R. Koford, C. P. Nicholson, T. O'Connell, M. Piorkowski, and R. Tankersley, Jr. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. Journal of Wildlife Management 72(1): 61-78.

Arnett, E. B., M. R. Schirmacher, M. M. P. Huso, and J. P. Hayes. 2009a. Effectiveness of Changing Wind Turbine Cut-in Speed to Reduce Bat Fatalities at Wind Facilities: 2008 Annual Report. Prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission. Bat Conservation International (BCI), Austin, Texas. April 2009. http://www.batsandwind.org/pdf/Curtailment_2008_Final_Report.pdf

Arnett, E. B., M. R. Schirmacher, M. M. P. Huso, and J. P. Hayes. 2009b. Patterns of Bat Fatality at the Casselman Wind Project in South-Central Pennsylvania. 2008 Annual Report. Annual report prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission. Bat Conservation International (BCI), Austin, Texas. June 2009. Available online at: http://www.batsandwind.org/pdf/2008%20Casselman%20Fatality%20Report.pdf

Arnett, E. B., M. R. Schirmacher, M. M. P. Huso, and J. P. Hayes. 2010. Patterns of Bat Fatality at the Casselman Wind Project in South-Central Pennsylvania. 2009 Annual Report. Annual report prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission. Bat Conservation International (BCI), Austin, Texas. January 2010.

Arnett, E. B., M. R. Schirmacher, C. D. Hein, and M. M. P. Huso. 2011. Patterns of Bird and Bat Fatality at the Locust Ridge II Wind Project, Pennsylvania. 2009-2010 Final Report. Prepared for the Bats and Wind Energy Cooperative (BWEC) and the Pennsylvania Game Commission (PGC). Prepared by Bat Conservation International (BCI), Austin, Texas. January 2011.

Arnett, E. B., G. D. Johnson, W. P. Erickson, and C. D. Hein. 2013. A Synthesis of Operational Mitigation Studies to Reduce Bat Fatalities at Wind Energy Facilities in North America. A report submitted to the National Renewable Energy Laboratory (NREL), Golden Colorado. Bat Conservation International (BCI), Austin, Texas. March 2013.

Atwell, LLC. 2012. Fall 2011 Post-Construction Monitoring Report for Roth Rock Wind Farm, Garrett County Maryland. Project No. 11001315. Prepared for Gestamp Wind North America, Houston, Texas. Prepared by Atwell, LCC. February 29, 2012. Revised August 15, 2012.

Barclay, R. M. R., E. F. Baerwald, and J. Gruver. 2007. Variation in Bat and Bird Fatalities at Wind Energy Facilities: Assessing the Effects of Rotor Size and Tower Height. Canadian Journal of Zoology 85: 381-387.

Baerwald, E. F. 2008. Variation in the Activity and Fatality of Migratory Bats at Wind Energy Facilities in Southern Alberta: Causes and Consequences. Thesis. University of Calgary, Calgary, Alberta, Canada.

Baerwald, E. F. and R. M. R. Barclay. 2009. Geographic Variation in Activity and Fatality of Migratory Bats at Wind Energy Facilities. Journal of Mammalogy 90(6): 1341–1349.

Baerwald, E. F., G. H. D'Amours, B. J. Klug, and R. M. R. Barclay. 2008. Barotrauma Is a Significant Cause of Bat Fatalities at Wind Turbines. Current Biology 18(16): R695-R696.

BHE Environmental, Inc. (BHE). 2008. Investigations of Bat Activity and Bat Species Richness at the Proposed Cedar Ridge Wind Farm in Fond Du Lac County, Wisconsin. Interim Report prepared for Wisconsin Power and Light.

BHE Environmental, Inc. (BHE). 2010. Post-Construction Bird and Bat Mortality Study: Cedar Ridge Wind Farm, Fond Du Lac County, Wisconsin. Interim Report prepared for Wisconsin Power and Light, Madison, Wisconsin. Prepared by BHE Environmental, Inc. Cincinnati, Ohio. February 2010.

BHE Environmental, Inc. (BHE). 2011. Post-Construction Bird and Bat Mortality Study: Cedar Ridge Wind Farm, Fond Du Lac County, Wisconsin. Final Report. Prepared for Wisconsin Power and Light, Madison, Wisconsin. Prepared by BHE Environmental, Inc. Cincinnati, Ohio. February 2011.

BioResource Consultants, Inc. (BRC). 2012. Avian Mortality Monitoring Report, Pine Tree Wind Farm, Kern County, California. Prepared for the City of Los Angeles Department of Water and Power. Report prepared by BioResource Consultants, Inc., Ojai, California. March 26, 2012.

Boyles, J. G. and C. K. R. Willis. 2010. Could Localized Warm Areas inside Cold Caves Reduce Mortality of Hibernating Bats Affected by White-Nose Syndrome? Frontiers in Ecology and the Environment 8(2): 92-98.

Britzke, E. R., E. H. Gillam, and K. L. Murray. 2013. Current State of Understanding of Ultrasonic Detectors for the Study of Bat Ecology. Acta Theriologica: doi: 10.1007/s13364-13013-10131-13363.

Brooks, R. T. and W. M. Ford. 2005. Bat Activity in a Forest Landscape of Central Massachusetts. Northeastern Naturalist 12(4): 447-462.

Brown, K., K. S. Smallwood, and B. Karas. 2013. Final 2012-2013 Annual Report, Avian and Bat Monitoring Project, Vasco Winds, Llc. Prepared for NextEra Energy Resources, Livermore, California. Prepared by Ventus Environmental Solutions, Portland, Oregon. September 2013.

Brown, W. K. and B. L. Hamilton. 2004. Bird and Bat Monitoring at the Mcbride Lake Wind Farm, Alberta, 2003-2004. Report for Vision Quest Windelectric, Inc., Calgary, Alberta, Canada. September 2004.

Brown, W. K. and B. L. Hamilton. 2006a. Bird and Bat Interactions with Wind Turbines Castle River Wind Facility, Alberta, 2001-2002. Report for Vision Quest Windelectric, Inc., Calgary, Alberta, Canada.

Brown, W. K. and B. L. Hamilton. 2006b. Monitoring of Bird and Bat Collisions with Wind Turbines at the Summerview Wind Power Project, Alberta: 2005-2006. Prepared for Vision Quest Windelectric, Calgary, Alberta by TAEM Ltd., Calgary, Alberta, and BLH Environmental Services, Pincher Creek, Alberta. September 2006. http://www.batsandwind.org/pdf/Brown2006.pdf

Chatfield, A. and K. Bay. 2014. Post-Construction Studies for the Mustang Hills and Alta VIII Wind Energy Facilities, Kern County, California. Final Report for the First Year of Operation: July 2012 - October 2013. Prepared for EverPower Wind Holdings, Inc. and Brookfield Renewable Energy Group. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 28, 2014.

Chatfield, A. and D. Russo. 2014. Post-Construction Avian and Bat Fatality Monitoring for the Pinyon Pines I & II Wind Energy Project, Kern County, California. Final Report for the First Year of Operation: March 2013 - March 2014. Prepared for MidAmerican Renewables, LLC, Des Moines, Iowa, and Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 28, 2014.

Chatfield, A., W. Erickson, and K. Bay. 2009. Avian and Bat Fatality Study, Dillon Wind-Energy Facility, Riverside County, California. Final Report: March 26, 2008 - March 26, 2009. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 3, 2009.

Chatfield, A., W. P. Erickson, and K. Bay. 2010. Final Report: Avian and Bat Fatality Study at the Alite Wind-Energy Facility, Kern County, California. Final Report: June 15, 2009 – June 15, 2010. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Chatfield, A., M. Sonnenberg, and K. Bay. 2012. Avian and Bat Mortality Monitoring at the Alta-Oak Creek Mojave Project, Kern County, California. Final Report for the First Year of Operation March 22, 2011 – June 15, 2012. Prepared for Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 12, 2012.

Chatfield, A., D. Riser-Espinoza, and K. Bay. 2014. Bird and Bat Mortality Monitoring at the Alta Wind Energy Center, Phases I - V, Kern County, California. Final Report for the Second Year of Operation: March 4, 2013 - March 6, 2014. Prepared for Alta Windpower Development, LLC, Mojave, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 22, 2014.

Chodachek, K., C. Derby, M. Sonnenberg, and T. Thorn. 2012. Post-Construction Fatality Surveys for the Pioneer Prairie Wind Farm I Llc Phase II, Mitchell County, Iowa: April 4, 2011 – March 31, 2012. Prepared for EDP Renewables, North America LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 27, 2012.

Chodachek, K., C. Derby, K. Adachi, and T. Thorn. 2014. Post-Construction Fatality Surveys for the Pioneer Prairie II Wind Energy Facility, Mitchell County, Iowa. Final Report: July 1 - October 18, 2013. Prepared for EDP Renewables, North America LLC, Houston, Texas. Prepared by Western EcoSystems Technology Inc. (WEST), Bismarck, North Dakota. April 2014.

Chodachek, K., K. Adachi, and G. DiDonato. 2015. Post Construction Fatality Surveys for the Prairie Rose Wind Energy Facility, Rock County, Minnesota. Final Report: April 15 to June 13, 2014, and August 15 to October 29, 2014. Prepared for Enel Green Power, North America, San Diego, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. January 23, 2015.

Collins, J. and G. Jones. 2009. Differences in Bat Activity in Relation to Bat Detector Height: Implications for Bat Surveys at Proposed Wind Farms. Acta Chiropterologica 11: 343:350.

Cryan, P. M. 2008. Mating Behavior as a Possible Cause of Bat Fatalities at Wind Turbines. Journal of Wildlife Management 72(3): 845-849. doi: 10.2193/2007-371.

Cryan, P. M. and R. M. R. Barclay. 2009. Causes of Bat Fatalities at Wind Turbines: Hypotheses and Predictions. Journal of Mammalogy 90(6): 1330-1340.

Derby, C., A. Dahl, W. Erickson, K. Bay, and J. Hoban. 2007. Post-Construction Monitoring Report for Avian and Bat Mortality at the Nppd Ainsworth Wind Farm. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, for the Nebraska Public Power District.

Derby, C., K. Chodachek, and K. Bay. 2010a. Post-Construction Bat and Bird Fatality Study Crystal Lake II Wind Energy Center, Hancock and Winnebago Counties, Iowa. Final Report: April 2009-October 2009. Prepared for NextEra Energy Resources, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. June 2, 2010.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010b. Post-Construction Fatality Survey for the Buffalo Ridge I Wind Project. May 2009 - May 2010. Prepared for Iberdrola Renewables, Inc., Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010c. Post-Construction Fatality Surveys for the Elm Creek Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010d. Post-Construction Fatality Surveys for the Moraine II Wind Project: March - December 2009. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., K. Chodachek, K. Bay, and A. Merrill. 2010e. Post-Construction Fatality Surveys for the Winnebago Wind Project: March 2009- February 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Derby, C., A. Dahl, A. Merrill, and K. Bay. 2010f. 2009 Post-Construction Monitoring Results for the Wessington Springs Wind-Energy Facility, South Dakota. Final Report. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 19, 2010.

Derby, C., J. Ritzert, and K. Bay. 2010g. Bird and Bat Fatality Study, Grand Ridge Wind Resource Area, Lasalle County, Illinois. January 2009 - January 2010. Prepared for Grand Ridge Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. July 13, 2010. Revised January 2011.

Derby, C., K. Chodachek, K. Bay, and S. Nomani. 2011a. Post-Construction Fatality Surveys for the Barton I and II Wind Project: Iri. March 2010 - February 2011. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. Version: September 28, 2011.

Derby, C., K. Chodachek, K. Bay, and S. Nomani. 2011b. Post-Construction Fatality Surveys for the Rugby Wind Project: Iberdrola Renewables, Inc. March 2010 - March 2011. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. Version: October 14, 2011.

Derby, C., K. Chodachek, T. Thorn, K. Bay, and S. Nomani. 2011c. Post-Construction Fatality Surveys for the PrairieWinds ND1 Wind Facility, Basin Electric Power Cooperative, March - November 2010. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 2, 2011.

Derby, C., A. Dahl, K. Bay, and L. McManus. 2011d. 2010 Post-Construction Monitoring Results for the Wessington Springs Wind Energy Facility, South Dakota. Final Report: March 9 – November 16, 2010. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 22, 2011.

Derby, C., K. Chodachek, and M. Sonnenberg. 2012a. Post-Construction Casualty Surveys for the Buffalo Ridge II Wind Project. Iberdrola Renewables: March 2011- February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 31, 2012.

Derby, C., K. Chodachek, and M. Sonnenberg. 2012b. Post-Construction Fatality Surveys for the Elm Creek II Wind Project. Iberdrola Renewables: March 2011-February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. October 8, 2012.

Derby, C., K. Chodachek, T. Thorn, and A. Merrill. 2012c. Post-Construction Surveys for the PrairieWinds ND1 (2011) Wind Facility Basin Electric Power Cooperative: March - October 2011. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western Ecosystems Technology, Inc. (WEST), Bismarck, North Dakota. August 31, 2012.

Derby, C., A. Dahl, and A. Merrill. 2012d. Post-Construction Monitoring Results for the PrairieWinds SD1 Wind Energy Facility, South Dakota. Final Report: March 2011 - February 2012. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. September 27, 2012.

Derby, C., A. Dahl, and D. Fox. 2013a. Post-Construction Fatality Monitoring Studies for the PrairieWinds SD1 Wind Energy Facility, South Dakota. Final Report: March 2012 - February 2013. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 13, 2013.

Derby, C., G. Iskali, S. Howlin, T. Thorn, T. Lyon, and A. Dahl. 2013b. Post-Construction Monitoring Results for the Big Smile Wind Farm, Roger Mills County, Oklahoma. Final Report: March 2012 to February 2013. Prepared for Acciona Wind Energy, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. June 12, 2013.

Derby, C., G. Iskali, M. Kauffman, T. Thorn, T. Lyon, and A. Dahl. 2013c. Post-Construction Monitoring Results, Red Hills Wind Farm, Roger Mills and Custer Counties, Oklahoma. Final Report: March 2012 to March 2013. Prepared for Acciona Wind Energy, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. June 12, 2013.

Derby, C., A. Dahl, and G. DiDonato. 2014. Post-Construction Fatality Monitoring Studies for the PrairieWinds SD1 Wind Energy Facility, South Dakota. Final Report: March 2013 - February 2014. Prepared for Basin Electric Power Cooperative, Bismarck, North Dakota. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota.

Downes, S. and R. Gritski. 2012a. Harvest Wind Project Wildlife Monitoring Report: January 2010 – January 2012. Prepared for Harvest Wind Project, Roosevelt, Washington. Prepared by Northwest Wildlife Consultants, Inc., Pendleton, Oregon May 1, 2012.

Downes, S. and R. Gritski. 2012b. White Creek Wind I Wildlife Monitoring Report: November 2007 - November 2011. Prepared for White Creek Wind I, LLC, Roosevelt, Washington. Prepared by Northwest Wildlife Consultants, Inc., Pendleton, Oregon May 1, 2012.

Ellison, L. E. 2012. Bats and Wind Energy: A Literature Synthesis and Annotated Bibliography. Open-File Report No. 2012-1110. US Geological Survey (USGS).

Enk, T., K. Bay, M. Sonnenberg, J. Baker, M. Kesterke, J. R. Boehrs, and A. Palochak. 2010. Biglow Canyon Wind Farm Phase I Post-Construction Avian and Bat Monitoring Second Annual Report, Sherman County, Oregon. January 26, 2009 - December 11, 2009. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc.(WEST) Cheyenne, Wyoming, and Walla Walla, Washington. April 2010.

Enk, T., K. Bay, M. Sonnenberg, J. Flaig, J. R. Boehrs, and A. Palochak. 2011a. Year 1 Post-Construction Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase II, Sherman County, Oregon. September 10, 2009 - September 12, 2010. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. January 7, 2011.

Enk, T., C. Derby, K. Bay, and M. Sonnenberg. 2011b. 2010 Post-Construction Fatality Monitoring Report, Elkhorn Valley Wind Farm, Union County, Oregon. January – December 2010. Prepared for EDP Renewables, North America LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Walla Walla, Washington, and Cheyenne, Wyoming. December 8, 2011.

Enk, T., K. Bay, M. Sonnenberg, and J. R. Boehrs. 2012a. Year 1 Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase III, Sherman County, Oregon. September 13, 2010 - September 9, 2011. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. April 24, 2012.

Enk, T., K. Bay, M. Sonnenberg, and J. R. Boehrs. 2012b. Year 2 Avian and Bat Monitoring Report: Biglow Canyon Wind Farm Phase II, Sherman County, Oregon. September 13, 2010 - September 15, 2011. Prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. April 23, 2012.

Enz, T. and K. Bay. 2010. Post-Construction Avian and Bat Fatality Monitoring Study, Tuolumne Wind Project, Klickitat County, Washington. Final Report: April 20, 2009 - April 7, 2010. Prepared for Turlock Irrigation District, Turlock, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 6, 2010.

Enz, T. and K. Bay. 2011. Post-Construction Monitoring at the Linden Ranch Wind Farm, Klickitat County, Washington. Final Report: June 30, 2010 - July 17, 2011. Prepared for EnXco. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. November 10, 2011.

Enz, T., K. Bay, S. Nomani, and M. Kesterke. 2011. Bird and Bat Fatality Monitoring Study, Windy Flats and Windy Point II Wind Energy Projects, Klickitat County, Washington. Final Report: February 1, 2010 - January 14, 2011. Prepared for Windy Flats Partners, LLC, Goldendale, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 19, 2011.

Enz, T., K. Bay, M. Sonnenberg, and A. Palochak. 2012. Post-Construction Monitoring Studies for the Combine Hills Turbine Ranch, Umatilla County, Oregon. Final Report: January 7 - December 2, 2011. Prepared for Eurus Energy America Corporation, San Diego, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Walla Walla, Washington.

Erickson, W. P. and L. Sharp. 2005. Phase 1 and Phase 1a Avian Mortality Monitoring Report for 2004-2005 for the Smud Solano Wind Project. Prepared for Sacramento Municipal Utility District (SMUD), Sacramento, California. Prepared by URS Sacramento, California and Western EcoSystems Technology, Inc. (WEST). August 2005.

Erickson, W. P., G. D. Johnson, M. D. Strickland, and K. Kronner. 2000. Avian and Bat Mortality Associated with the Vansycle Wind Project, Umatilla County, Oregon. Technical Report prepared by WEST, Inc., for Umatilla County Department of Resource Services and Development, Pendleton, Oregon. 21 pp.

Erickson, W. P., K. Kronner, and R. Gritski. 2003. Nine Canyon Wind Power Project Avian and Bat Monitoring Report. September 2002 – August 2003. Prepared for the Nine Canyon Technical Advisory Committee and Energy Northwest by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants (NWC), Pendleton, Oregon. October 2003. http://www.west-inc.com/reports/nine_canyon_monitoring_final.pdf

Erickson, W. P., J. Jeffrey, K. Kronner, and K. Bay. 2004. Stateline Wind Project Wildlife Monitoring Annual Report. July 2001 - December 2003. Technical report peer-reviewed by and submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee. Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. December 2004. Available online at: http://www.west-inc.com/reports/swp_final_dec04.pdf

Erickson, W. P., K. Kronner, and R. Gritski. 2005. Nine Canyon Wind Project Phase II, Fall 2004 Avian and Bat Monitoring Report: July 25 – November 2, 2004. Prepared for the Nine Canyon Technical Advisory Committee, Energy Northwest, by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. March 2005.

Erickson, W. P., K. Kronner, and K. J. Bay. 2007. Stateline 2 Wind Project Wildlife Monitoring Report, January - December 2006. Technical report submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee.

Erickson, W. P., J. D. Jeffrey, and V. K. Poulton. 2008. Puget Sound Energy Wild Horse Wind Facility Avian and Bat Monitoring: First Annual Report: January–December, 2007. Prepared for Puget Sound Energy, Ellensburg, Washington. Prepared by by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 2008.

Fagen Engineering, LLC. 2014. 2013 Avian and Bat Monitoring Annual Report: Big Blue Wind Farm, Blue Earth, Minnesota. Prepared for Big Blue Wind Farm. Prepared by Fagen Engineering, LLC. May 2014.

Fagen Engineering, LLC. 2015. 2014 Avian and Bat Monitoring Annual Report: Big Blue Wind Farm, Blue Earth, Minnesota. Prepared for Big Blue Wind Farm. Prepared by Fagen Engineering, LLC.

Fenton, M. B. 1980. Adaptiveness and Ecology of Echolocation in Terrestrial (Aerial) Systems. Pp. 427-446. *In*: R. G. Busnel and J. F. Fish, eds. Animal Sonar Systems. Plenum Press, New York.

Fenton, M. B. and W. Bogdanowicz. 2002. Relationships between External Morphology and Foraging Behaviour: Bats in the Genus *Myotis.* Canadian Journal of Zoology 80: 1004-1013.

Fiedler, J. K. 2004. Assessment of Bat Mortality and Activity at Buffalo Mountain Windfarm, Eastern Tennessee. Thesis. University of Tennessee, Knoxville, Tennessee. Available online at: http://www.tva.gov/environment/bmw_report/bat_mortality_bmw.pdf

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. Tennessee Valley Authority. June 28, 2007.

Fishman Ecological Services LLC. 2003. Carcass Survey Results for Seawest Windpower, Inc., Condon Site 2002-2003. Prepared for SeaWest WindPower Inc.

Frick, W. F., J. F. Pollock, A. C. Hicks, K. E. Langwig, D. S. Reynolds, G. G. Turner, C. M. Butchkoski, and T. H. Kunz. 2010. An Emerging Disease Causes Regional Population Collapse of a Common North American Bat Species. Science 329: 679-682.

Golder Associates. 2010. Report on Fall Post-Construction Monitoring, Ripley Wind Power Project, Acciona Wind. Report Number 09-1126-0029. Submitted to Suncor Energy Products Inc., Calgary, Alberta, and Acciona Wind Energy Canada, Toronto, Ontario. February 2010.

Good, R. E., W. P. Erickson, A. Merrill, S. Simon, K. Murray, K. Bay, and C. Fritchman. 2011. Bat Monitoring Studies at the Fowler Ridge Wind Energy Facility, Benton County, Indiana: April 13 - October 15, 2010. Prepared for Fowler Ridge Wind Farm. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 28, 2011.

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

Good, R. E., J. P. Ritzert, and K. Adachi. 2013a. Post-Construction Monitoring at the Top Crop Wind Farm, Gundy and Lasalle Counties, Illinois. Final Report: May 2012 - May 2013. Prepared for EDP Renewables, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. October 22, 2013.

Good, R. E., M. L. Ritzert, and K. Adachi. 2013b. Post-Construction Monitoring at the Rail Splitter Wind Farm, Tazwell and Logan Counties, Illinois. Final Report: May 2012 - May 2013. Prepared for EDP Renewables, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. October 22, 2013.

Good, R. E., M. Sonnenburg, and S. Simon. 2013c. Bat Evaluation Monitoring Studies at the Fowler Ridge Wind Farm, Benton County, Indiana: August 1 - October 15, 2012. Prepared for the Fowler Ridge Wind Farm. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. January 31, 2013.

Grehan, J. R. 2008. Steel Winds Bird Mortality Study, Final Report, Lackawanna, New York. Prepared for Steel Winds LLC. April 2008.

Gritski, R. and K. Kronner. 2010a. Hay Canyon Wind Power Project Wildlife Monitoring Study: May 2009 - May 2010. Prepared for Iberdrola Renewables, Inc. (IRI), Hay Canyon Wind Power Project LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. September 20, 2010.

Gritski, R. and K. Kronner. 2010b. Pebble Springs Wind Power Project Wildlife Monitoring Study: January 2009 - January 2010. Prepared for Iberdrola Renewables, Inc. (IRI), and the Pebble Springs Advisory Committee. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 20, 2010.

Gritski, R., K. Kronner, and S. Downes. 2008. Leaning Juniper Wind Power Project, 2006 − 2008. Wildlife Monitoring Final Report. Prepared for PacifiCorp Energy, Portland, Oregon. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. December 30, 2008.

Gritski, R., S. Downes, and K. Kronner. 2010. Klondike III (Phase 1) Wind Power Project Wildlife Monitoring: October 2007-October 2009. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon, for Klondike Wind Power III LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. April 21, 2010 (Updated September 2010). Available online at: http://www.oregon.gov/energy/Siting/docs/KWP/KWPWildlifeReport091210.pdf

Gritski, R., S. Downes, and K. Kronner. 2011. Klondike IIIa (Phase 2) Wind Power Project Wildlife Monitoring: August 2008 - August 2010. Updated Final. Prepared for Iberdrola Renewables, Inc. (IRI), Portland, Oregon, for Klondike Wind Power III LLC. Prepared by Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. Updated April 2011. Available online at: http://www.oregon.gov/energy/Siting/docs/KWP/KWPWildlifeReport042711.pdf

Grodsky, S. M. and D. Drake. 2011. Assessing Bird and Bat Mortality at the Forward Energy Center. Final Report. Public Service Commission (PSC) of Wisconsin. PSC REF#:152052. Prepared for Forward Energy LLC. Prepared by Department of Forest and Wildlife Ecology, University of Wisconsin-Madison, Madison, Wisconsin. August 2011.

Grodsky, S. M., M. J. Behr, A. Gendler, D. Drake, B. D. Dieterle, R. J. Rudd, and N. L. Walrath. 2011. Investigating the Causes of Death for Wind Turbine-Associated Bat Fatalities. Journal of Mammalogy 92(5): 917-925.

Gruver, J. 2002. Assessment of Bat Community Structure and Roosting Habitat Preferences for the Hoary Bat (*Lasiurus cinereus*) near Foote Creek Rim, Wyoming. Thesis. University of Wyoming, Laramie, Wyoming. 149 pp.

Gruver, J. 2008. Bat Acoustic Studies for the Blue Sky Green Field Wind Project, Fond Du Lac County, Wisconsin. Final Report: July 24 - October 29, 2007. Prepared for We Energies, Milwaukee, Wisconsin. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 26, 2008.

Gruver, J., M. Sonnenberg, K. Bay, and W. Erickson. 2009. Post-Construction Bat and Bird Fatality Study at the Blue Sky Green Field Wind Energy Center, Fond Du Lac County, Wisconsin July 21 - October 31, 2008 and March 15 - June 4, 2009. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. December 17, 2009.

Harvey & Associates. 2013. Montezuma II Wind Energy Center: Post Construction Monitoring Report, Year-1. Prepared by NextEra Montezuma II Wind, LLC, Juno Beach, Florida. Prepared by H.T. Harvey & Associates, Los Gatos, California. September 3, 2013.

Hayes, M. A. 2013. Bats Killed in Large Numbers at United States Wind Energy Facilities. Bioscience 63(12): 975-979.

Heffernan, L. 2016. Map of White-Nose Syndrome (WNS) Occurrence by County/District, March 31, 2016. Pennsylvania Game Commission. Map dated August 2, 2016. Available online at: https://www.whitenosesyndrome.org/sites/default/files/wns_map_20160802.jpg

Hein, C. D., J. Gruver, and E. B. Arnett. 2013a. Relating Pre-Construction Bat Activity and Post-Construction Bat Fatality to Predict Risk at Wind Energy Facilities: A Synthesis. A report submitted to the National Renewable Energy Laboratory (NREL), Golden Colorado. Bat Conservation International (BCI), Austin, Texas. March 2013. Available online at: http://batsandwind.org/pdf/Pre-%20Post-construction%20Synthesis_FINAL%20REPORT.pdf

Hein, C. D., A. Prichard, T. Mabee, and M. R. Schirmacher. 2013b. Avian and Bat Post-Construction Monitoring at the Pinnacle Wind Farm, Mineral County, West Virginia, 2012. Final Report. Bat Conservation International, Austin, Texas, and ABR, Inc., Forest Grove, Oregon. April 2013.

Hein, C. D., A. Prichard, T. Mabee, and M. R. Schirmacher. 2013c. Effectiveness of an Operational Mitigation Experiment to Reduce Bat Fatalities at the Pinnacle Wind Farm, Mineral County, West Virginia, 2012. Bat Conservation International, Austin, Texas, and ABR, Inc., Forest Grove, Oregon. April 2013.

Homer, C. G., J. A. Dewitz, L. Yang, S. Jin, P. Danielson, G. Xian, J. Coulston, N. D. Herold, J. D. Wickham, and K. Megown. 2015. Completion of the 2011 National Land Cover Database for the Conterminous United States-Representing a Decade of Land Cover Change Information. Photogrammetric Engineering and Remote Sensing 81(5): 345-354. Available online from: http://www.mrlc.gov/nlcd2011.php

Howe, R. W., W. Evans, and A. T. Wolf. 2002. Effects of Wind Turbines on Birds and Bats in Northeastern Wisconsin. Prepared by University of Wisconsin-Green Bay, for Wisconsin Public Service Corporation and Madison Gas and Electric Company, Madison, Wisconsin. November 21, 2002. 104 pp.

ICF International. 2012. Montezuma Wind Llc (Montezuma I) 2011 Avian and Bat Fatality Monitoring Report. Prepared for NextEra Energy Resources. Prepared by ICF International, Sacramento, California. May 17, 2012.

ICF International. 2013. Montezuma Wind Llc (Montezuma I) 2012 Avian and Bat Fatality Monitoring Report. Prepared for NextEra Energy Resources. Prepared by ICF International, Sacramento, California. May 2013.

Insignia Environmental. 2009. 2008/2009 Annual Report for the Buena Vista Avian and Bat Monitoring Project. Prepared for Contra Costa County, Martinez, California. Prepared by Insignia Environmental, Palo Alto, California. September 4, 2009.

International Union for Conservation of Nature (IUCN). 2016. IUCN Red List of Threatened Species: South Dakota Bat Species. Version 2016-3. Available from: www.iucnredlist.org

Jacques Whitford Stantec Limited (Jacques Whitford). 2009. Ripley Wind Power Project Postconstruction Monitoring Report. Project No. 1037529.01. Report to Suncor Energy Products Inc., Calgary, Alberta, and Acciona Energy Products Inc., Calgary, Alberta. Prepared for the Ripley Wind Power Project Post-Construction Monitoring Program. Prepared by Jacques Whitford, Markham, Ontario. April 30, 2009.

Jain, A. 2005. Bird and Bat Behavior and Mortality at a Northern Iowa Windfarm. M.S. Thesis. Iowa State University, Ames, Iowa.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2007. Annual Report for the Maple Ridge Wind Power Project: Post-Construction Bird and Bat Fatality Study – 2006. Final Report. Prepared for PPM Energy and Horizon Energy and Technical Advisory Committee (TAC) for the Maple Ridge Project Study.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2009a. Annual Report for the Maple Ridge Wind Power Project: Post-Construction Bird and Bat Fatality Study - 2007. Final report prepared for PPM Energy and Horizon Energy and Technical Advisory Committee (TAC) for the Maple Ridge Project Study. May 6, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, A. Fuerst, and C. Hansen. 2009b. Annual Report for the Noble Ellenburg Windpark, Llc, Postconstruction Bird and Bat Fatality Study - 2008. Prepared for Noble Environmental Power, LLC by Curry and Kerlinger, LLC. April 13, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Histed, and J. Meacham. 2009c. Annual Report for the Noble Clinton Windpark, Llc, Postconstruction Bird and Bat Fatality Study - 2008. Prepared for Noble Environmental Power, LLC by Curry and Kerlinger, LLC. April 13, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, and M. Lehman. 2009d. Maple Ridge Wind Power Avian and Bat Fatality Study Report - 2008. Annual Report for the Maple Ridge Wind Power Project, Post-construction Bird and Bat Fatality Study - 2008. Prepared for Iberdrola Renewables, Inc, Horizon Energy, and the Technical Advisory Committee (TAC) for the Maple Ridge Project Study. Prepared by Curry and Kerlinger, LLC. May 14, 2009.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Quant, and D. Pursell. 2009e. Annual Report for the Noble Bliss Windpark, Llc, Postconstruction Bird and Bat Fatality Study - 2008. Prepared for Noble Environmental Power, LLC by Curry and Kerlinger, LLC. April 13, 2009.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, A. Fuerst, and A. Harte. 2010a. Annual Report for the Noble Bliss Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. March 9, 2010.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2010b. Annual Report for the Noble Clinton Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. March 9, 2010.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2010c. Annual Report for the Noble Ellenburg Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. March 14, 2010.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and A. Harte. 2011a. Annual Report for the Noble Wethersfield Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. January 22, 2011.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2011b. Annual Report for the Noble Altona Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. January 22, 2011.

Jain, A., P. Kerlinger, L. Slobodnik, R. Curry, and K. Russell. 2011c. Annual Report for the Noble Chateaugay Windpark, Llc: Postconstruction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC. Prepared by Curry and Kerlinger, LLC, Cape May, New Jersey. January 22, 2011.

James, R. D. 2008. Erie Shores Wind Farm, Port Burwell, Ontario: Fieldwork Report for 2006 and 2007 During the First Two Years of Operation. Report to Environment Canada, Ontario Ministry of Natural Resources, Erie Shores Wind Farm LP - McQuarrie North American and AIM PowerGen Corporation. January 2008.

Jeffrey, J. D., K. Bay, W. P. Erickson, M. Sonneberg, J. Baker, M. Kesterke, J. R. Boehrs, and A. Palochak. 2009a. Portland General Electric Biglow Canyon Wind Farm Phase I Post-Construction Avian and Bat Monitoring First Annual Report, Sherman County, Oregon. January 2008 - December 2008. Technical report prepared for Portland General Electric Company, Portland, Oregon. Prepared by Western EcoSystems Technology (WEST) Inc., Cheyenne, Wyoming, and Walla Walla, Washington. April 29, 2009.

Jeffrey, J. D., W. P. Erickson, K. Bay, M. Sonneberg, J. Baker, J. R. Boehrs, and A. Palochak. 2009b. Horizon Wind Energy, Elkhorn Valley Wind Project, Post-Construction Avian and Bat Monitoring, First Annual Report, January-December 2008. Technical report prepared for Telocaset Wind Power Partners, a subsidiary of Horizon Wind Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc., Cheyenne, Wyoming, and Walla Walla, Washington. May 4, 2009.

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, and D. A. Shepherd. 2000. Final Report: Avian Monitoring Studies at the Buffalo Ridge Wind Resource Area, Minnesota: Results of a 4-Year Study. Final report prepared for Northern States Power Company, Minneapolis, Minnesota, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 22, 2000. 212 pp. http://www.west-inc.com

Johnson, G., W. Erickson, and J. White. 2003. Avian and Bat Mortality During the First Year of Operation at the Klondike Phase I Wind Project, Sherman County, Oregon. Technical report prepared for Northwestern Wind Power, Goldendale, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 2003. http://www.west-inc.com

Johnson, G. D., M. K. Perlik, W. P. Erickson, and M. D. Strickland. 2004. Bat Activity, Composition and Collision Mortality at a Large Wind Plant in Minnesota. Wildlife Society Bulletin 32(4): 1278-1288.

Johnson, G. D., M. Ritzert, S. Nomani, and K. Bay. 2010a. Bird and Bat Fatality Studies, Fowler Ridge I Wind-Energy Facility Benton County, Indiana. Unpublished report prepared for British Petroleum Wind Energy North America Inc. (BPWENA) by Western EcoSystems Technology, Inc. (WEST).

Johnson, G. D., M. Ritzert, S. Nomani, and K. Bay. 2010b. Bird and Bat Fatality Studies, Fowler Ridge III Wind-Energy Facility, Benton County, Indiana. April 2 - June 10, 2009. Prepared for BP Wind Energy North America. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

Kerlinger, P. 2002a. An Assessment of the Impacts of Green Mountain Power Corporation's Wind Power Facility on Breeding and Migrating Birds in Searsburg, Vermont: July 1996-July 1998. NREL/SR-500-28591. Prepared for Vermont Public Service, Montpelier, Vermont. US Department of Energy, National Renewable Energy Laboratory, Golden, Colorado. March 2002. 95 pp. http://www.nrel.gov/docs/fy02osti/28591.pdf

Kerlinger, P. 2002b. Avian Fatality Study at the Madison Wind Power Project, Madison, New York. Report to PG&E Generating.

Kerlinger, P., R. Curry, L. Culp, A. Hasch, and A. Jain. 2009. Revised Post-Construction Avian Monitoring Study for the Shiloh I Wind Power Project, Solano County, California. Final Report: October 2009. Third Year Report (Revised 2010). Prepared for Iberdrola Renewables, Inc. (IRI). Prepared by Curry and Kerlinger, LLC., McLean, Virginia. Available online at: https://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=8914

Kerlinger, P., R. Curry, L. Culp, A. Hasch, and A. Jain. 2010. Post-Construction Avian Monitoring Study for the Shiloh II Wind Power Project, Solano County, California. Year One Report. Prepared for enXco Development Inc. Prepared by Curry and Kerlinger, LLC, McLean, Virginia. September 2010. Available online at: https://www.solanocounty.com/civicax/filebank/blobdload.aspx?blobid=12118

Kerlinger, P., R. Curry, L. Culp, A. Jain, C. Wilkerson, B. Fischer, and A. Hasch. 2006. Post-Construction Avian and Bat Fatality Monitoring Study for the High Winds Wind Power Project, Solano County, California: Two Year Report. Prepared for High Winds LLC, FPL Energy. Prepared by Curry and Kerlinger, LLC, MacLean, Virginia. April 2006. Available online at: http://www.co.solano.ca.us/civicax/filebank/blobdload.aspx?blobid=8915

Kerlinger, P., R. Curry, A. Hasch, and J. Guarnaccia. 2007. Migratory Bird and Bat Monitoring Study at the Crescent Ridge Wind Power Project, Bureau County, Illinois: September 2005 - August 2006. Final draft prepared for Orrick Herrington and Sutcliffe, LLP. May 2007.

Kerlinger, P., J. Guarnaccia, L. Slobodnik, and R. Curry. 2011a. A Comparison of Bat Mortality in Farmland and Forested Habitats at the Noble Bliss and Wethersfield Windparks, Wyoming County, New York. Report Prepared for Noble Environmental Power. Report prepared by Curry & Kerlinger, LLC, Cape May Point, New Jersey. November 2011.

Kerlinger, P., D. S. Reynolds, J. Guarnaccia, L. Slobodnik, and R. Curry. 2011b. An Examination of the Relationship between Bat Abundance and Fatalities at the Noble Altona Windpark, Clinton County, New York. Report prepared for Noble Environmental Power. Report prepared by Curry & Kerlinger, LLC, Cape May Point, New Jersey, and North East Ecological Services. December 2011.

Kerlinger, P., R. Curry, A. Hasch, J. Guarnaccia, and D. Riser-Espinoza. 2013a. Post-Construction Bird and Bat Studies at the Shiloh II Wind Project, Llc, Solano County, California. Final Report. Prepared for EDF Renewable Energy (formerly known as enXco). Prepared by Curry and Kerlinger, LLC, McLean, Virginia. December 2012 (Revised June 2013).

Kerlinger, P., R. Curry, A. Hasch, J. Guarnaccia, and D. Riser-Espinoza. 2013b. Post-Construction Bird and Bat Studies at the Shiloh III Wind Project, Llc, Solano County, California. Report on Year 1 Results. Prepared for EDF Renewable Energy (formerly known as enXco). Prepared by Curry and Kerlinger, LLC, McLean, Virginia. August 2013.

Kerlinger, P., J. Guarnaccia, R. Curry, and C. J. Vogel. 2014. Bird and Bat Fatality Study, Heritage Garden I Wind Farm, Delta County, Michigan: 2012-2014. Prepared for Heritage Sustainable Energy, LLC. Prepared by Curry and Kerlinger, LLC, McLean, Virginia. November 2014.

Kerns, J. and P. Kerlinger. 2004. A Study of Bird and Bat Collision Fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: Annual Report for 2003. Prepared for FPL Energy and the Mountaineer Wind Energy Center Technical Review Committee. February 14, 2004. 39 pp. http://www.wvhighlands.org/Birds/MountaineerFinalAvianRpt-%203-15-04PKJK.pdf

Kronner, K., B. Gritski, and S. Downes. 2008. Big Horn Wind Power Project Wildlife Fatality Monitoring Study: 2006−2007. Final report prepared for PPM Energy and the Big Horn Wind Project Technical Advisory Committee by Northwest Wildlife Consultants, Inc. (NWC), Mid-Columbia Field Office, Goldendale, Washington. June 1, 2008.

Kunz, T. H., E. B. Arnett, B. M. Cooper, W. P. Erickson, R. P. Larkin, T. Mabee, M. L. Morrison, M. D. Strickland, and J. M. Szewczak. 2007a. Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. Journal of Wildlife Management 71(8): 2449-2486. Available online at: http://www.batsandwind.org/pdf/Assessing%20Impacts%20of%20wind-energy%20development%20on%20bats%20and%20birds.pdf

Kunz, T. H., E. B. Arnett, W. P. Erickson, A. R. Hoar, G. D. Johnson, R. P. Larkin, M. D. Strickland, R. W. Thresher, and M. D. Tuttle. 2007b. Ecological Impacts of Wind Energy Development on Bats: Questions, Research Needs, and Hypotheses. Frontiers in Ecology and the Environment 5(6): 315-324. Available online at: https://www.bu.edu/cecb/files/2009/12/kunzbats-wind07.pdf

Larson, D. J. and J. P. Hayes. 2000. Variability in Sensitivity of Anabat II Detectors and a Method of Calibration. Acta Chiropterologica 2: 209-213.

Martin, C., E. Arnett, and 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. Prepared by Department of Natural Resources Management, Texas Tech University, Lubbock, Texas. March 25, 2013.

Miller, A. 2008. Patterns of Avian and Bat Mortality at a Utility-Scaled Wind Farm on the Southern High Plains. Thesis. Texas Tech University, August 2008.

Minnesota Public Utilities Commission (MPUC). 2012. Lakefield Wind Project Avian and Bat Fatality Monitoring. MPUC Site Permit Quarterly Report and USFWS Special Purpose – Utility (Avian Take Monitoring) 30-Day Report: April 1 – September 30, 2012. USFWS Permit No: MB70161A-0; MDNR Permit No: 17930; MPUC Permit No: IP-6829/WS-09-1239, Permit Special Condition VII.B. October 15, 2012.

Minnis, A. M. and D. L. Lindner. 2013. Phylogenetic Evaluation of *Geomyces* and Allies Reveals No Close Relatives of *Pseudogymnoascus destructans*, Comb. Nov., in Bat Hibernacula of Eastern North America. Fungal Biology 117: 638-649.

Müeller, J., R. Brandl, J. Buchner, H. Pretzsch, S. Seifert, C. Strätz, M. Veith, and B. Fenton. 2013. From Ground to above Canopy - Bat Activity in Mature Forests Is Driven by Vegetation Density and Height. Forest Ecology and Management 306: 179-184.

National Geographic Society (National Geographic). 2016. World Maps. Digital Topographic Map.

Natural Resource Solutions Inc. (NRSI). 2011. Harrow Wind Farm 2010 Post-Construction Monitoring Report. Project No. 0953. Prepared for International Power Canada, Inc., Markham, Ontario. Prepared by NRSI. August 2011.

New Jersey Audubon Society (NJAS). 2008a. Post-Construction Wildlife Monitoring at the Atlantic City Utilities Authority - Jersey Atlantic Wind Power Facility: Periodic Report Covering Work Conducted between 1 August and 30 September 2008. Submitted to New Jersey Board of Public Utilities, New Jersey Clean Energy Program, Newark, New Jersey. Submitted by New Jersey Audubon Society, Center for Research and Education, Cape May Court House, New Jersey. Available online at: http://www.njcleanenergy.com/files/file/Renewable_Programs/Wind/ACUA_Interim%20Report_Jan-Sep08_all.pdf

New Jersey Audubon Society (NJAS). 2008b. Post-Construction Wildlife Monitoring at the Atlantic City Utilities Authority - Jersey Atlantic Wind Power Facility: Periodic Report Covering Work Conducted between 20 July and 31 December 2007. Submitted to New Jersey Board of Public Utilities, New Jersey Clean Energy Program, Newark, New Jersey. Submitted by New Jersey Audubon Society, Center for Research and Education, Cape May Court House, New Jersey. Available online at: http://www.njcleanenergy.com/files/file/Renewable_Programs/CORE/ACUAReportwithimages123107LowRes.pdf

New Jersey Audubon Society (NJAS). 2009. Post-Construction Wildlife Monitoring at the Atlantic City Utilities Authority - Jersey Atlantic Wind Power Facility: Project Status Report IV. Available online at: http://www.njcleanenergy.com/files/file/Renewable_Programs/Wind/ACUA_Quarterly%20report_to-date_Jan-Aug09_1c.pdf

Nicholson, C. P., J. R.D. Tankersley, J. K. Fiedler, and N. S. Nicholas. 2005. Assessment and Prediction of Bird and Bat Mortality at Wind Energy Facilities in the Southeastern United States. Final Report. Tennessee Valley Authority, Knoxville, Tennessee.

Norberg, U. M. and J. M. V. Rayner. 1987. Ecological Morphology and Flight in Bats (Mammalia; Chiroptera): Wing Adaptations, Flight Performance, Foraging Strategy and Echolocation. Philosophical Transactions of the Royal Society of London 316: 335-427.

Normandeau Associates, Inc. 2010. Stetson Mountain II Wind Project Year 1 Post-Construction Avian and Bat Mortality Monitoring Study, T8 R4 Nbpp, Maine. Prepared for First Wind, LLC, Portland, Maine. Prepared by Normandeau Associates, Inc., Falmouth, Maine. December 2, 2010.

Normandeau Associates, Inc. 2011. Year 3 Post- Construction Avian and Bat Casualty Monitoring at the Stetson I Wind Farm, T8 R4 Nbpp, Maine. Prepared for First Wind Energy, LLC, Portland, Maine. Prepared by Normandeau Associates, Inc., Falmouth, Maine. December 2011.

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

Northwest Wildlife Consultants, Inc. (NWC) and Western EcoSystems Technology, Inc. (WEST). 2007. Avian and Bat Monitoring Report for the Klondike II Wind Power Project. Sherman County, Oregon. Prepared for PPM Energy, Portland, Oregon. Managed and conducted by NWC, Pendleton, Oregon. Analysis conducted by WEST, Cheyenne, Wyoming. July 17, 2007.

Osborn, R. G., K. F. Higgins, C. D. Dieter, and R. E. Usgaard. 1996. Bat Collisions with Wind Turbines in Southwestern Minnesota. Bat Research News 37: 105-108.

Osborn, R. G., K. F. Higgins, R. E. Usgaard, C. D. Dieter, and R. G. Neiger. 2000. Bird Mortality Associated with Wind Turbines at the Buffalo Ridge Wind Resource Area, Minnesota. American Midland Naturalist 143: 41-52.

Piorkowski, M. D. and T. J. O'Connell. 2010. Spatial Pattern of Summer Bat Mortality from Collisions with Wind Turbines in Mixed-Grass Prairie. American Midland Naturalist 164: 260-269.

Poulton, V. and W. P. Erickson. 2010. Post-Construction Bat and Bird Fatality Study, Judith Gap Wind Farm, Wheatland County, Montana. Final Report: Results from June–October 2009 Study and Comparison with 2006-2007 Study. Prepared for Judith Gap Energy, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 2010.

Reeder, D. M., C. L. Frank, G. G. Turner, A. Kurta, E. R. Britzke, S. R. Darling, C. W. Stihler, A. C. Hicks, C. U. Meteyer, R. Jacob, L. A. Grieneisen, S. A. Brownlee, M. E. Vodzak, L. K. Muller, and D. S. Blehert. 2012. Frequent Arousal from Hibernation Linked to Severity of Infection and Mortality in Bats with White-Nose Syndrome. PLoS ONE 7(6): e38920. doi: 38910.31371/journal.pone.0038920.

Reynolds, D. S. 2010a. Post-Construction Acoustic Monitoring, 2009 Sampling Period: Noble Clinton Windpark, Clinton County, New York. Prepared for Noble Environmental Power, LLC, Essex, Connecticut. Prepared by North East Ecological Services, Bow, New Hampshire. April 6, 2010.

Reynolds, D. S. 2010b. Post-Construction Acoustic Monitoring, 2009 Sampling Period: Noble Ellenburg Windpark, Clinton County, New York. Prepared for Noble Environmental Power, LLC, Essex, Connecticut. Prepared by North East Ecological Services, Bow, New Hampshire. April 6, 2010.

Rollins, K. E., D. K. Meyerholz, G. D. Johnson, A. P. Capparella, and S. S. Loew. 2012. A Forensic Investigation into the Etiology of Bat Mortality at a Wind Farm: Barotrauma or Traumatic Injury? Veterinary Pathology 49(2): 362-371.

Sapphos Environmental, Inc. (Sapphos). 2014. Pacific Wind Energy Project: Year I Avian and Bat Fatality Monitoring Report. Prepared for Pacific Wind, LLC, San Diego, California. Prepared by Sapphos, Pasadena, California. September 15, 2014.

Solick, D., A. Krause, A. Chatfield, and W. P. Erickson. 2010. Bat Acoustic Studies for the Alta East Wind Resource Area, Kern County, California. Final Report: July 7, 2009 – July 9, 2010. Prepared for CH2M HILL, Oakland, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. October 15, 2010.

Stantec Consulting, Inc. (Stantec). 2008a. 2007 Spring, Summer, and Fall Post-Construction Bird and Bat Mortality Study at the Mars Hill Wind Farm, Maine. Prepared for UPC Wind Management, LLC, Cumberland, Maine. Prepared by Stantec (formerly Woodlot Alternatives, Inc.), Topsham, Maine. January 2008.

Stantec Consulting, Inc. (Stantec). 2008b. 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, Cumberland Foreside, Maine. Prepared by Stantec (formerly Woodlot Alternatives, Inc.), Topsham, Maine. October 2008.

Stantec Consulting, Inc. (Stantec). 2009a. Post-Construction Monitoring at the Mars Hill Wind Farm, Maine - Year 2, 2008. Prepared for First Wind Management, LLC, Portland, Maine. Prepared by Stantec Consulting, Topsham, Maine. January 2009.

Stantec Consulting, Inc. (Stantec). 2009b. Post-Construction Monitoring at the Munnsville Wind Farm, New York: 2008. Prepared for E.ON Climate and Renewables, Austin, Texas. Prepared by Stantec Consulting, Topsham, Maine. January 2009.

Stantec Consulting, Inc. (Stantec). 2009c. Stetson I Mountain Wind Project: Year 1 Post-Construction Monitoring Report, 2009 for the Stetson Mountain Wind Project in Penobscot and Washington Counties, Maine. Prepared for First Wind Management, LLC. Portland, Maine. Prepared by Stantec, Topsham, Maine. December 2009.

Stantec Consulting, Inc. (Stantec). 2010. Cohocton and Dutch Hill Wind Farms Year 1 Post-Construction Monitoring Report, 2009, for the Cohocton and Dutch Hill Wind Farms in Cohocton, New York. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. January 2010.

Stantec Consulting, Inc. (Stantec). 2011a. 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, Portland, Maine. Prepared by Stantec, Topsham, Maine. October 2011.

Stantec Consulting, Inc. (Stantec). 2011b. Post-Construction Monitoring 2010 Final Annual Report – Year 1, Milford Wind Corridor Phase I, Milford, Utah. Prepared for First Wind Management, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. August 2011.

Stantec Consulting, Inc. (Stantec). 2012a. 2011 Post-Construction Monitoring Report, Kibby Wind Power Project, Franklin County, Maine. Prepared for TransCanada Hydro Northeast, Inc., North Walpole, New Hampshire. Prepared by Stantec, Topsham, Maine. March 2012.

Stantec Consulting, Inc. (Stantec). 2012b. Post-Construction Monitoring 2011 - 2012, Milford Wind Corridor Phase I and II, Milford, Utah. Prepared for First Wind Management, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. May 2012.

Stantec Consulting, Inc. (Stantec). 2013a. Palouse Wind Post-Construction Wildlife Monitoring Report, 2012-2013. Prepared for Palouse Wind, Whitman County, Washington. Prepared by Stantec, Topsham, Maine. December 2013.

Stantec Consulting, Inc. (Stantec). 2013b. Record Hill Wind Project Post-Construction Monitoring Report, 2012. Prepared for Record Hill Wind LLC, Lyme, New Hampshire. Prepared by Stantec, Topsham, Maine. March 2013. Available online at: http://www.maine.gov/dep/ftp/WindPowerProjectFiles/PostConstructionMonitoring/RH%202012%20PCM%20Report_031313.pdf

Stantec Consulting, Inc. (Stantec). 2013c. Rollins Wind Project Post-Construction Monitoring Report, 2012. Prepared for First Wind, Portland, Maine. Prepared by Stantec, Topsham, Maine. March 2013.

Stantec Consulting, Inc. (Stantec). 2013d. Steel Winds I and II Post-Construction Monitoring Report, 2012, Lackwanna and Hamburg, New York. Prepared for First Wind Management, LLC, Portland, Maine. Prepared by Stantec, Topsham, Maine. April 2013.

Stantec Consulting, Inc. (Stantec). 2013e. Stetson II Wind Project Post-Construction Monitoring Report, 2012. Prepared for First Wind, Portland, Maine. Prepared by Stantec, Topsham, Maine. March 2013.

Stantec Consulting, Inc. (Stantec). 2014. Stetson I Wind Project 2013 Post-Construction Wildlife Monitoring Report, Year 5. Stetson I Wind Project, Washington County, Maine. Prepared for First Wind, Portland, Maine. Prepared by Stantec, Topsham, Maine. February 2014.

Stantec Consulting, Inc. (Stantec). 2015. Record Hill Wind Project Year 2 Post-Construction Wildlife Monitoring Report, 2014. Prepared for Record Hill Wind LLC and Wagner Forest Management, Ltd., Lyme, New Hampshire. Prepared by Stantec Consulting, Topsham, Maine. March 2015.

Stantec Consulting Ltd. (Stantec Ltd.). 2008. Melancthon I Wind Plant Post-Construction Bird and Bat Monitoring Report: 2007. File No. 160960220. Prepared for Canadian Hydro Developers, Inc., Guelph, Ontario. Prepared by Stantec Ltd., Guelph, Ontario. June 2008.

Stantec Consulting Ltd. (Stantec Ltd.). 2010a. Wolfe Island Ecopower Centre Post-Construction Followup Plan. Bird and Bat Resources Monitoring Report No. 1: May - June 2009. File No. 160960494. Prepared for Canadian Hydro Developers, Inc.'s wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Ltd., Guelph, Ontario. February 2010.

Stantec Consulting Ltd. (Stantec Ltd.). 2010b. Wolfe Island Ecopower Centre Post-Construction Followup Plan. Bird and Bat Resources Monitoring Report No. 2: July - December 2009. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Ltd., Guelph, Ontario. May 2010.

Stantec Consulting Ltd. (Stantec Ltd.). 2011a. Wolfe Island Wind Plant Post-Construction Follow-up Plan. Bird and Bat Resources Monitoring Report No. 3: January - June 2010. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Consulting Ltd., Guelph, Ontario. January 2011.

Stantec Consulting Ltd. (Stantec Ltd.). 2011b. Wolfe Island Wind Plant Post-Construction Followup Plan. Bird and Bat Resources Monitoring Report No. 4: July - December 2010. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Consulting Ltd., Guelph, Ontario. July 2011.

Stantec Consulting Ltd. (Stantec Ltd.). 2011c. Wolfe Island Wind Plant Post-Construction Followup Plan. Bird and Bat Resources Monitoring Report No. 5: January - June 2011. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Consulting Ltd., Guelph, Ontario. December 2011.

Stantec Consulting Ltd. (Stantec Ltd.). 2012. Wolfe Island Wind Plant Post-Construction Follow-up Plan. Bird and Bat Resources Monitoring Report No. 6: July-December 2011. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Consulting Ltd., Guelph, Ontario. July 2012.

Stantec Consulting Ltd. (Stantec Ltd.). 2014. Wolfe Island Wind Plant Post-Construction Follow-up Plan. Bird and Bat Resources Monitoring Report No. 7: January - June 2012. File No. 160960494. Prepared for TransAlta Corporation's wholly owned subsidiary, Canadian Renewable Energy Corporation. Prepared by Stantec Consulting Ltd., Guelph, Ontario. April 2014. Available online at: http://www.transalta.com/sites/default/files/WolfeIsland_TransAlta_PostConstruction_BirdBat_Report_7.pdf

Stantec Consulting Services, Inc. (Stantec Consulting). 2012. Post-Construction Monitoring, Summer 2011 - Spring 2012. Year 1 Annual Report. Kittitas Valley Wind Power Project, Cle Elum, Washington. Prepared for Sagebrush Power Partners, LLC, Houston, Texas. Prepared by Stantec Consulting, Salt Lake City, Utah.

Tetra Tech. 2013. Spruce Mountain Wind Project Post-Construction Bird and Bat Fatality and Raptor Monitoring: Year 1 Annual Report. Prepared for Patriot Renewables. Prepared by Tetra Tech, Portland, Maine. May 2013.

Thompson, J. and K. Bay. 2012. Post-Construction Fatality Surveys for the Dry Lake II Wind Project: February 2011 – February 2012. Prepared for Iberdrola Renewables, LLC, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 6, 2012.

Thompson, J., D. Solick, and K. Bay. 2011. Post-Construction Fatality Surveys for the Dry Lake Phase I Wind Project. Iberdrola Renewables: September 2009 - November 2010. Prepared for Iberdrola Renewables, Portland, Oregon. Prepared by Western Ecosystems Technology, Inc. (WEST), Cheyenne, Wyoming. February 10, 2011.

Tidhar, D., W. Tidhar, and M. Sonnenberg. 2010. Post-Construction Fatality Surveys for Lempster Wind Project, Iberdrola Renewables. Prepared for Lempster Wind, Llc, Lempster Wind Technical Advisory Committee, and Iberdrola Renewables, Inc. Prepared by Western EcoSystems Technology Inc. (WEST), Waterbury, Vermont. September 30, 2010.

Tidhar, D., W. L. Tidhar, L. McManus, and Z. Courage. 2011. 2010 Post-Construction Fatality Surveys for the Lempster Wind Project, Lempster, New Hampshire. Prepared for Iberdrola Renewables, Inc. and the Lempster Wind Technical Committee. Prepared by Western EcoSystems Technology, Inc., Waterbury, Vermont. May 18, 2011.

Tidhar, D., L. McManus, Z. Courage, and W. L. Tidhar. 2012a. 2010 Post-Construction Fatality Monitoring Study and Bat Acoustic Study for the High Sheldon Wind Farm, Wyoming County, New York. Final Report: April 15 - November 15, 2010. Prepared for High Sheldon Wind Farm, Sheldon Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Waterbury, Vermont. April 15, 2012.

Tidhar, D., L. McManus, D. Solick, Z. Courage, and K. Bay. 2012b. 2011 Post-Construction Fatality Monitoring Study and Bat Acoustic Study for the High Sheldon Wind Farm, Wyoming County, New York. Final Report: April 15 - November 15, 2011. Prepared for High Sheldon Wind Farm, Sheldon Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Waterbury, Vermont. April 25, 2012.

Tidhar, D., J. Ritzert, M. Sonnenberg, M. Lout, and K. Bay. 2013a. 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, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), NE/Mid-Atlantic Branch, Waterbury, Vermont. February 12, 2013.

Tidhar, D., M. Sonnenberg, and D.P. Young, Jr. 2013b. 2012 Post-Construction Carcass Monitoring Study for the Beech Ridge Wind Farm, Greenbrier County, West Virginia. Final Report: April 1 - October 28, 2012. Prepared for Beech Ridge Wind Farm, Beech Ridge Energy, LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), NE/Mid-Atlantic Branch, Waterbury, Vermont. January 18, 2013.

Tierney, R. 2007. Buffalo Gap I Wind Farm Avian Mortality Study: February 2006-January 2007. Final Survey Report. Prepared for AES SeaWest, Inc. TRC, Albuquerque, New Mexico. TRC Report No. 110766-C-01. May 2007.

Tierney, R. 2009. Buffalo Gap 2 Wind Farm Avian Mortality Study: July 2007 - December 2008. Final Survey Report. Submitted by TRC, Albuquerque, New Mexico. TRC Report No. 151143-B-01. June 2009.

TRC Environmental Corporation. 2008. Post-Construction Avian and Bat Fatality Monitoring and Grassland Bird Displacement Surveys at the Judith Gap Wind Energy Project, Wheatland County, Montana. Prepared for Judith Gap Energy, LLC, Chicago, Illinois. TRC Environmental Corporation, Laramie, Wyoming. TRC Project 51883-01 (112416). January 2008. http://www.newwest.net/pdfs/AvianBatFatalityMonitoring.pdf

URS Corporation. 2010a. Final Goodnoe Hills Wind Project Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 16, 2010.

URS Corporation. 2010b. Final Marengo I Wind Project Year One Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 22, 2010.

URS Corporation. 2010c. Final Marengo II Wind Project Year One Avian Mortality Monitoring Report. Prepared for PacifiCorp, Salt Lake City, Utah. Prepared by URS Corporation, Seattle, Washington. March 22, 2010.

US Fish and Wildlife Service (USFWS). 2011. A National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats. May 2011. Available online at: http://whitenosesyndrome.org/sites/default/files/white-nose_syndrome_national_plan_may_2011.pdf

US Fish and Wildlife Service (USFWS). 2012a. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online at: http://www.fws.gov/cno/pdf/Energy/2012_Wind_Energy_Guidelines_final.pdf

US Fish and Wildlife Service (USFWS). 2012b. North American Bat Death Toll Exceeds 5.5 Million from White-Nose Syndrome. USFWS News Release, USFWS Office of Communications, Arlington, Virginia. January 17, 2012. Available online at: http://whitenosesyndrome.org/sites/default/files/files/wns_mortality_2012_nr_final.pdf

US Fish and Wildlife Service (USFWS). 2013. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Endangered or Threatened Species; Listing the Northern Long-Eared Bat as an Endangered Species. Docket No. FWS-R5-ES-2011-0024. 78 Federal Register (FR) 191: 61046-61080. October 2, 2013. Available online at: https://www.gpo.gov/fdsys/pkg/FR-2013-10-02/pdf/2013-23753.pdf

US Fish and Wildlife Service (USFWS). 2015a. 2015 Range-Wide Indiana Bat Summer Survey Guidelines. April 2015. Available online at: http://www.fws.gov/midwest/endangered/mammals/inba/surveys/pdf/2015IndianaBatSummerSurveyGuidelines01April2015.pdf

US Fish and Wildlife Service (USFWS). 2015b. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Northern Long-Eared Bat with 4(D) Rule; Final Rule and Interim Rule. Department of the Interior, Fish and Wildlife Service, 50 CFR Part 17. 80 Federal Register (FR) 63: 17974-18033. April 2, 2015. Available online at: http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/FRnlebFinalListing02April2015.pdf

US Fish and Wildlife Service (USFWS). 2016a. Endangered and Threatened Wildlife and Plants; 4(D) Rule for the Northern Long-Eared Bat; Final Rule. Department of the Interior, Fish and Wildlife Service, 50 CFR Part 17. 81 Federal Register (FR) 9: 1900-1922. January 14, 2016. Available online at: http://www.fws.gov/Midwest/endangered/mammals/nleb/pdf/FRnlebFinal4dRule14Jan2016.pdf

US Fish and Wildlife Service (USFWS). 2016b. National Listing Workplan: 7-Year Workplan (September 2016 Version). Available online at: https://www.fws.gov/endangered/improving_ESA/pdf/Listing%207-Year%20Workplan%20Sept%202016.pdf

US Fish and Wildlife Service (USFWS). 2016c. Northern Long-Eared Bat Interim 4(d) Rule: White-Nose Syndrome Buffer Zone around WNS/Pd Positive Counties/Districts. April 29, 2016. Available online at: http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSBufferZone.pdf

US Fish and Wildlife Service (USFWS). 2016d. Resources for Hughes and Hyde Counties, South Dakota. Initial Project Scoping: IPaC - Information, Planning, and Conservation System, Environmental Conservation Online System (ECOS), USFWS. Accessed December 2016. IPaC information available online at: http://ecos.fws.gov/ipac/; IPaC Initial Project Scoping: http://ecos.fws.gov/ipac/wizard/chooseLocation!prepare.action; Hughes County resources at: https://ecos.fws.gov/ipac/location/Y2S32JBG3RDINNWL6EXA7UAGA4/resources; Hyde County resources at: https://ecos.fws.gov/ipac/location/LHFXX6RWVRD7PGIBQVG6T7F7WI/resources

US Geological Survey (USGS). 2010. White-Nose Syndrome Threatens the Survival of Hibernating Bats in North America. USGS Fort Collins Science Center.

US Geological Survey (USGS) National Land Cover Database (NLCD). 2011. National Land Cover Database 2011 (NLCD 2011). Multi-Resolution Land Characteristics Consortium (MRLC), National Land Cover Database (NLCD). USGS Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota. Information available online at: http://www.mrlc.gov/nlcd2011.php; Legend information available at: http://www.mrlc.gov/nlcd11_leg.php

USA Topo. 2016. USA Topo Maps. US Geological Survey (USGS) topographical maps for the United States. ArcGIS. ESRI, producers of ArcGIS software. Redlands, California.

Ventus Environmental Solutions (Ventus). 2012. Vantage Wind Energy Center Avian and Bat Monitoring Study: March 2011- March 2012. Prepared for Vantage Wind Energy, LLC, Chicago, Illinois. Prepared by Ventus, Portland, Oregon. May 16, 2012.

Warnecke, L., J. M. Turner, T. K. Bollinger, J. M. Lorch, V. Misra, P. M. Cryan, G. Wibbelt, D. S. Blehert, and C. K. R. Willis. 2012. Inoculation of Bats with European *Geomyces destructans* Supports the Novel Pathogen Hypothesis for the Origin of White-Nose Syndrome. Proceedings of the National Academy of Sciences 109(18): 6999-7003.

Watt, M. A. and D. Drake. 2011. Assessing Bat Use at the Forward Energy Center. Final Report. PSC REF#:152051. Public Service Commission of Wisconsin. Prepared for Forward Energy LLC. Prepared by Department of Forest and Wildlife Ecology, University of Wisconsin-Madison, Madison, Wisconsin. August 2011.

Weller, T. J. and J. A. Baldwin. 2012. Using Echolocation Monitoring to Model Bat Occupancy and Inform Mitigations at Wind Energy Facilities. Journal of Wildlife Management 76: 619-631.

Western EcoSystems Technology, Inc. (WEST). 2006. Diablo Winds Wildlife Monitoring Progress Report, March 2005 - February 2006. Technical report submitted to FPL Energy and Alameda County California. WEST. Cheyenne, Wyoming.

Western EcoSystems Technology, Inc. (WEST). 2008. Diablo Winds Wildlife Monitoring Progress Report: March 2005 – February 2007. Prepared by WEST, Cheyenne, Wyoming. August 2008.

Western EcoSystems Technology, Inc. (WEST). 2011. Post-Construction Fatality Surveys for the Barton Chapel Wind Project: Iberdrola Renewables. Version: July 2011. Iberdrola Renewables, Portland, Oregon.

White-Nose Syndrome.org. 2016. Where Is It Now? WNS Info, White-Nose Syndrome.org. Accessed December 1, 2016. Available online at: https://www.whitenosesyndrome.org/about/where-is-it-now

Young, D.P., Jr., W. P. Erickson, R. E. Good, M. D. Strickland, and G. D. Johnson. 2003a. Avian and Bat Mortality Associated with the Initial Phase of the Foote Creek Rim Windpower Project, Carbon County, Wyoming, Final Report, November 1998 - June 2002. Prepared for Pacificorp, Inc. Portland, Oregon, SeaWest Windpower Inc. San Diego, California, and Bureau of Land Management, Rawlins District Office, Rawlins, Wyoming. January 10, 2003. Available online at: http://west-inc.com/reports/fcr_final_mortality.pdf

Young, D.P., Jr., W. P. Erickson, M. D. Strickland, R. E. Good, and K. J. Sernka. 2003b. Comparison of Avian Responses to Uv-Light-Reflective Paint on Wind Turbines. Subcontract Report July 1999 – December 2000. NREL/SR-500-32840. Prepared for National Renewable Energy Laboratory, Golden, Colorado, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. Foote Creek Rim Wind Plant, Carbon County, Wyoming. January 2003. http://www.west-inc.com

Young, D.P., Jr., J. Jeffrey, W. P. Erickson, K. Bay, V. K. Poulton, K. Kronner, R. Gritski, and J. Baker. 2006. Eurus Combine Hills Turbine Ranch. Phase 1 Post Construction Wildlife Monitoring First Annual Report: February 2004 - February 2005. Technical report prepared for Eurus Energy America Corporation, San Diego, California, and the Combine Hills Technical Advisory Committee, Umatilla County, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla Washington, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. February 21, 2006. Available online at: http://wind.nrel.gov/public/library/young7.pdf

Young, D.P., Jr., W. P. Erickson, J. Jeffrey, and V. K. Poulton. 2007. Puget Sound Energy Hopkins Ridge Wind Project Phase 1 Post-Construction Avian and Bat Monitoring First Annual Report, January - December 2006. Technical report for Puget Sound Energy, Dayton, Washington and Hopkins Ridge Wind Project Technical Advisory Committee, Columbia County, Washington. Western EcoSystems Technology, Inc. (WEST) Cheyenne, Wyoming, and Walla Walla, Washington. 25 pp.

Young, D.P., Jr., K. Bay, S. Nomani, and W. Tidhar. 2009a. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: March - June 2009. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. August 17, 2009.

Young, D.P., Jr., W. P. Erickson, K. Bay, S. Nomani, and W. Tidhar. 2009b. Mount Storm Wind Energy Facility, Phase 1 Post-Construction Avian and Bat Monitoring, July - October 2008. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 17, 2009.

Young, D.P., Jr., J. D. Jeffrey, K. Bay, and W. P. Erickson. 2009c. Puget Sound Energy Hopkins Ridge Wind Project, Phase 1, Columbia County, Washington. Post-Construction Avian and Bat Monitoring, Second Annual Report: January - December, 2008. Prepared for Puget Sound Energy, Dayton, Washington, and the Hopkins Ridge Wind Project Technical Advisory Committee, Columbia County, Washington. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington. May 20, 2009.

Young, D.P., Jr., K. Bay, S. Nomani, and W. Tidhar. 2010a. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: April - July 2010. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 27, 2010.

Young, D.P., Jr., K. Bay, S. Nomani, and W. Tidhar. 2010b. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: July - October 2009. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. February 12, 2010.

Young, D.P., Jr., S. Nomani, Z. Courage, and K. Bay. 2011a. Nedpower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring: April - July 2011. Prepared for NedPower Mount Storm, LLC, Houston, Texas. Prepared by Western EcoSystems Technology (WEST), Inc., Cheyenne, Wyoming. August 29, 2011.

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

Young, D.P., Jr., M. Lout, Z. Courage, S. Nomani, and K. Bay. 2012a. 2011 Post-Construction Monitoring Study, Criterion Wind Project, Garrett County, Maryland: April - November 2011. Prepared for Criterion Power Partners, LLC, Oakland, Maryland. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Waterbury, Vermont. April 20, 2012. Revised November 25, 2013.

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

Young, D.P., Jr., C. Nations, M. Lout, and K. Bay. 2013. 2012 Post-Construction Monitoring Study, Criterion Wind Project, Garrett County, Maryland. April - November 2012. Prepared for Criterion Power Partners, LLC, Oakland, Maryland. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Waterbury, Vermont. January 15, 2013.

Young, D.P., Jr., M. Kauffman, M. Lout, and K. Bay. 2014a. 2013 Post-Construction Monitoring Study, Criterion Wind Project, Garrett County, Maryland. April - November 2013. Prepared for Criterion Power Partners, LLC, Oakland, Maryland. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Waterbury, Vermont. February 18, 2014.

Young, D.P., Jr., M. Lout, L. McManus, and K. Bay. 2014b. 2013 Post-Construction Monitoring Study, Beech Ridge Wind Energy Project, Greenbrier and Nicholas Counties, West Virginia. Final Report: April 1 - November 15, 2013. Prepared for Beech Ridge Energy, LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Burlington, Vermont. January 28, 2014.

# Appendix A: North American Fatality Summary Tables

**Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region.**

| Wind Energy Facility | Bat Activity Estimate[A] | Bat Activity Dates | Fatality Estimate[B] | No. of Turbines | Total MW |
|---|---|---|---|---|---|
| **Triple H, South Dakota** | **9.08** | | | | |
| | | ***Midwest*** | | | |
| Cedar Ridge, WI (2009) | 9.97 [C,D,E,F] | 7/16/07-9/30/07 | 30.61 | 41 | 67.6 |
| Blue Sky Green Field, WI (2008; 2009) | 7.7 [F] | 7/24/07-10/29/07 | 24.57 | 88 | 145 |
| Cedar Ridge, WI (2010) | 9.97 [C,D,E,F] | 7/16/07-9/30/07 | 24.12 | 41 | 68 |
| Fowler I, II, III, IN (2011) | | | 20.19 | 355 | 600 |
| Fowler I, II, III, IN (2010) | | | 18.96 | 355 | 600 |
| Forward Energy Center, WI (2008-2010) | 6.97 | 8/5/08-11/08/08 | 18.17 | 86 | 129 |
| Top Crop I & II (2012-2013) | | | 12.55 | 200 (68 Phase I, 132 Phase II) | 300 (102 Phase I, 198 Phase II) |
| Rail Splitter, IL (2012-2013) | | | 11.21 | 67 | 100.5 |
| Harrow, Ont (2010) | | | 11.13 | 24 (four 6-turb facilities) | 39.6 |
| Top of Iowa, IA (2004) | 35.7 | 5/26/04-9/24/04 | 10.27 | 89 | 80 |
| Pioneer Prairie I, IA (Phase II; 2011-2012) | | | 10.06 | 62 | 102.3 |
| Fowler I, IN (2009) | | | 8.09 | 162 | 301 |
| Crystal Lake II, IA (2009) | | | 7.42 | 80 | 200 |
| Top of Iowa, IA (2003) | | | 7.16 | 89 | 80 |
| Kewaunee County, WI (1999-2001) | | | 6.45 | 31 | 20.46 |
| Heritage Garden I, MI (2012-2014) | | | 5.9 | 14 | 28 |
| Ripley, Ont (2008) | | | 4.67 | 38 | 76 |
| Winnebago, IA (2009-2010) | | | 4.54 | 10 | 20 |
| Buffalo Ridge, MN (Phase II; 2001/Lake Benton I) | 2.2 [C] | 6/15/01-9/15/01 | 4.35 | 143 | 107.25 |
| Pioneer Prairie II, IA (2013) | | | 3.83 | 62 | 102.3 |
| Buffalo Ridge, MN (Phase III; 2001/Lake Benton II) | 2.2 [C] | 6/15/01-9/15/01 | 3.71 | 138 | 103.5 |
| Crescent Ridge, IL (2005-2006) | | | 3.27 | 33 | 49.5 |
| Fowler I, II, III, IN (2012) | | | 2.96 | 355 | 600 |
| Elm Creek II, MN (2011-2012) | | | 2.81 | 62 | 148.8 |
| Buffalo Ridge II, SD (2011-2012) | | | 2.81 | 105 | 210 |
| Buffalo Ridge, MN (Phase III; 1999) | | | 2.72 | 138 | 103.5 |
| Buffalo Ridge, MN (Phase II; 1999) | | | 2.59 | 143 | 107.25 |
| Moraine II, MN (2009) | | | 2.42 | 33 | 49.5 |
| Buffalo Ridge, MN (Phase II; 1998) | | | 2.16 | 143 | 107.25 |
| PrairieWinds ND1 (Minot), ND (2010) | | | 2.13 | 80 | 115.5 |
| Grand Ridge I, IL (2009-2010) | | | 2.1 | 66 | 99 |
| Big Blue, MN (2013) | | | 2.04 | 18 | 36 |
| Barton I & II, IA (2010-2011) | | | 1.85 | 80 | 160 |
| Fowler III, IN (2009) | | | 1.84 | 60 | 99 |
| Buffalo Ridge, MN (Phase III; 2002/Lake Benton II) | 1.9 [C] | 6/15/02-9/15/02 | 1.81 | 138 | 103.5 |

**Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region.**

| Wind Energy Facility | Bat Activity Estimate[A] | Bat Activity Dates | Fatality Estimate[B] | No. of Turbines | Total MW |
|---|---|---|---|---|---|
| Buffalo Ridge, MN (Phase II; 2002/Lake Benton I) | 1.9 [C] | 6/15/02-9/15/02 | 1.64 | 143 | 107.25 |
| Rugby, ND (2010-2011) | | | 1.6 | 71 | 149 |
| Elm Creek, MN (2009-2010) | | | 1.49 | 67 | 100 |
| Wessington Springs, SD (2009) | | | 1.48 | 34 | 51 |
| Big Blue, MN (2014) | | | 1.43 | 18 | 36 |
| PrairieWinds ND1 (Minot), ND (2011) | | | 1.39 | 80 | 115.5 |
| PrairieWinds SD1, SD (2011-2012) | | | 1.23 | 108 | 162 |
| NPPD Ainsworth, NE (2006) | | | 1.16 | 36 | 20.5 |
| PrairieWinds SD1, SD (2012-2013) | | | 1.05 | 108 | 162 |
| Buffalo Ridge, MN (Phase I; 1999) | | | 0.74 | 73 | 25 |
| PrairieWinds SD1, SD (2013-2014) | | | 0.52 | 108 | 162 |
| Wessington Springs, SD (2010) | | | 0.41 | 34 | 51 |
| Buffalo Ridge I, SD (2009-2010) | | | 0.16 | 24 | 50.4 |
| ***Southern Plains*** | | | | | |
| Barton Chapel, TX (2009-2010) | | | 3.06 | 60 | 120 |
| Big Smile, OK (2012-2013) | | | 2.9 | 66 | 132 |
| Buffalo Gap II, TX (2007-2008) | | | 0.14 | 155 | 233 |
| Red Hills, OK (2012-2013) | | | 0.11 | 82 | 123 |
| Buffalo Gap I, TX (2006) | | | 0.1 | 67 | 134 |
| ***Rocky Mountains*** | | | | | |
| Summerview, Alb (2006; 2007) | 7.7 [C] | 07/15/06-07-09/30/06-07 | 11.42 | 39 | 70.2 |
| Summerview, Alb (2005-2006) | | | 10.27 | 39 | 70.2 |
| Judith Gap, MT (2006-2007) | | | 8.93 | 90 | 135 |
| Foote Creek Rim, WY (Phase I; 1999) | | | 3.97 | 69 | 41.4 |
| Judith Gap, MT (2009) | | | 3.2 | 90 | 135 |
| Milford I, UT (2010-2011) | | | 2.05 | 58 | 145 |
| Milford I & II, UT (2011-2012) | | | 1.67 | 107 | 160.5 (58.5 I, 102 II) |
| Foote Creek Rim, WY (Phase I; 2001-2002) | 2.2 [C,D] | 6/15/01-9/1/01 | 1.57 | 69 | 41.4 |
| Foote Creek Rim, WY (Phase I; 2000) | 2.2 [C,D] | 6/15/00-9/1/00 | 1.05 | 69 | 41.4 |
| ***Southwest*** | | | | | |
| Dry Lake I, AZ (2009-2010) | 8.8 | 4/29/10-11/10/10 | 4.29 | 30 | 63 |
| Dry Lake II, AZ (2011-2012) | 11.5 | 5/11/11-10/26/11 | 1.66 | 31 | 65 |
| ***California*** | | | | | |
| Shiloh I, CA (2006-2009) | | | 3.92 | 100 | 150 |
| Shiloh II, CA (2010-2011) | | | 3.8 | 75 | 150 |
| Shiloh II, CA (2009-2010) | | | 2.6 | 75 | 150 |
| High Winds, CA (2003-2004) | | | 2.51 | 90 | 162 |
| Dillon, CA (2008-2009) | | | 2.17 | 45 | 45 |
| Montezuma I, CA (2011) | | | 1.9 | 16 | 36.8 |
| High Winds, CA (2004-2005) | | | 1.52 | 90 | 162 |
| Alta Wind I, CA (2011-2012) | 4.42 [G] | 6/26/09 -10/31/09 | 1.28 | 100 | 150 |
| Montezuma II, CA (2012-2013) | | | 0.91 | 34 | 78.2 |
| Montezuma I, CA (2012) | | | 0.84 | 16 | 36.8 |

**Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region.**

| Wind Energy Facility | Bat Activity Estimate[A] | Bat Activity Dates | Fatality Estimate[B] | No. of Turbines | Total MW |
|---|---|---|---|---|---|
| Diablo Winds, CA (2005-2007) | | | 0.82 | 31 | 20.46 |
| Shiloh III, CA (2012-2013) | | | 0.4 | 50 | 102.5 |
| Solano III, CA (2012-2013) | | | 0.31 | 55 | 128 |
| Alite, CA (2009-2010) | | | 0.24 | 8 | 24 |
| Alta Wind I-V, CA (2013-2014) | | | 0.2 | 290 | 720 (150 GE, 570 vestas) |
| Mustang Hills, CA (2012-2013) | | | 0.1 | 50 | 150 |
| Alta Wind II-V, CA (2011-2012) | 0.78 | 6/26/09 -10/31/09 | 0.08 | 190 | 570 |
| Pinyon Pines I & II, CA (2013-2014) | | | 0.04 | 100 | NA |
| Alta VIII, CA (2012-2013) | | | 0 | 50 | 150 |
| ***Pacific Northwest*** | | | | | |
| Palouse Wind, WA (2012-2013) | | | 4.23 | 58 | 104.4 |
| Biglow Canyon, OR (Phase II; 2009-2010) | | | 2.71 | 65 | 150 |
| Nine Canyon, WA (2002-2003) | | | 2.47 | 37 | 48.1 |
| Stateline, OR/WA (2003) | | | 2.29 | 454 | 299 |
| Elkhorn, OR (2010) | | | 2.14 | 61 | 101 |
| White Creek, WA (2007-2011) | | | 2.04 | 89 | 204.7 |
| Biglow Canyon, OR (Phase I; 2008) | | | 1.99 | 76 | 125.4 |
| Leaning Juniper, OR (2006-2008) | | | 1.98 | 67 | 100.5 |
| Big Horn, WA (2006-2007) | | | 1.9 | 133 | 199.5 |
| Combine Hills, OR (Phase I; 2004-2005) | | | 1.88 | 41 | 41 |
| Linden Ranch, WA (2010-2011) | | | 1.68 | 25 | 50 |
| Pebble Springs, OR (2009-2010) | | | 1.55 | 47 | 98.7 |
| Hopkins Ridge, WA (2008) | | | 1.39 | 87 | 156.6 |
| Harvest Wind, WA (2010-2012) | | | 1.27 | 43 | 98.9 |
| Elkhorn, OR (2008) | | | 1.26 | 61 | 101 |
| Vansycle, OR (1999) | | | 1.12 | 38 | 24.9 |
| Klondike III (Phase I), OR (2007-2009) | | | 1.11 | 125 | 223.6 |
| Stateline, OR/WA (2001-2002) | | | 1.09 | 454 | 299 |
| Stateline, OR/WA (2006) | | | 0.95 | 454 | 299 |
| Tuolumne (Windy Point I), WA (2009-2010) | | | 0.94 | 62 | 136.6 |
| Klondike, OR (2002-2003) | | | 0.77 | 16 | 24 |
| Combine Hills, OR (2011) | | | 0.73 | 104 | 104 |
| Hopkins Ridge, WA (2006) | | | 0.63 | 83 | 150 |
| Biglow Canyon, OR (Phase I; 2009) | | | 0.58 | 76 | 125.4 |
| Biglow Canyon, OR (Phase II; 2010-2011) | | | 0.57 | 65 | 150 |
| Hay Canyon, OR (2009-2010) | | | 0.53 | 48 | 100.8 |
| Windy Flats, WA (2010-2011) | | | 0.41 | 114 | 262.2 |
| Klondike II, OR (2005-2006) | | | 0.41 | 50 | 75 |
| Vantage, WA (2010-2011) | | | 0.4 | 60 | 90 |
| Wild Horse, WA (2007) | | | 0.39 | 127 | 229 |
| Goodnoe, WA (2009-2010) | | | 0.34 | 47 | 94 |
| Marengo II, WA (2009-2010) | | | 0.27 | 39 | 70.2 |

**Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region.**

| Wind Energy Facility | Bat Activity Estimate[A] | Bat Activity Dates | Fatality Estimate[B] | No. of Turbines | Total MW |
|---|---|---|---|---|---|
| Biglow Canyon, OR (Phase III; 2010-2011) | | | 0.22 | 76 | 174.8 |
| Marengo I, WA (2009-2010) | | | 0.17 | 78 | 140.4 |
| Klondike IIIa (Phase II), OR (2008-2010) | | | 0.14 | 51 | 76.5 |
| Kittitas Valley, WA (2011-2012) | | | 0.12 | 48 | 100.8 |
| ***Southeast*** | | | | | |
| Buffalo Mountain, TN (2005) | | | 39.70 | 18 | 28.98 |
| Buffalo Mountain, TN (2000-2003) | 23.7 [D] | | 31.54 | 3 | 1.98 |
| ***Northeast*** | | | | | |
| Pinnacle, WV (2012) | | | 40.2 | 23 | 55.2 |
| Mountaineer, WV (2003) | | | 31.69 | 44 | 66 |
| Mount Storm, WV (2009) | 30.09 | 7/15/09-10/7/09 | 17.53 | 132 | 264 |
| Noble Wethersfield, NY (2010) | | | 16.3 | 84 | 126 |
| Criterion, MD (2011) | | | 15.61 | 28 | 70 |
| Mount Storm, WV (2010) | 36.67 [H] | 4/18/10-10/15/10 | 15.18 | 132 | 264 |
| Locust Ridge, PA (Phase II; 2010) | | | 14.38 | 51 | 102 |
| Locust Ridge, PA (Phase II; 2009) | | | 14.11 | 51 | 102 |
| Casselman, PA (2008) | | | 12.61 | 23 | 34.5 |
| Maple Ridge, NY (2006) | | | 11.21 | 120 | 198 |
| Cohocton/Dutch Hills, NY (2010) | | | 10.32 | 50 | 125 |
| Wolfe Island, Ont (July-December 2010) | | | 9.5 | 86 | 197.8 |
| Cohocton/Dutch Hill, NY (2009) | | | 8.62 | 50 | 125 |
| Casselman, PA (2009) | | | 8.6 | 23 | 34.5 |
| Noble Bliss, NY (2008) | | | 7.8 | 67 | 100 |
| Criterion, MD (2012) | | | 7.62 | 28 | 70 |
| Mount Storm, WV (2011) | | | 7.43 | 132 | 264 |
| Maple Ridge, NY (2012) | | | 7.3 | 195 | 321.75 |
| Mount Storm, WV (Fall 2008) | 35.2 | 7/20/08-10/12/08 | 6.62 | 82 | 164 |
| Maple Ridge, NY (2007) | | | 6.49 | 195 | 321.75 |
| Wolfe Island, Ont (July-December 2009) | | | 6.42 | 86 | 197.8 |
| Criterion, MD (2013) | | | 5.32 | 28 | 70 |
| Maple Ridge, NY (2007-2008) | | | 4.96 | 195 | 321.75 |
| Noble Clinton, NY (2009) | 1.9 [E] | 8/1/09-09/31/09 | 4.5 | 67 | 100 |
| Casselman Curtailment, PA (2008) | | | 4.4 | 23 | 35.4 |
| Noble Altona, NY (2010) | | | 4.34 | 65 | 97.5 |
| Noble Ellenburg, NY (2009) | 16.1 [E] | 8/16/09-09/15/09 | 3.91 | 54 | 80 |
| Noble Bliss, NY (2009) | | | 3.85 | 67 | 100 |
| Lempster, NH (2010) | | | 3.57 | 12 | 24 |
| Noble Ellenburg, NY (2008) | | | 3.46 | 54 | 80 |
| Noble Clinton, NY (2008) | 2.1 [E] | 8/8/08-09/31/08 | 3.14 | 67 | 100 |
| Lempster, NH (2009) | | | 3.11 | 12 | 24 |
| Record Hill, ME (2012) | 24.6 | 4/16/12-10/23/12 | 2.96 | 22 | 50.6 |
| Mars Hill, ME (2007) | | | 2.91 | 28 | 42 |
| Wolfe Island, Ont (July-December 2011) | | | 2.49 | 86 | 197.8 |
| Noble Chateaugay, NY (2010) | | | 2.44 | 71 | 106.5 |
| High Sheldon, NY (2010) | | | 2.33 | 75 | 112.5 |
| Stetson Mountain II, ME (2012) | | | 2.27 | 17 | 25.5 |
| Beech Ridge, WV (2012) | | | 2.03 | 67 | 100.5 |

**Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region.**

| Wind Energy Facility | Bat Activity Estimate[A] | Bat Activity Dates | Fatality Estimate[B] | No. of Turbines | Total MW |
|---|---|---|---|---|---|
| Munnsville, NY (2008) | | | 1.93 | 23 | 34.5 |
| High Sheldon, NY (2011) | | | 1.78 | 75 | 112.5 |
| Stetson Mountain II, ME (2010) | | | 1.65 | 17 | 25.5 |
| Stetson Mountain I, ME (2009) | 28.5; 0.3 [I] | 7/10/09-10/15/09 | 1.4 | 38 | 57 |
| Beech Ridge, WV (2013) | | | 0.58 | 67 | 100.5 |
| Record Hill, ME (2014) | | | 0.55 | 22 | 50.6 |
| Mars Hill, ME (2008) | | | 0.45 | 28 | 42 |
| Stetson Mountain I, ME (2011) | | | 0.28 | 38 | 57 |
| Stetson Mountain I, ME (2013) | | | 0.18 | 38 | 57 |
| Rollins, ME (2012) | | | 0.18 | 40 | 60 |
| Kibby, ME (2011) | | | 0.12 | 44 | 132 |

A = Bat passes per detector-night

B = Number of fatalities per megawatt per year

C = Activity rate was averaged across phases and/or years

D = Activity rate calculated by WEST from data presented in referenced report

E = Activity rate based on data collected at various heights all other activity rates are from ground-based units only

F = Activity rate based on pre-construction monitoring; data for all other activity and fatality rates were collected concurrently

G = Average of ground-based detectors at CPC Proper (Phase I) for late summer/fall period only

H = Activity rate based on data collected from ground-based units excluding reference stations during the spring, summer and fall seasons

I = The overall activity rate of 28.5 is from reference stations located along forest edges which may be attractive to bats; the activity rate of 0.3 is from one unit placed on a nacelle

**Appendix A1 (*continued*). Wind energy facilities in North America with comparable activity and fatality data for bats.**

| Project, Location | Activity Reference | Fatality Reference |
|---|---|---|
| Alite, CA (09-10) | | Chatfield et al. 2010 |
| Alta Wind I, CA (11-12) | Solick et al. 2010 | Chatfield et al. 2012 |
| Alta Wind I-V, CA (13-14) | | Chatfield et al. 2014 |
| Alta Wind II-V, CA (11-12) | Solick et al. 2010 | Chatfield et al. 2012 |
| Alta VIII, CA (12-13) | | Chatfield and Bay 2014 |
| Barton I & II, IA (10-11) | | Derby et al. 2011a |
| Barton Chapel, TX (09-10) | | WEST 2011 |
| Beech Ridge, WV (12) | | Tidhar et al. 2013b |
| Beech Ridge, WV (13) | | Young et al. 2014b |
| Big Blue, MN (13) | | Fagen Engineering 2014 |
| Big Blue, MN (14) | | Fagen Engineering 2015 |
| Big Horn, WA (06-07) | | Kronner et al. 2008 |
| Big Smile, OK (12-13) | | Derby et al. 2013b |
| Biglow Canyon, OR (Phase I; 08) | | Jeffrey et al. 2009a |
| Biglow Canyon, OR (Phase I; 09) | | Enk et al. 2010 |
| Biglow Canyon, OR (Phase II; 09-10) | | Enk et al. 2011a |
| Biglow Canyon, OR (Phase II; 10-11) | | Enk et al. 2012b |
| Biglow Canyon, OR (Phase III; 10-11) | | Enk et al. 2012a |
| Blue Sky Green Field, WI (08; 09) | Gruver 2008 | Gruver et al. 2009 |
| Buffalo Gap I, TX (06) | | Tierney 2007 |
| Buffalo Gap II, TX (07-08) | | Tierney 2009 |
| Buffalo Mountain, TN (00-03) | Fiedler 2004 | Nicholson et al. 2005 |
| Buffalo Mountain, TN (05) | | Fiedler et al. 2007 |
| Buffalo Ridge, MN (Phase I; 99) | | Johnson et al. 2000 |
| Buffalo Ridge, MN (Phase II; 98) | | Johnson et al. 2000 |
| Buffalo Ridge, MN (Phase II; 99) | | Johnson et al. 2000 |
| Buffalo Ridge, MN (Phase II; 01/Lake Benton I) | Johnson et al. 2004 | Johnson et al. 2004 |
| Buffalo Ridge, MN (Phase II; 02/Lake Benton I) | Johnson et al. 2004 | Johnson et al. 2004 |
| Buffalo Ridge, MN (Phase III; 99) | | Johnson et al. 2000 |
| Buffalo Ridge, MN (Phase III; 01/Lake Benton II) | Johnson et al. 2004 | Johnson et al. 2004 |
| Buffalo Ridge, MN (Phase III; 02/Lake Benton II) | Johnson et al. 2004 | Johnson et al. 2004 |
| Buffalo Ridge I, SD (09-10) | | Derby et al. 2010b |
| Buffalo Ridge II, SD (11-12) | | Derby et al. 2012a |
| Casselman, PA (08) | | Arnett et al. 2009b |
| Casselman, PA (09) | | Arnett et al. 2010 |
| Casselman Curtailment, PA (08) | | Arnett et al. 2009a |
| Cedar Ridge, WI (09) | BHE Environmental 2008 | BHE Environmental 2010 |
| Cedar Ridge, WI (10) | BHE Environmental 2008 | BHE Environmental 2011 |
| Cohocton/Dutch Hill, NY (09) | | Stantec 2010 |
| Cohocton/Dutch Hills, NY (10) | | Stantec 2011a |
| Combine Hills, OR (Phase I; 04-05) | | Young et al. 2006 |
| Combine Hills, OR (11) | | Enz et al. 2012 |
| Crescent Ridge, IL (05-06) | | Kerlinger et al. 2007 |
| Criterion, MD (11) | | Young et al. 2012a |
| Criterion, MD (12) | | Young et al. 2013 |
| Lempster, NH (09) | | Tidhar et al. 2010 |
| Lempster, NH (10) | | Tidhar et al. 2011 |
| Linden Ranch, WA (10-11) | | Enz and Bay 2011 |
| Locust Ridge, PA (Phase II; 09) | | Arnett et al. |
| Locust Ridge, PA (Phase II; 10) | | Arnett et al. |
| Maple Ridge, NY (06) | | Jain et al. 2007 |
| Maple Ridge, NY (07) | | Jain et al. 2009a |
| Maple Ridge, NY (07-08) | | Jain et al. 2009d |
| Maple Ridge, NY (12) | | Tidhar et al. 2013a |
| Marengo I, WA (09-10) | | URS Corporation 2010b |
| Marengo II, WA (09-10) | | URS Corporation 2010c |
| Mars Hill, ME (07) | | Stantec 2008a |
| Mars Hill, ME (08) | | Stantec 2009a |
| Milford I, UT (10-11) | | Stantec 2011b |
| Milford I & II, UT (11-12) | | Stantec 2012b |
| Montezuma I, CA (11) | | ICF International 2012 |
| Montezuma I, CA (12) | | ICF International 2013 |
| Montezuma II, CA (12-13) | | Harvey & Associates 2013 |
| Moraine II, MN (09) | | Derby et al. 2010d |
| Mount Storm, WV (Fall 08) | Young et al. 2009b | Young et al. 2009b |
| Mount Storm, WV (09) | Young et al. 2009a, 2010b | Young et al. 2009a, 2010b |
| Mount Storm, WV (10) | Young et al. 2010a, 2011b | Young et al. 2010a, 2011b |
| Mount Storm, WV (11) | | Young et al. 2011a, 2012b |
| Mountaineer, WV (03) | | Kerns and Kerlinger 2004 |
| Munnsville, NY (08) | | Stantec 2009b |
| Mustang Hills, CA (12-13) | | Chatfield and Bay 2014 |
| Nine Canyon, WA (02-03) | | Erickson et al. 2003 |
| Noble Altona, NY (10) | | Jain et al. 2011b |
| Noble Bliss, NY (08) | | Jain et al.2009e |
| Noble Bliss, NY (09) | | Jain et al. 2010a |
| Noble Chateaugay, NY (10) | | Jain et al. 2011c |
| Noble Clinton, NY (08) | Reynolds 2010a | Jain et al. 2009c |
| Noble Clinton, NY (09) | Reynolds 2010a | Jain et al. 2010b |
| Noble Ellenburg, NY (08) | | Jain et al. 2009b |
| Noble Ellenburg, NY (09) | Reynolds 2010b | Jain et al. 2010c |
| Noble Wethersfield, NY (10) | | Jain et al. 2011a |
| NPPD Ainsworth, NE (06) | | Derby et al. 2007 |
| Palouse Wind, WA (12-13) | | Stantec 2013a |
| Pebble Springs, OR (09-10) | | Gritski and Kronner 2010b |
| Pinnacle, WV (12) | | Hein et al. 2013b |
| Pinyon Pines I&II, CA (13-14) | | Chatfield and Russo 2014 |
| Pioneer Prairie I, IA (Phase II; 11-12) | | Chodachek et al. 2012 |
| Pioneer Prairie II, IA (13) | | Chodachek et al. 2014 |
| PrairieWinds ND1 (Minot), ND (10) | | Derby et al. 2011c |
| PrairieWinds ND1 (Minot), ND (11) | | Derby et al. 2012c |

**Appendix A1 (*continued*). Wind energy facilities in North America with comparable activity and fatality data for bats.**

| Project, Location | Activity Reference | Fatality Reference |
|---|---|---|
| Criterion, MD (13) | | Young et al. 2014a |
| Crystal Lake II, IA (09) | | Derby et al. 2010a |
| Diablo Winds, CA (05-07) | | WEST 2006, 2008 |
| Dillon, CA (08-09) | | Chatfield et al. 2009 |
| Dry Lake I, AZ (09-10) | Thompson et al. 2011 | Thompson et al. 2011 |
| Dry Lake II, AZ (11-12) | Thompson and Bay 2012 | Thompson and Bay 2012 |
| Elkhorn, OR (08) | | Jeffrey et a. 2009b |
| Elkhorn, OR (10) | | Enk et al. 2011b |
| Elm Creek, MN (09-10) | | Derby et al. 2010c |
| Elm Creek II, MN (11-12) | | Derby et al. 2012b |
| Foote Creek Rim, WY (Phase I; 99) | | Young et al. 2003a |
| Foote Creek Rim, WY (Phase I; 00) | Gruver 2002 | Young et al. 2003a, 2003b |
| Foote Creek Rim, WY (Phase I; 01-02) | Gruver 2002 | Young et al. 2003a, 2003b |
| Forward Energy Center, WI (08-10) | Watt and Drake 2011 | Grodsky and Drake 2011 |
| Fowler I, IN (09) | | Johnson et al. 2010a |
| Fowler III, IN (09) | | Johnson et al. 2010b |
| Fowler I, II, III, IN (10) | | Good et al. 2011 |
| Fowler I, II, III, IN (11) | | Good et al. 2012 |
| Fowler I, II, III, IN (12) | | Good et al. 2013c |
| Goodnoe, WA (09-10) | | URS Corporation 2010a |
| Grand Ridge I, IL (09-10) | | Derby et al. 2010g |
| Harrow, Ont (10) | | NRSI 2011 |
| Harvest Wind, WA (10-12) | | Downes and Gritski 2012a |
| Hay Canyon, OR (09-10) | | Gritski and Kronner 2010a |
| Heritage Garden I, MI (12-14) | | Kerlinger et al. 2014 |
| High Sheldon, NY (10) | | Tidhar et al. 2012a |
| High Sheldon, NY (11) | | Tidhar et al. 2012b |
| High Winds, CA (03-04) | | Kerlinger et al. 2006 |
| High Winds, CA (04-05) | | Kerlinger et al. 2006 |
| Hopkins Ridge, WA (06) | | Young et al. 2007 |
| Hopkins Ridge, WA (08) | | Young et al. 2009c |
| Judith Gap, MT (06-07) | | TRC 2008 |
| Judith Gap, MT (09) | | Poulton and Erickson 2010 |
| Kewaunee County, WI (99-01) | | Howe et al. 2002 |
| Kibby, ME (11) | | Stantec 2012a |
| Kittitas Valley, WA (11-12) | | Stantec Consulting Services 2012 |
| Klondike, OR (02-03) | | Johnson et al. 2003 |
| Klondike II, OR (05-06) | | NWC and WEST 2007 |
| Klondike III (Phase I), OR (07-09) | | Gritski et al. 2010 |
| Klondike IIIa (Phase II), OR (08-10) | | Gritski et al. 2011 |
| Leaning Juniper, OR (06-08) | | Gritski et al. 2008 |
| PrairieWinds SD1 (Crow Lake), SD (11-12) | | Derby et al. 2012d |
| PrairieWinds SD1 (Crow Lake), SD (12-13) | | Derby et al. 2013a |
| PrairieWinds SD1, SD (13-14) | | Derby et al. 2014 |
| Rail Splitter, IL (12-13) | | Good et al. 2013b |
| Record Hill, ME (12) | Stantec 2008b | Stantec 2013b |
| Record Hill, ME (14) | | Stantec 2015 |
| Red Hills, OK (12-13) | | Derby et al. 2013c |
| Ripley, Ont (08) | | Jacques Whitford 2009 |
| Rollins, ME (12) | | Stantec 2013c |
| Rugby, ND (10-11) | | Derby et al. 2011b |
| Shiloh I, CA (06-09) | | Kerlinger et al. 2009 |
| Shiloh II, CA (09-10) | | Kerlinger et al. 2010 |
| Shiloh II, CA (10-11) | | Kerlinger et al. 2013a |
| Shiloh III, CA (12-13) | | Kerlinger et al. 2013b |
| Solano III, CA (12-13) | | AECOM 2013 |
| Stateline, OR/WA (01-02) | | Erickson et al. 2004 |
| Stateline, OR/WA (03) | | Erickson et al. 2004 |
| Stateline, OR/WA (06) | | Erickson et al. 2007 |
| Stetson Mountain I, ME (09) | Stantec 2009c | Stantec 2009c |
| Stetson Mountain I, ME (11) | | Normandeau Associates 2011 |
| Stetson Mountain I, ME (13) | | Stantec 2014 |
| Stetson Mountain II, ME (10) | | Normandeau Associates 2010 |
| Stetson Mountain II, ME (12) | | Stantec 2013e |
| Summerview, Alb (05-06) | | Brown and Hamilton 2006b |
| Summerview, Alb (06; 07) | Baerwald 2008 | Baerwald 2008 |
| Top Crop I & II, IL (12-13) | | Good et al. 2013a |
| Top of Iowa, IA (03) | | Jain 2005 |
| Top of Iowa, IA (04) | Jain 2005 | Jain 2005 |
| Tuolumne (Windy Point I), WA (09-10) | | Enz and Bay 2010 |
| Vansycle, OR (99) | | Erickson et al. 2000 |
| Vantage, WA (10-11) | | Ventus 2012 |
| Wessington Springs, SD (09) | | Derby et al. 2010f |
| Wessington Springs, SD (10) | | Derby et al. 2011d |
| White Creek, WA (07-11) | | Downes and Gritski 2012b |
| Wild Horse, WA (07) | | Erickson et al. 2008 |
| Windy Flats, WA (10-11) | | Enz et al. 2011 |
| Winnebago, IA (09-10) | | Derby et al. 2010e |
| Wolfe Island, Ont (July-December 09) | | Stantec Ltd. 2010b |
| Wolfe Island, Ont (July-December 10) | | Stantec Ltd. 2011b |
| Wolfe Island, Ont (July-December 11) | | Stantec Ltd. 2012 |

**Appendix A2. Fatality estimates for North American wind-energy facilities.**

| Project | Bat Fatalities (bats/MW/ year) | Predominant Habitat Type | Citation |
|---|---|---|---|
| Alite, CA (2009-2010) | 0.24 | shrub/scrub & grassland | Chatfield et al. 2010 |
| Alta VIII, CA (2012-2013) | 0 | grassland and riparian | Chatfield and Bay 2014 |
| Alta Wind I, CA (2011-2012) | 1.28 | woodland, grassland, shrubland | Chatfield et al. 2012 |
| Alta Wind I-V, CA (2013-2014) | 0.2 | NA | Chatfield et al. 2014 |
| Alta Wind II-V, CA (2011-2012) | 0.08 | desert scrub | Chatfield et al. 2012 |
| Barton I & II, IA (2010-2011) | 1.85 | agriculture | Derby et al. 2011a |
| Barton Chapel, TX (2009-2010) | 3.06 | agriculture/forest | WEST 2011 |
| Beech Ridge, WV (2012) | 2.03 | forest | Tidhar et al. 2013b |
| Beech Ridge, WV (2013) | 0.58 | forest | Young et al. 2014b |
| Big Blue, MN (2013) | 2.04 | agriculture | Fagen Engineering 2014 |
| Big Blue, MN (2014) | 1.43 | agriculture | Fagen Engineering 2015 |
| Big Horn, WA (2006-2007) | 1.9 | agriculture/grassland | Kronner et al. 2008 |
| Big Smile, OK (2012-2013) | 2.9 | grassland, agriculture | Derby et al. 2013b |
| Biglow Canyon, OR (Phase I; 2008) | 1.99 | agriculture/grassland | Jeffrey et al. 2009a |
| Biglow Canyon, OR (Phase I; 2009) | 0.58 | agriculture/grassland | Enk et al. 2010 |
| Biglow Canyon, OR (Phase II; 2009-2010) | 2.71 | agriculture | Enk et al. 2011a |
| Biglow Canyon, OR (Phase II; 2010-2011) | 0.57 | grassland/shrub-steppe, agriculture | Enk et al. 2012b |
| Biglow Canyon, OR (Phase III; 2010-2011) | 0.22 | grassland/shrub-steppe, agriculture | Enk et al. 2012a |
| Blue Sky Green Field, WI (2008; 2009) | 24.57 | agriculture | Gruver et al. 2009 |
| Buffalo Gap I, TX (2006) | 0.1 | grassland | Tierney 2007 |
| Buffalo Gap II, TX (2007-2008) | 0.14 | forest | Tierney 2009 |
| Buffalo Mountain, TN (2000-2003) | 31.54 | forest | Nicholson et al. 2005 |
| Buffalo Mountain, TN (2005) | 39.7 | forest | Fiedler et al. 2007 |
| Buffalo Ridge, MN (Phase I; 1999) | 0.74 | agriculture | Johnson et al. 2000 |
| Buffalo Ridge, MN (Phase II; 1998) | 2.16 | agriculture | Johnson et al. 2000 |
| Buffalo Ridge, MN (Phase II; 1999) | 2.59 | agriculture | Johnson et al. 2000 |
| Buffalo Ridge, MN (Phase II; 2001/Lake Benton I) | 4.35 | agriculture | Johnson et al. 2004 |
| Buffalo Ridge, MN (Phase II; 2002/Lake Benton I) | 1.64 | agriculture | Johnson et al. 2004 |
| Buffalo Ridge, MN (Phase III; 1999) | 2.72 | agriculture | Johnson et al. 2000 |
| Buffalo Ridge, MN (Phase III; 2001/Lake Benton II) | 3.71 | agriculture | Johnson et al. 2004 |
| Buffalo Ridge, MN (Phase III; 2002/Lake Benton II) | 1.81 | agriculture | Johnson et al. 2004 |

**Appendix A2. Fatality estimates for North American wind-energy facilities.**

| Project | Bat Fatalities (bats/MW/ year) | Predominant Habitat Type | Citation |
|---|---|---|---|
| Buffalo Ridge I, SD (2009-2010) | 0.16 | agriculture/grassland | Derby et al. 2010b |
| Buffalo Ridge II, SD (2011-2012) | 2.81 | agriculture, grassland | Derby et al. 2012a |
| Casselman, PA (2008) | 12.61 | forest | Arnett et al. 2009b |
| Casselman, PA (2009) | 8.6 | forest, pasture, grassland | Arnett et al. 2010 |
| Casselman Curtailment, PA (2008) | 4.4 | forest | Arnett et al. 2009a |
| Cedar Ridge, WI (2009) | 30.61 | agriculture | BHE Environmental 2010 |
| Cedar Ridge, WI (2010) | 24.12 | agriculture | BHE Environmental 2011 |
| Cohocton/Dutch Hill, NY (2009) | 8.62 | agriculture/forest | Stantec 2010 |
| Cohocton/Dutch Hills, NY (2010) | 10.32 | agriculture, forest | Stantec 2011a |
| Combine Hills, OR (Phase I; 2004-2005) | 1.88 | agriculture/grassland | Young et al. 2006 |
| Combine Hills, OR (2011) | 0.73 | grassland/shrub-steppe, agriculture | Enz et al. 2012 |
| Crescent Ridge, IL (2005-2006) | 3.27 | agriculture | Kerlinger et al. 2007 |
| Criterion, MD (2011) | 15.61 | forest, agriculture | Young et al. 2012a |
| Criterion, MD (2012) | 7.62 | forest, agriculture | Young et al. 2013 |
| Criterion, MD (2013) | 5.32 | forest, agriculture | Young et al. 2014a |
| Crystal Lake II, IA (2009) | 7.42 | agriculture | Derby et al. 2010a |
| Diablo Winds, CA (2005-2007) | 0.82 | NA | WEST 2006, 2008 |
| Dillon, CA (2008-2009) | 2.17 | desert | Chatfield et al. 2009 |
| Dry Lake I, AZ (2009-2010) | 3.43 | desert grassland/forested | Thompson et al. 2011 |
| Dry Lake II, AZ (2011-2012) | 1.66 | desert grassland/forested | Thompson and Bay 2012 |
| Elkhorn, OR (2008) | 1.26 | shrub/scrub & agriculture | Jeffrey et al. 2009b |
| Elkhorn, OR (2010) | 2.14 | shrub/scrub & agriculture | Enk et al. 2011b |
| Elm Creek, MN (2009-2010) | 1.49 | agriculture | Derby et al. 2010c |
| Elm Creek II, MN (2011-2012) | 2.81 | agriculture, grassland | Derby et al. 2012b |
| Foote Creek Rim, WY (Phase I; 1999) | 3.97 | grassland | Young et al. 2003a |
| Foote Creek Rim, WY (Phase I; 2000) | 1.05 | grassland | Young et al. 2003a |
| Foote Creek Rim, WY (Phase I; 2001-2002) | 1.57 | grassland | Young et al. 2003a |
| Forward Energy Center, WI (2008-2010) | 18.17 | agriculture | Grodsky and Drake 2011 |
| Fowler I, IN (2009) | 8.09 | agriculture | Johnson et al. 2010a |
| Fowler I, II, III, IN (2010) | 18.96 | agriculture | Good et al. 2011 |
| Fowler I, II, III, IN (2011) | 20.19 | agriculture | Good et al. 2012 |
| Fowler I, II, III, IN (2012) | 2.96 | agriculture | Good et al. 2013c |
| Fowler III, IN (2009) | 1.84 | agriculture | Johnson et al. 2010b |
| Goodnoe, WA (2009-2010) | 0.34 | grassland and shrub-steppe | URS Corporation 2010a |
| Grand Ridge I, IL (2009-2010) | 2.1 | agriculture | Derby et al. 2010g |

**Appendix A2. Fatality estimates for North American wind-energy facilities.**

| Project | Bat Fatalities (bats/MW/ year) | Predominant Habitat Type | Citation |
|---|---|---|---|
| Harrow, Ont (2010) | 11.13 | agriculture | Natural Resource Solutions Inc. (NRSI) 2011 |
| Harvest Wind, WA (2010-2012) | 1.27 | grassland/shrub-steppe | Downes and Gritski 2012a |
| Hay Canyon, OR (2009-2010) | 0.53 | agriculture | Gritski and Kronner 2010a |
| Heritage Garden I, MI (2012-2014) | 5.9 | agriculture | Kerlinger et al. 2014 |
| High Sheldon, NY (2010) | 2.33 | agriculture | Tidhar et al. 2012a |
| High Sheldon, NY (2011) | 1.78 | agriculture | Tidhar et al. 2012b |
| High Winds, CA (2003-2004) | 2.51 | agriculture/grassland | Kerlinger et al. 2006 |
| High Winds, CA (2004-2005) | 1.52 | agriculture/grassland | Kerlinger et al. 2006 |
| Hopkins Ridge, WA (2006) | 0.63 | agriculture/grassland | Young et al. 2007 |
| Hopkins Ridge, WA (2008) | 1.39 | agriculture/grassland | Young et al. 2009c |
| Judith Gap, MT (2006-2007) | 8.93 | agriculture/grassland | TRC 2008 |
| Judith Gap, MT (2009) | 3.2 | agriculture/grassland | Poulton and Erickson 2010 |
| Kewaunee County, WI (1999-2001) | 6.45 | agriculture | Howe et al. 2002 |
| Kibby, ME (2011) | 0.12 | forest; commercial forest | Stantec 2012a |
| Kittitas Valley, WA (2011-2012) | 0.12 | sagebrush-steppe, grassland | Stantec Consulting Services 2012 |
| Klondike, OR (2002-2003) | 0.77 | agriculture/grassland | Johnson et al. 2003 |
| Klondike II, OR (2005-2006) | 0.41 | agriculture/grassland | NWC and WEST 2007 |
| Klondike III (Phase I), OR (2007-2009) | 1.11 | agriculture/grassland | Gritski et al. 2010 |
| Klondike IIIa (Phase II), OR (2008-2010) | 0.14 | grassland/shrub-steppe and agriculture | Gritski et al. 2011 |
| Leaning Juniper, OR (2006-2008) | 1.98 | agriculture | Gritski et al. 2008 |
| Lempster, NH (2009) | 3.11 | grasslands/forest/rocky embankments | Tidhar et al. 2010 |
| Lempster, NH (2010) | 3.57 | grasslands/forest/rocky embankments | Tidhar et al. 2011 |
| Linden Ranch, WA (2010-2011) | 1.68 | grassland/shrub-steppe, agriculture | Enz and Bay 2011 |
| Locust Ridge, PA (Phase II; 2009) | 14.11 | grassland | Arnett et al. 2011 |
| Locust Ridge, PA (Phase II; 2010) | 14.38 | grassland | Arnett et al. 2011 |
| Maple Ridge, NY (2006) | 11.21 | agriculture/forested | Jain et al. 2007 |
| Maple Ridge, NY (2007) | 6.49 | agriculture/forested | Jain et al. 2009a |
| Maple Ridge, NY (2007-2008) | 4.96 | agriculture/forested | Jain et al. 2009d |
| Maple Ridge, NY (2012) | 7.3 | agriculture/forested | Tidhar et al. 2013a |
| Marengo I, WA (2009-2010) | 0.17 | agriculture | URS Corporation 2010b |
| Marengo II, WA (2009-2010) | 0.27 | agriculture | URS Corporation 2010c |
| Mars Hill, ME (2007) | 2.91 | forest | Stantec 2008a |
| Mars Hill, ME (2008) | 0.45 | forest | Stantec 2009a |
| Milford I, UT (2010-2011) | 2.05 | desert shrub | Stantec 2011b |
| Milford I & II, UT (2011-2012) | 1.67 | desert shrub | Stantec 2012b |

**Appendix A2. Fatality estimates for North American wind-energy facilities.**

| Project | Bat Fatalities (bats/MW/ year) | Predominant Habitat Type | Citation |
|---|---|---|---|
| Montezuma I, CA (2011) | 1.9 | agriculture and grasslands | ICF International 2012 |
| Montezuma I, CA (2012) | 0.84 | agriculture and grasslands | ICF International 2013 |
| Montezuma II, CA (2012-2013) | 0.91 | agriculture | Harvey & Associates 2013 |
| Moraine II, MN (2009) | 2.42 | agriculture/grassland | Derby et al. 2010d |
| Mount Storm, WV (Fall 2008) | 6.62 | forest | Young et al. 2009b |
| Mount Storm, WV (2009) | 17.53 | forest | Young et al. 2009a, 2010b |
| Mount Storm, WV (2010) | 15.18 | forest | Young et al. 2010a, 2011b |
| Mount Storm, WV (2011) | 7.43 | forest | Young et al. 2011a, 2012b |
| Mountaineer, WV (2003) | 31.69 | forest | Kerns and Kerlinger 2004 |
| Munnsville, NY (2008) | 1.93 | agriculture/forest | Stantec 2009b |
| Mustang Hills, CA (2012-2013) | 0.1 | grasslands and riparian | Chatfield and Bay 2014 |
| Nine Canyon, WA (2002-2003) | 2.47 | agriculture/grassland | Erickson et al. 2003 |
| Noble Altona, NY (2010) | 4.34 | forest | Jain et al. 2011b |
| Noble Bliss, NY (2008) | 7.8 | agriculture/forest | Jain et al. 2009e |
| Noble Bliss, NY (2009) | 3.85 | agriculture/forest | Jain et al. 2010a |
| Noble Chateaugay, NY (2010) | 2.44 | agriculture | Jain et al. 2011c |
| Noble Clinton, NY (2008) | 3.14 | agriculture/forest | Jain et al. 2009c |
| Noble Clinton, NY (2009) | 4.5 | agriculture/forest | Jain et al. 2010b |
| Noble Ellenburg, NY (2008) | 3.46 | agriculture/forest | Jain et al. 2009b |
| Noble Ellenburg, NY (2009) | 3.91 | agriculture/forest | Jain et al. 2010c |
| Noble Wethersfield, NY (2010) | 16.3 | agriculture | Jain et al. 2011a |
| NPPD Ainsworth, NE (2006) | 1.16 | agriculture/grassland | Derby et al. 2007 |
| Palouse Wind, WA (2012-2013) | 4.23 | agriculture and grasslands | Stantec 2013a |
| Pebble Springs, OR (2009-2010) | 1.55 | grassland | Gritski and Kronner 2010b |
| Pinnacle, WV (2012) | 40.2 | forest | Hein et al. 2013b |
| Pinyon Pines I & II, CA (2013-2014) | 0.04 | NA | Chatfield and Russo 2014 |
| Pioneer Prairie I, IA (Phase II; 2011-2012) | 10.06 | agriculture, grassland | Chodachek et al. 2012 |
| Pioneer Prairie II, IA (2013) | 3.83 | agriculture | Chodachek et al. 2014 |
| PrairieWinds ND1 (Minot), ND (2010) | 2.13 | agriculture | Derby et al. 2011c |
| PrairieWinds ND1 (Minot), ND (2011) | 1.39 | agriculture, grassland | Derby et al. 2012c |
| PrairieWinds SD1, SD (2011-2012) | 1.23 | grassland | Derby et al. 2012d |
| PrairieWinds SD1, SD (2012-2013) | 1.05 | grassland | Derby et al. 2013a |
| PrairieWinds SD1, SD (2013-2014) | 0.52 | grassland | Derby et al. 2014 |
| Rail Splitter, IL (2012-2013) | 11.21 | agriculture | Good et al. 2013b |
| Record Hill, ME (2012) | 2.96 | forest | Stantec 2013b |
| Record Hill, ME (2014) | 0.55 | forest | Stantec 2015 |
| Red Hills, OK (2012-2013) | 0.11 | grassland | Derby et al. 2013c |
| Ripley, Ont (2008) | 4.67 | agriculture | Jacques Whitford 2009 |
| Rollins, ME (2012) | 0.18 | forest | Stantec 2013c |

**Appendix A2. Fatality estimates for North American wind-energy facilities.**

| Project | Bat Fatalities (bats/MW/ year) | Predominant Habitat Type | Citation |
|---|---|---|---|
| Rugby, ND (2010-2011) | 1.6 | agriculture | Derby et al. 2011b |
| Shiloh I, CA (2006-2009) | 3.92 | agriculture/grassland | Kerlinger et al. 2009 |
| Shiloh II, CA (2009-2010) | 2.6 | agriculture | Kerlinger et al. 2010, 2013a |
| Shiloh II, CA (2010-2011) | 3.8 | agriculture | Kerlinger et al. 2013a |
| Shiloh III, CA (2012-2013) | 0.4 | NA | Kerlinger et al. 2013b |
| Solano III, CA (2012-2013) | 0.31 | NA | AECOM 2013 |
| Stateline, OR/WA (2001-2002) | 1.09 | agriculture/grassland | Erickson et al. 2004 |
| Stateline, OR/WA (2003) | 2.29 | agriculture/grassland | Erickson et al. 2004 |
| Stateline, OR/WA (2006) | 0.95 | agriculture/grassland | Erickson et al. 2007 |
| Stetson Mountain I, ME (2009) | 1.4 | forest | Stantec 2009c |
| Stetson Mountain I, ME (2011) | 0.28 | forest | Normandeau Associates 2011 |
| Stetson Mountain I, ME (2013) | 0.18 | forest | Stantec 2014 |
| Stetson Mountain II, ME (2010) | 1.65 | forest | Normandeau Associates 2010 |
| Stetson Mountain II, ME (2012) | 2.27 | forest | Stantec 2013e |
| Summerview, Alb (2005-2006) | 10.27 | agriculture | Brown and Hamilton 2006b |
| Summerview, Alb (2006; 2007) | 11.42 | agriculture/grassland | Baerwald 2008 |
| Top Crop I & II (2012-2013) | 12.55 | agriculture | Good et al. 2013a |
| Top of Iowa, IA (2003) | 7.16 | agriculture | Jain 2005 |
| Top of Iowa, IA (2004) | 10.27 | agriculture | Jain 2005 |
| Tuolumne (Windy Point I), WA (2009-2010) | 0.94 | grassland/shrub-steppe, agriculture and forest | Enz and Bay 2010 |
| Vansycle, OR (1999) | 1.12 | agriculture/grassland | Erickson et al. 2000 |
| Vantage, WA (2010-2011) | 0.4 | Shrub-steppe, grassland | Ventus Environmental Solutions 2012 |
| Wessington Springs, SD (2009) | 1.48 | grassland | Derby et al. 2010f |
| Wessington Springs, SD (2010) | 0.41 | grassland | Derby et al. 2011d |
| White Creek, WA (2007-2011) | 2.04 | grassland/shrub-steppe, agriculture | Downes and Gritski 2012b |
| Wild Horse, WA (2007) | 0.39 | grassland | Erickson et al. 2008 |
| Windy Flats, WA (2010-2011) | 0.41 | grassland/shrub-steppe, agriculture | Enz et al. 2011 |
| Winnebago, IA (2009-2010) | 4.54 | agriculture/grassland | Derby et al. 2010e |
| Wolfe Island, Ont (July-December 2009) | 6.42 | grassland | Stantec Ltd. 2010b |
| Wolfe Island, Ont (July-December 2010) | 9.5 | grassland | Stantec Ltd. 2011b |
| Wolfe Island, Ont (July-December 2011) | 2.49 | grassland | Stantec Ltd. 2012 |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Alite, CA (2009-2010) | 8 | 24 | 80 | 8 | 200 m x 200 m | 1 year | weekly (spring, fall), bi-monthly (summer, winter) |
| Alta Wind I, CA (2011-2012) | 100 | 150 | 80 | 25 | 120-m radius circle | 12.5 months | every two weeks |
| Alta Wind I-V, CA (2013-2014) | 290 | 720 (150 GE, 570 vestas) | 80 | 55 (25 at Alta I, 30 at Alta II-V) | 120 m radius circles | NA | monthly or bi-weekly |
| Alta Wind II-V, CA (2011-2012) | 190 | 570 | 80 | 41 | 120-m radius circle | 14.5 months | every two weeks |
| Alta VIII, CA (2012-2013) | 50 | 150 | 90 | 12 plots (equivalent to 15 turbines) | 240 x 240 m | 1 year | bi-weekly |
| Barton I & II, IA (2010-2011) | 80 | 160 | 100 | 35 (9 turbines were dropped in June 2010 due to landowner issues) 26 turbines were searched for the remainder of the study | 200 m x 200 m | 1 year | weekly (spring, fall; migratory turbines), monthly (summer, winter; non-migratory turbines) |
| Barton Chapel, TX (2009-2010) | 60 | 120 | 78 | 30 | 200 m x 200 m | 1 year | 10 turbines weekly, 20 monthly |
| Beech Ridge, WV (2012) | 67 | 100.5 | 80 | 67 | 40 m radius | 7 months | every two days |
| Beech Ridge, WV (2013) | 67 | 100.5 | 80 | 67 | 40 m radius | 7.5 months | every two days |
| Big Blue, MN (2013) | 18 | 36 | 78 or 90 (according to Gamesa website) | 18 | 200m diameter | NA | weekly, monthly (Nov and Dec) |
| Big Blue, MN (2014) | 18 | 36 | 78 or 90 (according to Gamesa website) | 18 | 200m diameter | NA | weekly, monthly (Nov and Dec) |
| Big Horn, WA (2006-2007) | 133 | 199.5 | 80 | 133 | 180 m x 180 m | 1 year | bi-monthly (spring, fall), monthly (winter, summer) |
| Big Smile, OK (2012-2013) | 66 | 132 | 78 | 17 (plus one met tower) | 100 x 100 | 1 year | weekly (spring, summer, fall), monthly (winter) |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Biglow Canyon, OR (Phase I; 2008) | 76 | 125.4 | 80 | 50 | 110 m x 110 m | 1 year | bi-monthly (spring, fall), monthly (winter, summer) |
| Biglow Canyon, OR (Phase I; 2009) | 76 | 125.4 | 80 | 50 | 110 m x 110 m | 1 year | bi-monthly (spring, fall), monthly (winter, summer) |
| Biglow Canyon, OR (Phase II; 2009-2010) | 65 | 150 | 80 | 50 | 250 m x 250 m | 1 year | bi-monthly (spring, fall), monthly (winter, summer) |
| Biglow Canyon, OR (Phase II; 2010-2011) | 65 | 150 | 80 | 50 | 252 m x 252 m | 1 year | bi-weekly(spring, fall), monthly (summer, winter) |
| Biglow Canyon, OR (Phase III; 2010-2011) | 76 | 174.8 | 80 | 50 | 252 m x 252 m | 1 year | bi-weekly(spring, fall), monthly (summer, winter) |
| Blue Sky Green Field, WI (2008; 2009) | 88 | 145 | 80 | 30 | 160 m x 160 m | fall, spring | daily(10 turbines), weekly (20 turbines) |
| Buena Vista, CA (2008-2009) | 38 | 38 | 45-55 | 38 | 75-m radius | 1 year | monthly to bi-monthly starting in September 2008 |
| Buffalo Gap I, TX (2006) | 67 | 134 | 78 | 21 | 215 m x 215 m | 10 months | every 3 weeks |
| Buffalo Gap II, TX (2007-2008) | 155 | 233 | 80 | 36 | 215 m x 215 m | 14 months | every 21 days |
| Buffalo Mountain, TN (2000-2003) | 3 | 1.98 | 65 | 3 | 50-m radius | 3 years | bi-weekly, weekly, bi-monthly |
| Buffalo Mountain, TN (2005) | 18 | 28.98 | V47 = 65;<br>V80 = 78 | 18 | 50-m radius | 1 year | bi-weekly, weekly, bi-monthly, and 2 to 5 day intervals |
| Buffalo Ridge, MN (1994-1995) | 73 | 25 | 37 | 1994:10 plots (3 turbines/plot), 20 addition plots in Sept & Oct 1994, 1995: 30 turbines search every other week (Jan-Mar), 60 searched weekly (Apr, July, Aug) 73 searched weekly (May-June and Sept-Oct), 30 searched weekly (Nov-Dec) | 100 x 100m | 20 months | varies. See number turbines searched or page 44 of report |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Buffalo Ridge, MN (Phase I; 1996) | 73 | 25 | 36 | 21 | 126 m x 126 m | 1 year | bi-monthly (spring, summer, and fall) |
| Buffalo Ridge, MN (Phase I; 1997) | 73 | 25 | 36 | 21 | 126 m x 126 m | 1 year | bi-monthly (spring, summer, and fall) |
| Buffalo Ridge, MN (Phase I; 1998) | 73 | 25 | 36 | 21 | 126 m x 126 m | 1 year | bi-monthly (spring, summer, and fall) |
| Buffalo Ridge, MN (Phase I; 1999) | 73 | 25 | 36 | 21 | 126 m x 126 m | 1 year | bi-monthly (spring, summer, and fall) |
| Buffalo Ridge, MN (Phase II; 1998) | 143 | 107.25 | 50 | 40 | 126 m x 126 m | 1 year | bi-monthly (spring, summer, and fall) |
| Buffalo Ridge, MN (Phase II; 1999) | 143 | 107.25 | 50 | 40 | 126 m x 126 m | 1 year | bi-monthly (spring, summer, and fall) |
| Buffalo Ridge, MN (Phase II; 2001/Lake Benton I) | 143 | 107.25 | 50 | 83 | 60 m x 60 m | summer, fall | bi-monthly |
| Buffalo Ridge, MN (Phase II; 2002/Lake Benton I) | 143 | 107.25 | 50 | 103 | 60 m x 60 m | summer, fall | bi-monthly |
| Buffalo Ridge, MN (Phase III; 1999) | 138 | 103.5 | 50 | 30 | 126 m x 126 m | 1 year | bi-monthly (spring, summer, and fall) |
| Buffalo Ridge, MN (Phase III; 2001/Lake Benton II) | 138 | 103.5 | 50 | 83 | 60 m x 60 m | summer, fall | bi-monthly |
| Buffalo Ridge, MN (Phase III; 2002/Lake Benton II) | 138 | 103.5 | 50 | 103 | 60 m x 60 m | summer, fall | bi-monthly |
| Buffalo Ridge I, SD (2009-2010) | 24 | 50.4 | 79 | 24 | 200 m x 200 m | 1 year | weekly (migratory), monthly (non-migratory) |
| Buffalo Ridge II, SD (2011-2012) | 105 | 210 | 78 | 65 (60 road and pad, 5 turbine plots) | 100 x 100m | 1 year | weekly (spring, summer, fall), monthly (winter) |
| Casselman, PA (2008) | 23 | 34.5 | 80 | 10 | 126 m x 120 m | 7 months | daily |
| Casselman, PA (2009) | 23 | 34.5 | 80 | 10 | 126 m x 120 m | 7.5 months | daily searches |
| Casselman Curtailment, PA (2008) | 23 | 35.4 | 80 | 12 experimental; 10 control | 126 m x 120 m | 2.5 months | daily |
| Castle River, Alb (2001) | 60 | 39.6 | 50 | 60 | 50-m radius | 2 years | weekly, bi-weekly |
| Castle River, Alb (2002) | 60 | 39.6 | 50 | 60 | 50-m radius | 2 years | weekly, bi-weekly |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Cedar Ridge, WI (2009) | 41 | 67.6 | 80 | 20 | 160 m x 160 m | spring, summer, fall | daily, every 4 days; late fall searched every 3 days |
| Cedar Ridge, WI (2010) | 41 | 68 | 80 | 20 | 160 m x 160 m | 1 year | Five turbines were surveyed daily, 15 turbines surveyed every 4 days in rotating groups each day. All 20 surveyed every three days during late fall |
| Cohocton/Dutch Hill, NY (2009) | 50 | 125 | 80 | 17 | 130 m x 130 m | spring, summer, fall | daily (5 turbines), weekly (12 turbines) |
| Cohocton/Dutch Hills, NY (2010) | 50 | 125 | 80 | 17 | 120 m x 120 m | spring, summer, fall | daily, weekly |
| Combine Hills, OR (Phase I; 2004-2005) | 41 | 41 | 53 | 41 | 90-m radius | 1 year | monthly |
| Combine Hills, OR (2011) | 104 | 104 | 53 | 52 (plus 1 MET tower) | 180 m x 180 m | 1 year | bi-weekly(spring, fall), monthly (summer, winter) |
| Condon, OR | 84 | NA | NA | NA | NA | NA | NA |
| Crescent Ridge, IL (2005-2006) | 33 | 49.5 | 80 | 33 | 70-m radius | 1 year | weekly (fall, spring) |
| Criterion, MD (2011) | 28 | 70 | 80 | 28 | 40-50m radius | 7.3 months | daily |
| Criterion, MD (2012) | 28 | 70 | 80 | 14 | 40-50m radius | 7.5 months | weekly |
| Criterion, MD (2013) | 28 | 70 | 80 | 14 | 40-50m radius | 7.5 months | weekly |
| Crystal Lake II, IA (2009) | 80 | 200 | 80 | 16 turbines through week 6, and then 15 for duration of study | 100 m x 100 m | spring, summer, fall | 3 times per week for 26 weeks |
| Diablo Winds, CA (2005-2007) | 31 | 20.46 | 50 and 55 | 31 | 75 m x 75 m | 2 years | monthly |
| Dillon, CA (2008-2009) | 45 | 45 | 69 | 15 | 200 m x 200 m | 1 year | weekly, bi-monthly in winter |
| Dry Lake I, AZ (2009-2010) | 30 | 63 | 78 | 15 | 160 m x 160 m | 1 year | bi-monthly (spring, fall), monthly (winter, summer) |
| Dry Lake II, AZ (2011-2012) | 31 | 65 | 78 | 31: 5 (full plot), 26 (road & pad) | 160 m x 160 m | 1 year | twice weekly (spring, summer, fall), weekly (winter) |
| Elkhorn, OR (2008) | 61 | 101 | 80 | 61 | 220 m x 220 m | 1 year | monthly |
| Elkhorn, OR (2010) | 61 | 101 | 80 | 31 | 220 m x 220 m | 1 year | bi-monthly (spring, fall), monthly (winter, summer) |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Elm Creek, MN (2009-2010) | 67 | 100 | 80 | 29 | 200 m x 200 m | 1 year | weekly, monthly |
| Elm Creek II, MN (2011-2012) | 62 | 148.8 | 80 | 30 | 200 x 200m (2 random migration search areas 100 x 100m) | 1 year | 20 searched every 28 days, 10 turbines every 7 days during migration) |
| Erie Shores, Ont (2006) | 66 | 99 | 80 | 66 | 40-m radius | 2 years | weekly, bi-monthly, 2-3 times weekly (migration) |
| Foote Creek Rim, WY (Phase I; 1999) | 69 | 41.4 | 40 | 69 | 126 m x 126 m | 1 year | monthly |
| Foote Creek Rim, WY (Phase I; 2000) | 69 | 41.4 | 40 | 69 | 126 m x 126 m | 1 year | monthly |
| Foote Creek Rim, WY (Phase I; 2001-2002) | 69 | 41.4 | 40 | 69 | 126 m x 126 m | 1 year | monthly |
| Forward Energy Center, WI (2008-2010) | 86 | 129 | 80 | 29 | 160 m x 160 m | 2 years | 11 turbines daily, 9 every 3 days, 9 every 5 days |
| Fowler I, IN (2009) | 162 | 301 | 78 (Vestas), 80 (Clipper) | 25 | 160 m x 160 m | spring, summer, fall | weekly, bi-weekly |
| Fowler I, II, III, IN (2010) | 355 | 600 | Vestas = 80, Clipper = 80, GE = 80 | 36 turbines, 100 road and pads | 80 m x 80 m for turbines ; 40-m radius for roads and pads | spring, fall | daily, weekly |
| Fowler I, II, III, IN (2011) | 355 | 600 | Vestas = 80, Clipper = 80, GE = 80 | 177 road and pads (spring), 9 turbines & 168 roads and pads (fall) | turbines (80 m circular plot), roads and pads (out to 80 m) | spring, fall | daily, weekly |
| Fowler I, II, III, IN (2012) | 355 | 600 | Vestas = 80, Clipper = 80, GE = 80 | 118 roads and pads | roads and pads (out to 80 m) | 2.5 months | weekly |
| Fowler III, IN (2009) | 60 | 99 | 78 | 12 | 160 m x 160 m | 10 weeks | weekly, bi-weekly |
| Goodnoe, WA (2009-2010) | 47 | 94 | 80 | 24 | 180 m x 180 m | 1 year | 14 days during migration periods, 28 days during non-migration periods |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Grand Ridge I, IL (2009-2010) | 66 | 99 | 80 | 30 | 160 m x 160 m | 1 year | weekly, monthly |
| Harrow, Ont (2010) | 24 (four 6-turb facilities) | 39.6 | NA | 12 in July, 24 Aug-Oct | 50-m radius from turbine base | 4 months | twice-weekly |
| Harvest Wind, WA (2010-2012) | 43 | 98.9 | 80 | 32 | 180 m x 180 m & 240 m x 240 m | 2 years | twice a week, weekly and monthly |
| Hay Canyon, OR (2009-2010) | 48 | 100.8 | 79 | 20 | 180 m x 180 m | 1 year | bi-monthly (spring, fall), monthly (winter, summer) |
| Heritage Garden I, MI (2012-2014) | 14 | 28 | 90 | 14 | 120x120 m except one plot that was 280x280 m | 1 years | weekly (spring, summer, and fall) and bi-weekly (winter) |
| High Sheldon, NY (2010) | 75 | 112.5 | 80 | 25 | 115 m x 115 m | 7 months | daily (8 turbines), weekly (17 turbines) |
| High Sheldon, NY (2011) | 75 | 112.5 | 80 | 25 | 115 m x 115 m | 7 months | daily (8 turbines), weekly (17 turbines) |
| High Winds, CA (2003-2004) | 90 | 162 | 60 | 90 | 75-m radius | 1 year | bi-monthly |
| High Winds, CA (2004-2005) | 90 | 162 | 60 | 90 | 75-m radius | 1 year | bi-monthly |
| Hopkins Ridge, WA (2006) | 83 | 150 | 67 | 41 | 180 m x 180 m | 1 year | monthly, weekly (subset of 22 turbines spring and fall migration) |
| Hopkins Ridge, WA (2008) | 87 | 156.6 | 67 | 41-43 | 180 m x 180 m | 1 year | bi-monthly (spring, fall), monthly (winter, summer) |
| Jersey Atlantic, NJ (2008) | 5 | 7.5 | 80 | 5 | 130 m x 120 m | 9 months | weekly |
| Judith Gap, MT (2006-2007) | 90 | 135 | 80 | 20 | 190 m x 190 m | 7 months | monthly |
| Judith Gap, MT (2009) | 90 | 135 | 80 | 30 | 100 m x 100 m | 5 months | bi-monthly |
| Kewaunee County, WI (1999-2001) | 31 | 20.46 | 65 | 31 | 60 m x 60 m | 2 years | bi-weekly (spring, summer), daily (spring, fall migration), weekly (fall, winter) |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Kibby, ME (2011) | 44 | 132 | 124 | 22 turbines | 75-m diameter circular plots | 22 weeks | avg 5-day |
| Kittitas Valley, WA (2011-2012) | 48 | 100.8 | 80 | 48 | 100 m x 102 m | 1 year | bi-weekly from Aug 15 - Oct 31 and March 16 - May 15; every 4 weeks from Nov 1 - March 15 and May 16 - Aug 14 |
| Klondike, OR (2002-2003) | 16 | 24 | 80 | 16 | 140 m x 140 m | 1 year | monthly |
| Klondike II, OR (2005-2006) | 50 | 75 | 80 | 25 | 180 m x 180 m | 1 year | bi-monthly (spring, fall), monthly (summer, winter) |
| Klondike III (Phase I), OR (2007-2009) | 125 | 223.6 | GE = 80; Siemens= 80, Mitsubishi = 80 | 46 | 240 m x 240 m (1.5MW) 252 m x 252 m (2.3MW) | 2 year | bi-monthly (spring, fall migration), monthly (summer, winter) |
| Klondike IIIa (Phase II), OR (2008-2010) | 51 | 76.5 | GE = 80 | 34 | 240 m x 240 m | 2 years | bi-monthly (spring, fall), monthly (summer, winter) |
| Lakefield Wind, MN (2012) | 137 | 205.5 | 80 | 26 | 100 m x 100 m | 7.5 months | 3 times per week |
| Leaning Juniper, OR (2006-2008) | 67 | 100.5 | 80 | 17 | 240 m x 240 m | 2 years | bi-monthly (spring, fall), monthly (winter, summer) |
| Lempster, NH (2009) | 12 | 24 | 78 | 4 | 120 m x 130 m | 6 months | daily |
| Lempster, NH (2010) | 12 | 24 | 78 | 12 | 120 m x 130 m | 6 months | weekly |
| Linden Ranch, WA (2010-2011) | 25 | 50 | 80 | 25 | 110 m x 110 m | 1 year | bi-weekly(spring, fall), monthly (summer, winter) |
| Locust Ridge, PA (Phase II; 2009) | 51 | 102 | 80 | 15 | 120m x 126m | 6.5 months | daily |
| Locust Ridge, PA (Phase II; 2010) | 51 | 102 | 80 | 15 | 120m x 126m | 6.5 months | daily |
| Madison, NY (2001-2002) | 7 | 11.55 | 67 | 7 | 60-m radius | 1 year | weekly (spring, fall), monthly (summer) |
| Maple Ridge, NY (2006) | 120 | 198 | 80 | 50 | 130 m x 120 m | 5 months | daily (10 turbines), every 3 days (10 turbines), weekly (30 turbines) |
| Maple Ridge, NY (2007) | 195 | 321.75 | 80 | 64 | 130 m x 120 m | 7 months | weekly |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Maple Ridge, NY (2007-2008) | 195 | 321.75 | 80 | 64 | 130 m x 120 m | 7 months | weekly |
| Maple Ridge, NY (2012) | 195 | 321.75 | 80 | 105 (5 turbines, 100 roads/pads) | 100 m x 100 m | 3 months | weekly |
| Marengo I, WA (2009-2010) | 78 | 140.4 | 67 | 39 | 180 m x 180 m | 1 year | bi-monthly (spring, fall), monthly (winter, summer) |
| Marengo II, WA (2009-2010) | 39 | 70.2 | 67 | 20 | 180 m x 180 m | 1 year | bi-monthly (spring, fall), monthly (winter, summer) |
| Mars Hill, ME (2007) | 28 | 42 | 80.5 | 28 | 76-m diameter, extended plot 238-m diameter | spring, summer, fall | daily (2 random turbines), weekly (all turbines): extended plot searched once per season |
| Mars Hill, ME (2008) | 28 | 42 | 80.5 | 28 | 76-m diameter, extended plot 238-m diameter | spring, summer, fall | weekly: extended plot searched once per season |
| McBride, Alb (2004) | 114 | 75 | 50 | 114 | 4 parallel transects 120-m wide | 1 year | weekly, bi-weekly |
| Melancthon, Ont (Phase I; 2007) | 45 | NA | NA | 45 | 35m radius | 5 months | weekly, twice weekly |
| Meyersdale, PA (2004) | 20 | 30 | 80 | 20 | 130 m x 120 m | 6 weeks | daily (half turbines), weekly (half turbines) |
| Milford I, UT (2010-2011) | 58 | 145 | 80 | 24 | 120x120 | NA | weekly |
| Milford I & II, UT (2011-2012) | 107 | 160.5 (58.5 I, 102 II) | 80 | 43 | 120x120 | NA | every 10.5 days |
| Montezuma I, CA (2011) | 16 | 36.8 | 80 | 16 | 105 m radius | 1 year | Weekly and bi-Weekly |
| Montezuma I, CA (2012) | 16 | 36.8 | 80 | 16 | 105 m radius | 1 year | Weekly and bi-Weekly |
| Montezuma II, CA (2012-2013) | 34 | 78.2 | 80 | 17 | 105 m radius | 1 year | Weekly |
| Moraine II, MN (2009) | 33 | 49.5 | 82.5 | 30 | 200 m x 200 m | 1 year | weekly (migratory), monthly (non-migratory) |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Mount Storm, WV (Fall 2008) | 82 | 164 | 78 | 27 | varied | 3 months | weekly (18 turbines), daily (9 turbines) |
| Mount Storm, WV (2009) | 132 | 264 | 78 | 44 | varied | 4.5 months | weekly (28 turbines), daily (16 turbines) |
| Mount Storm, WV (2010) | 132 | 264 | 78 | 24 | 20 to 60 m from turbine | 6 months | daily |
| Mount Storm, WV (2011) | 132 | 264 | 78 | 24 | varied | 6 months | daily |
| Mountaineer, WV (2003) | 44 | 66 | 80 | 44 | 60-m radius | 7 months | weekly, monthly |
| Mountaineer, WV (2004) | 44 | 66 | 80 | 44 | 130 m x 120 m | 6 weeks | daily, weekly |
| Munnsville, NY (2008) | 23 | 34.5 | 69.5 | 12 | 120 m x 120 m | spring, summer, fall | weekly |
| Mustang Hills, CA (2012-2013) | 50 | 150 | 90 | 13 plots (equivalent to 15 turbines) | 240 x 240 m | 1 year | bi-weekly |
| Nine Canyon, WA (2002-2003) | 37 | 48.1 | 60 | 37 | 90-m radius | 1 year | bi-monthly (spring, summer, fall), monthly (winter) |
| Nine Canyon II, WA (2004) | 12 | 15.6 | 60 | 12 | 90 m x 90 m | 3 months | once every two weeks |
| Noble Altona, NY (2010) | 65 | 97.5 | 80 | 22 | 120 m x 120 m | spring, summer, fall | daily, weekly |
| Noble Altona, NY (2011) | 65 | 97.5 | 80 | 22 | 120m x 120m | 2 months | daily |
| Noble Bliss, NY (2008) | 67 | 100 | 80 | 23 | 120 m x 120 m | spring, summer, fall | daily (8 turbines), 3-day (8 turbines), weekly ( 7 turbines) |
| Noble Bliss, NY (2009) | 67 | 100 | 80 | 23 | 120 m x 120 m | spring, summer, fall | weekly, 8 turbines searched daily from July 1 to August 15 |
| Noble Bliss/Wethersfield, NY (2011) | 151 | 226 | 80 | 48 (24 from each site:12 ag, 12 forest) | road & pad 70 m out from turbine | 2 months | daily |
| Noble Chateaugay, NY (2010) | 71 | 106.5 | 80 | 24 | 120 m x 120 m | spring, summer, fall | weekly |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Noble Clinton, NY (2008) | 67 | 100 | 80 | 23 | 120 m x 120 m | spring, summer, fall | daily (8 turbines), 3-day (8 turbines), weekly (7 turbines) |
| Noble Clinton, NY (2009) | 67 | 100 | 80 | 23 | 120 m x 120 m | spring, summer, fall | daily (8 turbines), weekly (15 turbines), all turbines weekly from July 1 to August 15 |
| Noble Ellenburg, NY (2008) | 54 | 80 | 80 | 18 | 120 m x 120 m | spring, summer, fall | daily (6 turbines), 3-day (6 turbines), weekly (6 turbines) |
| Noble Ellenburg, NY (2009) | 54 | 80 | 80 | 18 | 120 m x 120 m | spring, summer, fall | daily (6 turbines), weekly (12 turbines), all turbines weekly from July 1 to August 15 |
| Noble Wethersfield, NY (2010) | 84 | 126 | 80 | 28 | 120 m x 120 m | spring, summer, fall | weekly |
| NPPD Ainsworth, NE (2006) | 36 | 20.5 | 70 | 36 | 220 m x 220 m | spring, summer, fall | bi-monthly |
| Oklahoma Wind Energy Center, OK (2004; 2005) | 68 | 102 | 70 | 68 | 20m radius | 3 months (2 years) | bi-monthly |
| Pacific, CA (2012-2013) | 70 | 140 | 78.5 | 20 | 126 m radius | NA | Twice weekly (fall), and biweekly |
| Palouse Wind, WA (2012-2013) | 58 | 104.4 | 80, 90, or 105 M (according to the Vestas website) | 19 | 120m x 120m | 1 year | Montly (Winter) and Weekly (Spring-Fall) |
| Pebble Springs, OR (2009-2010) | 47 | 98.7 | 79 | 20 | 180 m x 180 m | 1 year | bi-monthly (spring, fall), monthly (winter, summer) |
| Pine Tree, CA (2009-2010, 2011) | 90 | 135 | 65 | 40 | 100 m radius | 1.5 year | bi-weekly, weekly |
| Pinnacle, WV (2012) | 23 | 55.2 | 80 | 11 | 126 m x 120m | 9 months | weekly |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Pinnacle Operational Mitigation Study (2012) | 23 | 55.2 | 80 | 12 | 126m x 120m | 2.5 months | daily |
| Pinyon Pines I & II, CA (2013-2014) | 100 | NA | 90 | 25 plots (aprox 31 turbines) | 240x240 m | NA | bi-weekly |
| Pioneer Prairie II, IA (2013) | 62 | 102.3 | 80 | 62 | 80x80 m (5 turbines), road and pad within 100 m of turbine (57 turbines) | NA | weekly |
| Pioneer Prairie I, IA (Phase II; 2011-2012) | 62 | 102.3 | 80 | 62 (57 road/pad) 5 full search plots | 80 x 80m | 1 year | weekly (spring and fall), every two weeks (summer), monthly (winter) |
| Pioneer Trail, IL (2012-2013) | 94 | 150.5 | NA | 50 | 80x80m | fall, spring | weekly |
| Prairie Rose, MN (2014) | 119 | 200 | 80 | 10 | 100x100m | 6 months | weekly |
| PrairieWinds ND1 (Minot), ND (2010) | 80 | 115.5 | 89 | 35 | minimum of 100 m x 100 m | 3 seasons | bi-monthly |
| PrairieWinds ND1 (Minot), ND (2011) | 80 | 115.5 | 80 | 35 | minimum 100 x 100m | 3 season | twice monthly |
| PrairieWinds SD1, SD (2011-2012) | 108 | 162 | 80 | 50 | 200 x 200m | 1 year | twice monthly (spring, summer, fall), monthly (winter) |
| PrairieWinds SD1, SD (2012-2013) | 108 | 162 | 80 | 50 | 200 x 200m | 1 year | bi-weekly |
| PrairieWinds SD1, SD (2013-2014) | 108 | 162 | 80 | 45 | 200 x 200m | 1 year | twice monthly (spring, summer, fall), monthly (winter) |
| Rail Splitter, IL (2012-2013) | 67 | 100.5 | 80 | 34 | 60 m radius | 1 year | weekly (spring, summer, and fall) and bi-weekly (winter) |
| Record Hill, ME (2012) | 22 | 50.6 | 80 | 22 | 126.5x126.5 | 5 months | three times every two weeks |
| Record Hill, ME (2014) | 22 | 50.6 | 80 | 10 | varied due to steep terrain and heavily vegetated areas | 4.5 months | daily for 5 days a week |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Red Canyon, TX (2006-2007) | 56 | 84 | 70 | 28 | 200 m x 200 m in fall and winter; 160 m x 160 m in spring and summer | 1 year | every 14 days in fall and winter; 7 days in spring, 3 days in summer |
| Red Hills, OK (2012-2013) | 82 | 123 | 80 | 20 (plus one met tower) | 100 x 100 | 1 year | weekly (spring, summer, fall), monthly (winter) |
| Ripley, Ont (2008) | 38 | 76 | 64 | 38 | 80 m x 80 m | spring, fall | twice weekly for odd turbines; weekly for even turbines. |
| Ripley, Ont (2008-2009) | 38 | 76 | 64 | 38 | 80 m x 80 m | 6 weeks | twice weekly for odd turbines; weekly for even turbines. |
| Rollins, ME (2012) | 40 | 60 | 80 | 20 | varied; turbine laydown area and gravel access roads out to 60m | 6 months | weekly |
| Roth Rock, MD (2011) | 20 | 50 | 80 | 10 | 80m x 80m | 3 months | daily |
| Rugby, ND (2010-2011) | 71 | 149 | 78 | 32 | 200 m x 200 m | 1 year | weekly (spring, fall; migratory turbines), monthly ( non-migratory turbines) |
| San Gorgonio, CA (1997-1998; 1999-2000) | 3000 | NA | 24.4-42.7 | NA | 50-m radius | 2 years | quarterly |
| Searsburg, VT (1997) | 11 | 7 | 65 | 11 | 20- to 55-m radius | spring, fall | weekly (fall migration) |
| Sheffield, VT (2012) | 16 | 40 | 80 | 8 | 126m x 120m | 3 months | daily |
| Sheffield Operational Mitigation Study (2012) | 16 | 40 | 80 | 16 | 126m x 120m | 4 months | daily |
| Shiloh I, CA (2006-2009) | 100 | 150 | 65 | 100 | 105-m radius | 3 years | weekly |
| Shiloh II, CA (2009-2010) | 75 | 150 | 80 | 25 | 100m radius | 1 year | weekly |
| Shiloh II, CA (2010-2011) | 75 | 150 | 80 | 25 | 100 m radius | 1 year | weekly |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Shiloh III, CA (2012-2013) | 50 | 102.5 | 78.5 | 25 | 100 m radius | NA | weekly |
| SMUD Solano, CA (2004-2005) | 22 | 15 | 65 | 22 | 60-m radius | 1 year | bi-monthly |
| Solano III, CA (2012-2013) | 55 | 128 | 80 | 19 | 100 m radius | NA | bi-Weekly |
| Spruce Mountain, ME (2012) | 10 | 20 | 78 | 10 | 100 m x 100 m | 7 months | weekly |
| Stateline, OR/WA (2001-2002) | 454 | 299 | 50 | 124 | minimum 126 m x 126 m | 17 months | bi-weekly, monthly |
| Stateline, OR/WA (2003) | 454 | 299 | 50 | 153 | minimum 126 m x 126 m | 1 year | bi-weekly, monthly |
| Stateline, OR/WA (2006) | 454 | 299 | 50 | 39 | variable turbine strings | 1 year | bi-weekly |
| Steel Winds I & II, NY (2012) | 14 | 35 | 80 | 8 (1 was just gravel pad) | 120m x 120m | 6 months | weekly, bi-weekly (November only) |
| Steel Winds I, NY (2007) | 8 | 20 | 80 | 8 | 176m x 176m | 6.5 months | every 10 days (spring, fall)<br>every 21 days (summer) |
| Stetson Mountain I, ME (2009) | 38 | 57 | 80 | 19 | 76-m diameter | 27 weeks (spring, summer, fall) | weekly |
| Stetson Mountain I, ME (2011) | 38 | 57 | 80 | 19 | 79.45x79.45m | 6 months | weekly |
| Stetson Mountain I, ME (2013) | 38 | 57 | 80 | 19 | 76 m diameter | 6 months | weekly |
| Stetson Mountain II, ME (2010) | 17 | 25.5 | 80 | 17 | 74.5x74.5m | 6 months | weekly (3 turbines twice a week) |
| Stetson Mountain II, ME (2012) | 17 | 25.5 | 80 | 17 | laydown area and road up to 60m | 6 months | weekly |
| Summerview, Alb (2005-2006) | 39 | 70.2 | 67 | 39 | 140 m x 140 m | 1 year | weekly, bi-weekly (May to July, September) |
| Summerview, Alb (2006; 2007) | 39 | 70.2 | 65 | 39 | 52-m radius; 2 spiral transects 7 m apart | summer, fall (2 years) | daily (10 turbines), weekly (29 turbines) |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Tehachapi, CA (1996-1998) | 3300 | NA | 14.7 to 57.6 | 201 | 50-m radius | 20 months | quarterly |
| Top Crop I & II (2012-2013) | 200 (68 Phase I, 132 Phase II) | 300 (102 Phase I, 198 Phase II) | 65 (Phase I) 80 (Phase II) | 100 | 61 m radius | 1 year | weekly (spring, summer, and fall) and bi-weekly (winter) |
| Top of Iowa, IA (2003) | 89 | 80 | 71.6 | 26 | 76 m x 76 m | spring, summer, fall | once every 2 to 3 days |
| Top of Iowa, IA (2004) | 89 | 80 | 71.6 | 26 | 76 m x 76 m | spring, summer, fall | once every 2 to 3 days |
| Tuolumne (Windy Point I), WA (2009-2010) | 62 | 136.6 | 80 | 21 | 180 m x 180 m | 1 year | monthly throughout the year, a sub-set of 10 turbines were also searched weekly during the spring, summer, and fall |
| Vansycle, OR (1999) | 38 | 24.9 | 50 | 38 | 126 m x 126 m | 1 year | monthly |
| Vantage, WA (2010-2011) | 60 | 90 | 80 | 30 | 240 m x 240 m | 1 year | monthly, a subset of 10 searched weekly during migration |
| Vasco, CA (2012-2013) | 34 | 78.2 | 80 | 34 | 105 m radius | 1 year | weekly, monthly |
| Wessington Springs, SD (2009) | 34 | 51 | 80 | 20 | 200 m x 200 m | spring, summer, fall | bi-monthly |
| Wessington Springs, SD (2010) | 34 | 51 | 80 | 20 | 200 m x 200 m | 8 months | bi-weekly (spring, summer, fall) |
| White Creek, WA (2007-2011) | 89 | 204.7 | 80 | 89 | 180 m x 180 m & 240 m x 240 m | 4 years | twice a week, weekly and monthly |
| Wild Horse, WA (2007) | 127 | 229 | 67 | 64 | 110 m from two turbines in plot | 1 year | monthly, weekly (fall, spring migration at 16 turbines) |
| Windy Flats, WA (2010-2011) | 114 | 262.2 | 80 | 36 (plus 1 MET tower) | 180 m x 180 m (120m at MET tower) | 1 year | monthly (spring, summer, fall, and winter), weekly (spring and fall migration) |
| Winnebago, IA (2009-2010) | 10 | 20 | 78 | 10 | 200 m x 200 m | 1 year | weekly (migratory), monthly (non-migratory) |
| Wolfe Island, Ont (May-June 2009) | 86 | 197.8 | 80 | 86 | 60-m radius | spring | 43 twice weekly, 43 weekly |

**Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.**

| Project Name | Total # of Turbines | Total MW | Tower Size (m) | Number Turbines Searched | Plot Size | Length of Study | Survey Frequency |
|---|---|---|---|---|---|---|---|
| Wolfe Island, Ont (July-December 2009) | 86 | 197.8 | 80 | 86 | 60-m radius | summer, fall | 43 twice weekly, 43 weekly |
| Wolfe Island, Ont (January-June 2010) | 86 | 197.8 | 80 | 86 | 60-m radius | 6 months | 43 twice weekly, 43 weekly |
| Wolfe Island, Ont (July-December 2010) | 86 | 197.8 | 80 | 86 | 50-m radius | 6 months | 43 twice weekly, 43 weekly |
| Wolfe Island, Ont (January-June 2011) | 86 | 197.8 | 80 | 86 | 50m radius | 6 months | 43 twice weekly, 43 weekly |
| Wolfe Island, Ont (July-December 2011) | 86 | 197.8 | 80 | 86 | 50m radius | 6 months | 43 twice weekly, 43 weekly |
| Wolfe Island, Ont (January-June 2012) | 86 | 197.8 | NA | 86 | 50 m radius | NA | 1/2 searched twice weekly, 1/2 searched weekly |

**Appendix A3 (*continued*). All post-construction monitoring studies, project characteristics, and select study methodology.**

Data from the following sources:

| Project, Location | Reference | Project, Location | Reference |
|---|---|---|---|
| Alite, CA (09-10) | Chatfield et al. 2010 | Marengo I, WA (09-10) | URS Corporation 2010b |
| Alta Wind I, CA (11-12) | Chatfield et al. 2012 | Marengo II, WA (09-10) | URS Corporation 2010c |
| Alta Wind I-V, CA (13-14) | Chatfield et al. 2014 | Mars Hill, ME (07) | Stantec 2008a |
| Alta Wind II-V, CA (11-12) | Chatfield et al. 2012 | Mars Hill, ME (08) | Stantec 2009a |
| Alta VIII, CA (12-13) | Chatfield and Bay 2014 | McBride, Alb (04) | Brown and Hamilton 2004 |
| Barton I & II, IA (10-11) | Derby et al. 2011a | Melancthon, Ont (Phase I; 07) | Stantec Ltd. 2008 |
| Barton Chapel, TX (09-10) | WEST 2011 | Meyersdale, PA (04) | Arnett et al. 2005 |
| Beech Ridge, WV (12) | Tidhar et al. 2013b | Milford I, UT (10-11) | Stantec 2011b |
| Beech Ridge, WV (13) | Young et al. 2014b | Milford I & II, UT (11-12) | Stantec 2012b |
| Big Blue, MN (13) | Fagen Engineering 2014 | Montezuma I, CA (11) | ICF International 2012 |
| Big Blue, MN (14) | Fagen Engineering 2015 | Montezuma I, CA (12) | ICF International 2013 |
| Big Horn, WA (06-07) | Kronner et al. 2008 | Montezuma II, CA (12-13) | Harvey & Associates 2013 |
| Big Smile, OK (12-13) | Derby et al. 2013b | Moraine II, MN (09) | Derby et al. 2010d |
| Biglow Canyon, OR (Phase I; 08) | Jeffrey et al. 2009a | Mount Storm, WV (Fall 08) | Young et al. 2009b |
| Biglow Canyon, OR (Phase I; 09) | Enk et al. 2010 | Mount Storm, WV (09) | Young et al. 2009a, 2010b |
| Biglow Canyon, OR (Phase II; 09-10) | Enk et al. 2011a | Mount Storm, WV (10) | Young et al. 2010a, 2011b |
| Biglow Canyon, OR (Phase II; 10-11) | Enk et al. 2012b | Mount Storm, WV (11) | Young et al. 2011a, 2012b |
| Biglow Canyon, OR (Phase III; 10-11) | Enk et al. 2012a | Mountaineer, WV (03) | Kerns and Kerlinger 2004 |
| Blue Sky Green Field, WI (08; 09) | Gruver et al. 2009 | Mountaineer, WV (04) | Arnett et al. 2005 |
| Buena Vista, CA (08-09) | Insignia Environmental 2009 | Munnsville, NY (08) | Stantec 2009b |
| Buffalo Gap I, TX (06) | Tierney 2007 | Mustang Hills, CA (12-13) | Chatfield and Bay 2014 |
| Buffalo Gap II, TX (07-08) | Tierney 2009 | Nine Canyon, WA (02-03) | Erickson et al. 2003 |
| Buffalo Mountain, TN (00-03) | Nicholson et al. 2005 | Nine Canyon II, WA (04) | Erickson et al. 2005 |
| Buffalo Mountain, TN (05) | Fiedler et al. 2007 | Noble Altona, NY (10) | Jain et al. 2011b |
| Buffalo Ridge, MN (94-95) | Osborn et al. 1996, 2000 | Noble Altona, NY (11) | Kerlinger et al. 2011b |
| Buffalo Ridge, MN (Phase I; 96) | Johnson et al. 2000 | Noble Bliss, NY (08) | Jain et al.2009e |
| Buffalo Ridge, MN (Phase I; 97) | Johnson et al. 2000 | Noble Bliss, NY (09) | Jain et al. 2010a |
| Buffalo Ridge, MN (Phase I; 98) | Johnson et al. 2000 | Noble Bliss/Wethersfield, NY (11) | Kerlinger et al. 2011a |
| Buffalo Ridge, MN (Phase I; 99) | Johnson et al. 2000 | Noble Chateaugay, NY (10) | Jain et al. 2011c |
| Buffalo Ridge, MN (Phase II; 98) | Johnson et al. 2000 | Noble Clinton, NY (08) | Jain et al. 2009c |
| Buffalo Ridge, MN (Phase II; 99) | Johnson et al. 2000 | Noble Clinton, NY (09) | Jain et al. 2010b |
| Buffalo Ridge, MN (Phase II; 01/Lake Benton I) | Johnson et al. 2004 | Noble Ellenburg, NY (08) | Jain et al. 2009b |
| Buffalo Ridge, MN (Phase II; 02/Lake Benton I) | Johnson et al. 2004 | Noble Ellenburg, NY (09) | Jain et al. 2010c |
| Buffalo Ridge, MN (Phase III; 99) | Johnson et al. 2000 | Noble Wethersfield, NY (10) | Jain et al. 2011a |
| Buffalo Ridge, MN (Phase III; 01/Lake Benton II) | Johnson et al. 2004 | NPPD Ainsworth, NE (06) | Derby et al. 2007 |
| Buffalo Ridge, MN (Phase III; 02/Lake Benton II) | Johnson et al. 2004 | Oklahoma Wind Energy Center, OK (04; 05) | Piorkowski and O'Connell 2010 |
| Buffalo Ridge I, SD (09-10) | Derby et al. 2010b | Pacific, CA (12-13) | Sapphos 2014 |
| Buffalo Ridge II, SD (11-12) | Derby et al. 2012a | Palouse Wind, WA (12-13) | Stantec 2013a |
| Casselman, PA (08) | Arnett et al. 2009b | Pebble Springs, OR (09-10) | Gritski and Kronner 2010b |
| Casselman, PA (09) | Arnett et al. 2010 | Pine Tree, CA (09-10, 11) | BioResource Consultants 2012 |
| Casselman Curtailment, PA (08) | Arnett et al. 2009a | Pinnacle, WV (12) | Hein et al. 2013b |
| Castle River, Alb. (01) | Brown and Hamilton 2006a | Pinnacle Operational Mitigation Study (12) | Hein et al. 2013c |
| Castle River, Alb. (02) | Brown and Hamilton 2006a | Pinyon Pines I & II, CA (13-14) | Chatfield and Russo 2014 |
| Cedar Ridge, WI (09) | BHE Environmental 2010 | Pioneer Prairie I, IA (Phase II; 11-12) | Chodachek et al. 2012 |
| Cedar Ridge, WI (10) | BHE Environmental 2011 | Pioneer Prairie II, IA (13) | Chodachek et al. 2014 |
| Cohocton/Dutch Hill, NY (09) | Stantec 2010 | Pioneer Trail, IL (12-13) | ARCADIS 2013 |
| Cohocton/Dutch Hills, NY (10) | Stantec 2011a | Prairie Rose, MN (14) | Chodachek et al. 2015 |
| Combine Hills, OR (Phase I; 04-05) | Young et al. 2006 | PrairieWinds ND1 (Minot), ND (10) | Derby et al. 2011c |
| Combine Hills, OR (11) | Enz et al. 2012 | PrairieWinds ND1 (Minot), ND (11) | Derby et al. 2012c |
| Condon, OR | Fishman Ecological Services 2003 | PrairieWinds SD1 (Crow Lake), SD (11-12) | Derby et al. 2012d |
| Crescent Ridge, IL (05-06) | Kerlinger et al. 2007 | PrairieWinds SD1 (Crow Lake), SD (12-13) | Derby et al. 2013a |
| Criterion, MD (11) | Young et al. 2012a | PrairieWinds SD1 (Crow Lake), SD (13-14) | Derby et al. 2014 |
| Criterion, MD (12) | Young et al. 2013 | Rail Splitter, IL (12-13) | Good et al. 2013b |
| Criterion, MD (13) | Young et al. 2014a | Record Hill, ME (12) | Stantec 2013b |
| Crystal Lake II, IA (09) | Derby et al. 2010a | Record Hill, ME (14) | Stantec 2015 |
| Diablo Winds, CA (05-07) | WEST 2006, 2008 | Red Canyon, TX (06-07) | Miller 2008 |
| Dillon, CA (08-09) | Chatfield et al. 2009 | Red Hills, OK (12-13) | Derby et al. 2013c |
| Dry Lake I, AZ (09-10) | Thompson et al. 2011 | Ripley, Ont (08) | Jacques Whitford 2009 |
| Dry Lake II, AZ (11-12) | Thompson and Bay 2012 | Ripley, Ont (08-09) | Golder Associates 2010 |
| Elkhorn, OR (08) | Jeffrey et a. 2009b | Rollins, ME (12) | Stantec 2013c |
| Elkhorn, OR (10) | Enk et al. 2011b | Roth Rock, MD (11) | Atwell 2012 |
| Elm Creek, MN (09-10) | Derby et al. 2010c | Rugby, ND (10-11) | Derby et al. 2011b |
| Elm Creek II, MN (11-12) | Derby et al. 2012b | San Gorgonio, CA (97-98; 99-00) | Anderson et al. 2005 |
| Erie Shores, Ont. (06) | James 2008 | Searsburg, VT (97) | Kerlinger 2002a |

## Appendix A3 (*continued*). All post-construction monitoring studies, project characteristics, and select study methodology.

Data from the following sources:

| Project, Location | Reference | Project, Location | Reference |
|---|---|---|---|
| Foote Creek Rim, WY (Phase I; 99) | Young et al. 2003a | Sheffield, VT (12) | Martin et al. 2013 |
| Foote Creek Rim, WY (Phase I; 00) | Young et al. 2003a | Sheffield Operational Mitigation Study (12) | Martin et al. 2013 |
| Foote Creek Rim, WY (Phase I; 01-02) | Young et al. 2003a | Shiloh I, CA (06-09) | Kerlinger et al. 2009 |
| Forward Energy Center, WI (08-10) | Grodsky and Drake 2011 | Shiloh II, CA (09-10) | Kerlinger et al. 2010 |
| Fowler I, IN (09) | Johnson et al. 2010a | Shiloh II, CA (10-11) | Kerlinger et al. 2013a |
| Fowler I, II, III, IN (10) | Good et al. 2011 | Shiloh III, CA (12-13) | Kerlinger et al. 2013b |
| Fowler I, II, III, IN (11) | Good et al. 2012 | SMUD Solano, CA (04-05) | Erickson and Sharp 2005 |
| Fowler I, II, III, IN (12) | Good et al. 2013c | Solano III, CA (12-13) | AECOM 2013 |
| Fowler III, IN (09) | Johnson et al. 2010b | Spruce Mountain, ME (12) | Tetra Tech 2013 |
| Goodnoe, WA (09-10) | URS Corporation 2010a | Stateline, OR/WA (01-02) | Erickson et al. 2004 |
| Grand Ridge I, IL (09-10) | Derby et al. 2010g | Stateline, OR/WA (03) | Erickson et al. 2004 |
| Harrow, Ont (10) | Natural Resource Solutions 2011 | Stateline, OR/WA (06) | Erickson et al. 2007 |
| Harvest Wind, WA (10-12) | Downes and Gritski 2012a | Steel Winds I, NY (07) | Grehan 2008 |
| Hay Canyon, OR (09-10) | Gritski and Kronner 2010a | Steel Winds I & II, NY (12) | Stantec 2013d |
| Heritage Garden I, MI (12-14) | Kerlinger et al. 2014 | Stetson Mountain I, ME (09) | Stantec 2009c |
| High Sheldon, NY (10) | Tidhar et al. 2012a | Stetson Mountain I, ME (11) | Normandeau Associates 2011 |
| High Sheldon, NY (11) | Tidhar et al. 2012b | Stetson Mountain I, ME (13) | Stantec 2014 |
| High Winds, CA (03-04) | Kerlinger et al. 2006 | Stetson Mountain II, ME (10) | Normandeau Associates 2010 |
| High Winds, CA (04-05) | Kerlinger et al. 2006 | Stetson Mountain II, ME (12) | Stantec 2013e |
| Hopkins Ridge, WA (06) | Young et al. 2007 | Summerview, Alb (05-06) | Brown and Hamilton 2006b |
| Hopkins Ridge, WA (08) | Young et al. 2009c | Summerview, Alb (06; 07) | Baerwald 2008 |
| Jersey Atlantic, NJ (08) | NJAS 2008a, 2008b, 2009 | Tehachapi, CA (96-98) | Anderson et al. 2004 |
| Judith Gap, MT (06-07) | TRC 2008 | Top Crop I & II, IL (12-13) | Good et al. 2013a |
| Judith Gap, MT (09) | Poulton and Erickson 2010 | Top of Iowa, IA (03) | Jain 2005 |
| Kewaunee County, WI (99-01) | Howe et al. 2002 | Top of Iowa, IA (04) | Jain 2005 |
| Kibby, ME (11) | Stantec 2012a | Tuolumne (Windy Point I), WA (09-10) | Enz and Bay 2010 |
| Kittitas Valley, WA (11-12) | Stantec Consulting 2012 | Vansycle, OR (99) | Erickson et al. 2000 |
| Klondike, OR (02-03) | Johnson et al. 2003 | Vantage, WA (10-11) | Ventus Environmental Solutions 2012 |
| Klondike II, OR (05-06) | NWC and WEST 2007 | Vasco, CA (12-13) | Brown et al. 2013 |
| Klondike III (Phase I), OR (07-09) | Gritski et al. 2010 | Wessington Springs, SD (09) | Derby et al. 2010f |
| Klondike IIIa (Phase II), OR (08-10) | Gritski et al. 2011 | Wessington Springs, SD (10) | Derby et al. 2011d |
| Lakefield Wind, MN (12) | MPUC 2012 | White Creek, WA (07-11) | Downes and Gritski 2012b |
| Leaning Juniper, OR (06-08) | Gritski et al. 2008 | Wild Horse, WA (07) | Erickson et al. 2008 |
| Lempster, NH (09) | Tidhar et al. 2010 | Windy Flats, WA (10-11) | Enz et al. 2011 |
| Lempster, NH (10) | Tidhar et al. 2011 | Winnebago, IA (09-10) | Derby et al. 2010e |
| Linden Ranch, WA (10-11) | Enz and Bay 2011 | Wolfe Island, Ont (May-June 09) | Stantec Ltd. 2010a |
| Locust Ridge, PA (Phase II; 09) | Arnett et al. 2011 | Wolfe Island, Ont (July-December 09) | Stantec Ltd. 2010b |
| Locust Ridge, PA (Phase II; 10) | Arnett et al. 2011 | Wolfe Island, Ont (January-June 10) | Stantec Ltd. 2011a |
| Madison, NY (01-02) | Kerlinger 2002b | Wolfe Island, Ont (July-December 10) | Stantec Ltd. 2011b |
| Maple Ridge, NY (06) | Jain et al. 2007 | Wolfe Island, Ont (January-June 11) | Stantec Ltd. 2011c |
| Maple Ridge, NY (07) | Jain et al. 2009a | Wolfe Island, Ont (July-December 11) | Stantec Ltd. 2012 |
| Maple Ridge, NY (07-08) | Jain et al. 2009d | Wolfe Island, Ont (January-June 12) | Stantec Ltd. 2014 |
| Maple Ridge, NY (12) | Tidhar et al. 2013a | | |