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February 28, 2023

By E-Mail and First-Class Mail

Ms. Holly Anderson, Clerk
Vermont Public Utility Commission
112 State Street, Drawer 20
Montpelier, VT 05620-2701

Re: Docket No. 7250 – Deerfield Wind Project
Submission of Final Report Under Bird and Bat Post-Construction Monitoring Plan

Dear Ms. Anderson,

On November 18, 2022, Deerfield Wind, LLC ("Deerfield Wind") filed with the Commission a status update on several compliance issues, including the Bird and Bat Post-Construction Monitoring Plan. The final year of survey work was completed in October of 2022, and a final report is attached.

Deerfield Wind thanks the Commission in advance for its consideration of the above information. Please let us know if you have any questions or require further information.

Sincerely,

Andrew N. Raubvogel, Esq.
SRH Law PLLC

Encl.

cc: Amy Parsons, Avangrid Renewables
Service list (via email)

Post-Construction Monitoring Report Year 3, Deerfield Wind Project

Bennington County, Vermont

January 26, 2023

Prepared for:

Deerfield Wind, LLC

A subsidiary of
Avangrid Renewables, LLC.
2701 NW Vaughn Street, Suite 300
Portland, OR 97210

Prepared by:

Stantec Consulting Services Inc.
30 Park Drive
Topsham, ME 04086

Report Citation

Stantec Consulting Services Inc. (Stantec). 2022. Post-Construction Monitoring Report Year 3, Deerfield Wind Project. Stantec Consulting Services Inc., Topsham, Maine, USA. 34 pages + front matter and appendices.

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Executive Summary

The Deerfield Wind Project (Project) is a 15-turbine 30-megawatt (MW) facility located in Searsburg and Readsboro, Bennington County, Vermont. The Project is owned by Deerfield Wind, LLC (Deerfield Wind), a subsidiary of Avangrid Renewables. The Project consists of 8 Gamesa G97 turbines with 97-meter rotor diameters, and 7 Gamesa G87 turbines with 87-meter rotor diameters. The Project became operational in late 2017. Per conditions outlined in the Special Use Permit issued by the United States Forest Service (USFS) and the Certificate of Public Good from the Vermont Public Service Board, a Post-Construction Monitoring Plan (PCMP) dated September 2017 was developed in consultation with and approved by the Vermont Agency of Natural Resources (VANR) and Green Mountain National Forest (GMNF). Per methods outlined in the PCMP, Stantec Consulting Services Inc. (Stantec) conducted post-construction bird and bat fatality surveys during Year 1 (2018), Year 3 (2020), and Year 5 (2022) following the operational start of the Project. In addition, the Project implemented operational control measures from June 1 to September 30 of each year in accordance with the Threatened and Endangered Species Taking Permit issued to the Project by VANR in 2018, the USFS Record of Decision (ROD) dated January 2012, and the PCMP. This report covers the methods and results of the third and final year (Year 5 of operation) of post-construction monitoring surveys at the Project in 2022. Survey results from 2018 and 2020 monitoring are provided under separate reports dated February 28, 2019 and February 27, 2021.

Stantec conducted standardized fatality searches from April 15 to October 13, 2022. Weather and site maintenance activities permitting, all 15 turbines were searched approximately once every three days. During the 2022 surveys, 943 turbine searches were completed. Eight bat carcasses were found; species groups included two migratory tree-roosting species and one cave-dwelling species. All bat carcasses were documented during standardized searches. Seventeen bird carcasses were found; species groups included 13 passerines and one woodpecker species. Three of the 17 bird carcasses were found incidentally either outside of a search plot or outside of the scheduled turbine search day.

There were no federally or state-listed endangered or threatened bird species found during 2022 surveys. One bird species of Vermont Greatest Conservation Need was found—black-throated blue warbler (*Setophaga caerulescen*; n = 1)—which is listed as medium priority in Vermont. There were no federally or state-listed endangered or threatened bat species found during 2022 surveys. All bats identified are species of Vermont Greatest Conservation Need: silver-haired bat (*Lasionycteris noctivagans*; n = 6, 75%), hoary bat (*Lasiurus cinereus*; n = 1, 12.5%), and big brown bat (*Eptesicus fuscus*; n = 1, 12.5%).

Fatality data, searcher efficiency trial data, and carcass persistence data were used to estimate bat and bird fatality rates (with and without a correction factor for area searched) using the Huso fatality estimator. Searcher efficiency for bats and birds was 65% and 42%, respectively, and carcass persistence for bats and birds was 8.19 days and 7.76 days, respectively. Based on the Huso Estimator, estimates of bat and bird fatality were 1.01 bats and 3.51 birds per turbine per study period (with area corrections). Estimates of bat and bird fatality by rated power were 0.53 bats and 1.77 birds per MW per study period (with area corrections).

The estimates of bat and bird fatality at the Project in 2022 were at the low end of the range of other standardized post-construction wind energy studies in the Northeast (0.18 to 63.90 bats/turbine/period

and 0.56 to 27.40 birds/turbine/period). The 2022 bat fatality estimate at Deerfield (1.01 bats/turbine/period) is lower than at other Vermont sites such as Georgia Mountain Community Wind (Georgia), Kingdom Community Wind (Kingdom), and Sheffield Wind Facility (Sheffield), which ranged from 1.94 to 14.65 bats/turbine/period. The 2022 bird fatality estimate at Deerfield (3.51 birds/turbine/period) is at the low end of the range of estimates at Georgia, Kingdom, and Sheffield, which ranged from 2.13 to 13.17 birds/turbine/period.

Bat fatality rates at the Project in 2022 are lower compared to those reported for the Northeast region (median = 3.99 bats/MW/period) and nationally (median = 3.01 bats/MW/period) (AWWI 2020a). Bird fatality rates at the Project in 2022 are slightly higher compared to the Northern Forest region, which includes New England and portions of the upper Midwest (median = 1.43 birds/MW/period) and nationally (median = 1.26 birds/MW/period) (AWWI 2020b).

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Deerfield Wind Project (Project) is a 15-turbine 30-megawatt (MW) facility located in Searsburg and Readsboro, Bennington County, Vermont (Figure 1-1). The Project was issued a Certificate of Public Good by the Vermont Public Service Board in 2009 and a Record of Decision (ROD) by the United States Forest Service (USFS) in 2012. The January 2012 ROD (USDA 2012) approved a Special Use Permit for construction of the Project in the Green Mountain National Forest (GMNF). The Project is operated by Deerfield Wind, LLC (Deerfield Wind), a subsidiary of Avangrid Renewables, LLC. The Project consists of 8 Gamesa G97 turbines with 97-meter (m) rotor diameters, and 7 Gamesa G87 turbines with 87-m rotor diameters. The Project became operational in late 2017.

The maximum rotor-swept height of the turbines is 126.5 m (415 feet [ft]), with a rotor diameter of 97 m (318 ft) and a hub height of 78 m (256 ft). Seven of the 15 turbines are lit with a single L-864 aviation red-colored synchronized flashing light mounted on top of the nacelle, which is activated by a radar-activated Federal Aviation Administration (FAA) lighting Aircraft Detection Lighting System (ADLS). Other light sources at the Project are located at the substation, which was designed with downward facing lights, sloped covers, and motion-detector activation. The use of the ADLS and motion-control substation lighting significantly decreases the amount of lighting at night at the Project.

The Project is split between two ridges: eight turbines are located on the west ridge (Gamesa G97 turbines), and seven turbines are located on the east ridge (Gamesa G87 turbines). The east ridge, located approximately 1.5 miles southeast of the west ridge, is shared with the existing 12-turbine 6-MW Searsburg Wind Energy Facility. Elevations of turbines range from 837 to 882 m (2,746 to 2,894 ft) on the west ridge and from 887 to 945 m (2,910 to 3,100 ft) on the east ridge. The west ridge is predominantly hardwood forest with American beech (*Fagus grandifolia*), red maple (*Acer rubrum*), and sugar maple (*Acer saccharum*), and the east ridge is predominantly coniferous forest dominated by spruce (*Picea* sp.). Each ridge contains one access road, with turbines located less than 50 m (164 ft) to over 100 m (328 ft) from the road. Driveways to individual turbines consist of crushed rock.

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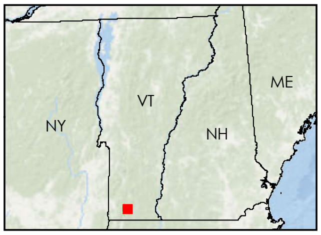

Legend

- Turbine Location
- Edge of Gravel/Collector

0 0.5 Miles

1:31,680 (at original document size of 8.5x11)

Stantec

Project Location 195601468
Searsburg, Vermont
Prepared by GC on 2019-01-03
Reviewed by LJ on 2019-01-04

Client/Project
Avangrid Renewables, LLC
Deerfield Wind Project
Post-Construction Monitoring

Figure No.
1-1

Title
Project Location Map

Notes
1. Coordinate System: NAD 1983 UTM Zone 18N
2. Orthoimagery: NAIP 2016

1.2 POST-CONSTRUCTION WILDLIFE MONITORING BACKGROUND AND OBJECTIVES

The *Deerfield Wind Project Post-Construction Monitoring Plan: Birds and Bats* (PCMP; Stantec 2017) was developed in consultation with and approved by the Vermont Agency of Natural Resources (VANR) and GMNF. The PCMP incorporates recommendations provided by the GMNF in *Recommendations for the Bird and Bat Post-Construction Monitoring Plan Deerfield Wind Project Green Mountain National Forest*, dated August 9, 2013, and additional review and comments provided by the GMNF and VANR between 2013 and 2017. The PCMP also incorporates recommendations from the most current VANR Fish and Wildlife Department Bat-Wind Guidelines (VANR 2016).

This report summarizes the methods and results of the third and final year of post-construction monitoring surveys at the Project. The first and second years of surveys were conducted in 2018 and 2020. Consistent with 2018 and 2020 monitoring, the objectives of 2022 monitoring were to:

- Estimate annual fatality of birds and bats at the Project;
- Investigate if there are project design characteristics (e.g., east versus west ridge), habitat or landscape features, weather conditions, or other factors that may increase risk of collision of birds and/or bats;
- Evaluate the effectiveness of operational control measures by comparing fatality at the Project to other projects in the region and investigating if and when bat fatalities were documented during the curtailment period; and
- If necessary, evaluate the effectiveness of adaptive management strategies, and modify adaptive management strategies if found to be ineffective at reducing fatalities.

2.0 METHODS

2.1 FATALITY SEARCHES

Surveys occurred between April 15 and October 13, 2022. Monitoring covered the following wildlife activity periods:

- Spring and fall migration when nocturnal migrant passerines are found to be most at risk of collision, as well as the summer breeding period. Monitoring covered breeding and migration periods of bird species of conservation concern in the region, including Bicknell's thrush (*Catharus bicknelli*).
- Spring and fall migration periods of migratory raptors, as well as the summer breeding period of local raptors
- Spring dispersal, summer breeding, and late-summer and fall swarming period for bats

Stantec conducted turbine searches at all 15 turbines approximately once every 3 days. If a scheduled search could not be conducted due to weather, turbine maintenance, or construction activities, it was visited later that day or the next day, as feasible.

Search areas included the same 120-m by 120-m (394-ft by 394-ft) plots (60 m [197 ft] distance from the towers) as 2018 and 2020 surveys. Areas that were unsafe for surveyors (e.g., steep slopes, hazardous walking conditions) and areas with dense vegetation (e.g., forest, thick and tall brush) were not searched. Search areas at the Project are consistent with those at other ridgeline wind facilities in New England since the landscape generally consists of densely forested areas and the search plots contain minimal cleared area. Transects spaced 6 m (20 ft) in width were established within search plots, oriented north-to-south and perpendicular to the dominant wind direction (west-to-east). Transects were numbered and marked with flagging on rocks or trees for easy navigation and consistency of search area. Upon initial site visit and plot boundary mapping in 2018, Stantec determined that the searchable areas cleared of forest were variable and occasionally limited in size; therefore, a search radius out to a maximum of 120 m on adjacent access roads was included where possible to maximize the amount of searchable area. Upon initial site visit in 2022, Stantec refreshed turbine transect markings that had been established in 2018 and 2020, including search areas surrounding turbines and portions of access roads searched in 2018 and 2020. Search plot areas are provided in Table 3-1 and Appendix C.

Surveyors were trained by a Stantec project manager and field lead experienced in conducting and managing post-construction monitoring surveys. Searches began approximately one hour after sunrise and continued until mid-afternoon. Search order on each turbine string varied during each search day so that any one turbine would not be searched during the same time during consecutive search days. During searches, the surveyors walked slowly (at a rate of approximately 10 to 20 m/minute) along each transect, searching up to 3 m (10 ft) on both sides for bird and bat fatalities. Any fatality found along or between transects was documented. All intact bird or bat carcasses or remnants of scavenged carcasses (a cluster of feathers representing more than a molt, or a patch of skin and bone) were documented as fatalities. Carcasses found outside of standardized search times, or outside defined search areas, were considered incidental.

In addition to standard turbine plot searches, surveyors also searched driveways extending from the access road to each turbine. The driveway searches were an extension of turbine plots and were conducted using the same methods as the turbine plot searches. Carcasses found on turbine driveways were documented and treated the same as those found on the turbine plots.

For each carcass found, multiple distinguishing photographs were taken, and the following information was recorded on standardized data forms using the Survey123 app on iPads:

- Turbine number
- Carcass distance from turbine (determined with a laser range finder)
- Carcass azimuth from turbine (compass reading)
- Date
- Surveyor

- Time discovered
- Ground conditions (vegetation type and height, wet, dry, etc.)
- Species identification (including age and sex when possible)
- Carcass position
- Stage of decomposition of the carcass (fatality estimated to occur on previous night, in the last 2 to 3 days, 4 to 7 days, 7 to 14 days, or greater than 2 weeks)
- Evidence of scavenger activity
- Additional notes as necessary

Each bat carcass was collected in an individual re-sealable plastic bag marked with a unique carcass identification number and stored in a freezer at the Project Operations and Maintenance (O&M) building. Due to concerns regarding avian influenza, bird carcasses were buried on site and not collected. Stantec's post-construction field lead or project manager (both experienced wildlife biologists) confirmed identification of carcasses collected by surveyors through photographs.

Weather information such as sky conditions and precipitation were recorded prior to each turbine search. On nights prior to scheduled searches, the surveyors recorded weather conditions including sky conditions, percent cloud cover, and moon phase from a nearby location. Operations data and weather including wind speed (m per second [m/s]) and temperature (degrees Celsius [°C]), were obtained from archived weather data from stations on turbine nacelles at the Project for the survey period.

2.2 VEGETATION MAPPING

Ground cover types within plots were characterized by visibility class as designated in Table 2-1, and the dominant visibility class was recorded during each turbine search. Any significant changes in ground cover type were noted throughout the survey period (e.g., reclamation, mowing). The aerial extent of each cover type within search plots was mapped using a global positioning system unit once during the 2022 survey period to account for vegetation growth.

Table 2-1. Ground Cover Visibility Class Descriptions (Based on PGC 2007, as described in Arnett et al. 2010), Deerfield Wind, 2022.

Visibility Class	% Vegetative Cover	Vegetation Height
1 (easy)	≥ 90% bare ground	≤ 6 inches
2 (moderate)	≥ 25% bare ground	≤ 6 inches
3 (difficult)	≤ 25% bare ground	≤ 25% of cover > 12 inches
4 (very difficult)	< 5% bare ground	> 25% of cover > 12 inches

2.3 SEARCHER EFFICIENCY TRIALS

Searcher efficiency trials were conducted to quantify the percent of carcasses observed by searchers during standardized surveys. The study targeted the placement of 50 bird carcasses and 50 bat carcasses throughout the survey period. The same individual trial carcasses were re-used in multiple trials over the course of the survey period until they became too decomposed. Due to the limited number of fatalities found onsite, brown mice and 4- to 5-week-old domestic quail obtained from a feed supply lab were used as surrogates for bats and birds.

The trial coordinator placed carcasses at search turbines prior to surveys on the day of scheduled searches. Surveyors being tested were unaware of trial dates and locations, and the trial coordinator tried to leave no evidence of trial set-up (e.g., vehicle or footprints in wet grass or mud). Carcasses were marked discreetly so they could be identified as trials upon inspection and were placed in search plots at arbitrary distances and azimuths from turbines and distributed among representative visibility classes. The trial coordinator recorded the following information for each carcass placed:

- Date, time of set-up, and surveyor being tested
- Turbine number
- Species identification
- Carcass distance and direction from tower
- Vegetation type and visibility class where carcass was placed

Trial carcasses found by the surveyors were documented, and the trial coordinator was notified. After all scheduled turbine searches were completed, the trial coordinator picked up any carcasses not found by the surveyors and determined the number of carcasses recovered during the trial or if any carcasses had been scavenged during the trial.

2.4 CARCASS PERSISTENCE TRIALS

Carcass persistence trials were conducted to determine the percent of carcasses that remained visible (i.e., not removed by scavengers or weather) between search intervals. The study targeted the placement of 50 bird carcasses and 50 bat carcasses throughout the survey period, in good disposition. Due to the limited number of fatalities found onsite, brown mice and 4- to 5-week-old domestic quail obtained from a feed supply lab were used as surrogates for bats and birds.

Trial carcasses were randomly placed at multiple turbines throughout the study area and were checked daily for 14 days. On each trial day, surveyors indicated whether the trial carcass was present (intact, or partially scavenged but readily detectable) or absent (completely removed, or with so few feathers or tissue that it would not be readily detectable). The following additional information was recorded on standardized datasheets for each trial carcass:

- Date, time of set-up, trial coordinator
- Turbine number

- Species identification
- Carcass distance and direction from tower
- Ground cover type and vegetation height where carcass was placed
- Detailed notes describing any scavenging, evidence of scavenger identification, and stage of decomposition

2.5 OPERATIONAL CONTROL

Per the ROD and State Takings Permit conditions, operational control measures were implemented for 122 nights from June 1 to September 30, 2022. The Supervisory Control and Data Acquisition (SCADA) system was programmed to incorporate curtailment treatments into nightly operation. Treatments were implemented from one half hour before sunset to sunrise during periods when ambient air temperature was greater than 10°C and wind speeds were equal to or less than 6 m/s. Curtailment was achieved by switching all the turbines into a “pause mode” to prevent normal turbine operations, when blades would rotate at a rate less than or equal to 1 revolution per minute (RPM). Once criteria for one of the weather conditions (i.e., temperature or wind speed) stopped being met for a total of 10 consecutive minutes, the turbines returned to normal operations.

2.6 STATISTICAL ANALYSIS

2.6.1 Temporal Distribution

Seasonal timing of bat and bird fatalities were summarized in tabular and graphical format.

2.6.2 Spatial Distribution

The range of distances that birds and bats were found from the towers, the average distances birds and bats were found from towers, and the dispersion of fatalities at turbines on east versus west ridges were summarized. The distances and azimuths of carcasses from towers were plotted on a scatterplot diagram within 10-m concentric distance increments. A ridge profile figure showing the elevations and numbers of fatalities at each turbine was also prepared.

2.6.3 Weather Conditions and Fatality Events

The weather conditions for nights when collisions were believed to have occurred (i.e., for nights prior to discovery of fresh carcasses) were summarized, including:

- Nightly mean wind speed (m/s)[1];
- Nightly mean temperature (ºC)[2];

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[1] Data were downloaded from weather stations on the nacelles of turbines in the Project area.
[2] Data were downloaded from weather stations on the nacelles of turbines in the Project area.

- Moon phase[3]; and
- Sky conditions (precipitation events)[4].

The average nightly wind speed and temperature were also plotted for each night when fatalities were believed to have occurred.

2.6.4 Operational Control and Fatality Events

The following summaries were prepared to address survey objectives specified in the PCMP:

- Timing of bat fatalities during the curtailment period (June 1 to September 30, 2022)
- Effectiveness of operational control measures, which was evaluated by comparing fatality at the Project to other projects in the region

2.6.5 Bat and Bird Fatality Estimates

Bat and bird fatality estimates were determined using the Huso estimator software (Huso 2010). Detailed methods and a description of the software are described in Appendix A.

3.0 RESULTS

3.1 SURVEY EFFORT AND SEARCH PLOT VISIBILITY

Stantec conducted 943 (98%) of 960 scheduled turbine searches from April 15 to October 13, 2022. Searches that were missed during this timeframe due to turbine maintenance, weather conditions, or other factors, were generally made up later during the search day, or during the next search day, as feasible.

Visibility class, project attributes (FAA lighting and elevation) and size of searchable areas within plots are described in Table 3-1. The average visibility class within search plots ranged from 1 (easy) to 3 (difficult) throughout the survey period. The majority of search areas consisted of grass and included portions of areas with bare cover and large rocks. Appendix C Figures 1 through 15 show the search plot boundaries and ground cover at each turbine.

[3] Data were downloaded from www.timeanddate.com/moon/phases/.
[4] Data were recorded nights prior to searches by observers at a location proximal to the Project.

Table 3-1. Description of Search Turbines, Deerfield Wind Project, 2022.

Turbine No.[1]	FAA Lighting	Primary Visibility Class[2]	Elevation (m)	Search Area (m^2)	Search Area Ground Cover Description
E1	Y	1, 2	919	2,860	68% grass/weeds, 32% pad/gravel/road
E2	N	1, 2	887	3,095	60% grass/weeds, 30% pad/gravel/road, 10% large rock
E3	N	1, 2, 3	906	3,508	33% grass/weeds, 33% grass/shrub, 26% pad/gravel/road, 8% large rock
E4	Y	1, 2	914	3,385	75% grass/weeds, 25% pad/gravel/road
E5	N	1, 2	945	4,286	68% grass/weeds, 27% pad/gravel/road, 6% large rock
E6	N	1, 2, 3	940	10,529	64% grass/weeds, 16% grass/shrub, 20% pad/gravel/road
E7	Y	1, 2, 3	930	3,210	63% grass/weeds, 25% pad/gravel/road, 12% shrub
W1	Y	1, 2	839	4,925	52% grass/weeds, 36% pad/gravel/road, 12% large rock
W2	Y	1, 2, 3	837	3,445	68% grass/weeds, 32% pad/gravel/road/bare ground
W3	N	1, 2	846	4,373	62% grass/weeds, 38% pad/gravel/road
W4	N	1, 2, 3	877	4,741	73% grass/weeds, 27% pad/gravel/road
W5	Y	1, 3	850	5,900	67% grass/weeds, 33% pad/gravel/road
W6	N	1, 3	845	4,083	68% grass/weeds, 32% pad/gravel/road
W7	N	1, 2, 3	879	2,723	79% grass/weeds, 21% pad/gravel/road
W8	Y	1, 2, 3	882	3,023	62% grass/weeds, 25% pad/gravel/road, 13% large rock

[1] E = east ridge; W = west ridge.

[2] Ground cover visibility class descriptions based on PGC 2007, as described in Arnett et al. 2010.

3.2 BIRD AND BAT FATALITIES

Seventeen bird carcasses comprising 14 species were documented, three of which were found incidentally either outside of a search plot or outside of the scheduled turbine search day. Species included 13 passerines and one woodpecker species. Red-eyed vireo (*Vireo olivaceus*) and unidentified passerine were the species most commonly documented (n = 2 each; 12% each) (Table 3-2; Appendix B Table 1).

Eight bat carcasses comprising three species were documented, all during standardized searches. Silver-haired bat (*Lasionycteris noctivagans*) was the most commonly documented species (n = 6; 75%), followed by hoary bat (*Lasiurus cinereus*; n = 1, 12.5%), and big brown bat (*Eptesicus fuscus*; n = 1, 12.5%) (Table 3-2; Appendix B Table 2).

Table 3-2. Total Number and Species Composition of Bird and Bat Carcasses Discovered at Deerfield Wind Project, 2022.

Species		Number of Carcasses	Percent of Carcasses
Birds			
black-and-white warbler	*Mniotilta varia*	1	5.9%
black-throated blue warbler	*Setophaga caerulescens*	1	5.9%
blue-headed vireo	*Vireo solitarius*	1	5.9%
brown creeper	*Certhia americana*	1	5.9%
magnolia warbler	*Setophaga magnolia*	1	5.9%
northern parula	*Setophaga americana*	1	5.9%
pine warbler	*Setophaga pinus*	1	5.9%
red-eyed vireo	*Vireo olivaceus*	2	11.8%
ruby-crowned kinglet	*Regulus calendula*	1	5.9%
scarlet tanager	*Piranga olivacea*	1	5.9%
warbling vireo	*Vireo gilvus*	1	5.9%
white-throated sparrow	*Zonotrichia albicollis*	1	5.9%
winter wren	*Troglodytes hiemalis*	1	5.9%
yellow-bellied sapsucker	*Sphyrapicus varius*	1	5.9%
unidentified passerine[1]	*Passeriformes (fam, gen, sp.)*	2	11.8%
Total Birds		**17**	**100.0%**
Bats			
hoary bat	*Lasiurus cinereus*	1	12.5%
silver-haired bat	*Lasionycteris noctivagans*	6	75.0%
big brown bat	*Eptesicus fuscus*	1	12.5%
Total Bats		**8**	**100.0%**

[1]Highly decomposed partial carcasses consisting of only bones and some feathers

There were no federally or state-listed endangered or threatened bird species documented (VFWD 2015a). One bird species of Vermont Greatest Conservation Need was documented—black-throated blue warbler (*Setophaga caerulescen;* n = 1)—which is listed as medium priority in Vermont (VFWD 2015b).

There were no federally or state-listed endangered or threatened bat species documented (VFWD 2015a). All bat species documented are species of Vermont Greatest Conservation Need. Hoary bat and silver-haired bat are listed as species of high priority in Vermont, and big brown bat is listed as a species of medium priority in Vermont (VFWD 2015b).

Based on carcass condition, 47% of birds found (n = 8) and 63% of bats found (n = 5) were estimated to have died the night prior to discovery (Table 3-3).

Table 3-3. Summary of Estimated Time of Death for Bird and Bat Carcasses Found at Deerfield Wind Project, 2022.

Species Type	Estimated Time of Death	Number of Carcasses	Percent of Carcasses
Birds	last night	8	47%
	2-3 days	4	24%
	4-7 days	1	6%
	7-14 days	2	12%
	unknown	2	12%
Bats	last night	5	63%
	2-3 days	1	13%
	4-7 days	2	25%
	7-14 days	0	0%
	unknown	0	0%

3.3 SEASONAL TIMING OF FATALITIES

The majority of birds were documented during the month of May (n = 7, 41%), followed by October (n = 4, 24%), which is consistent with the timing of seasonal migration. The majority of bats were found in May, August, and October (n = 2 each month; 25% each month) (Figure 3-1; Appendix B Tables 1 and 2).

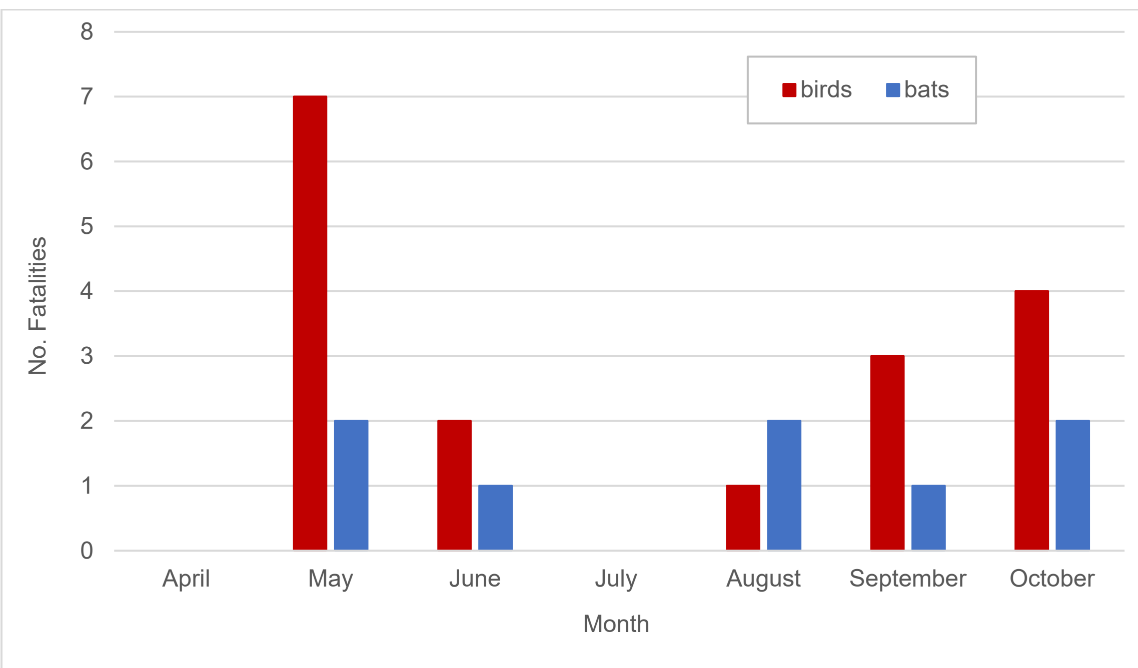
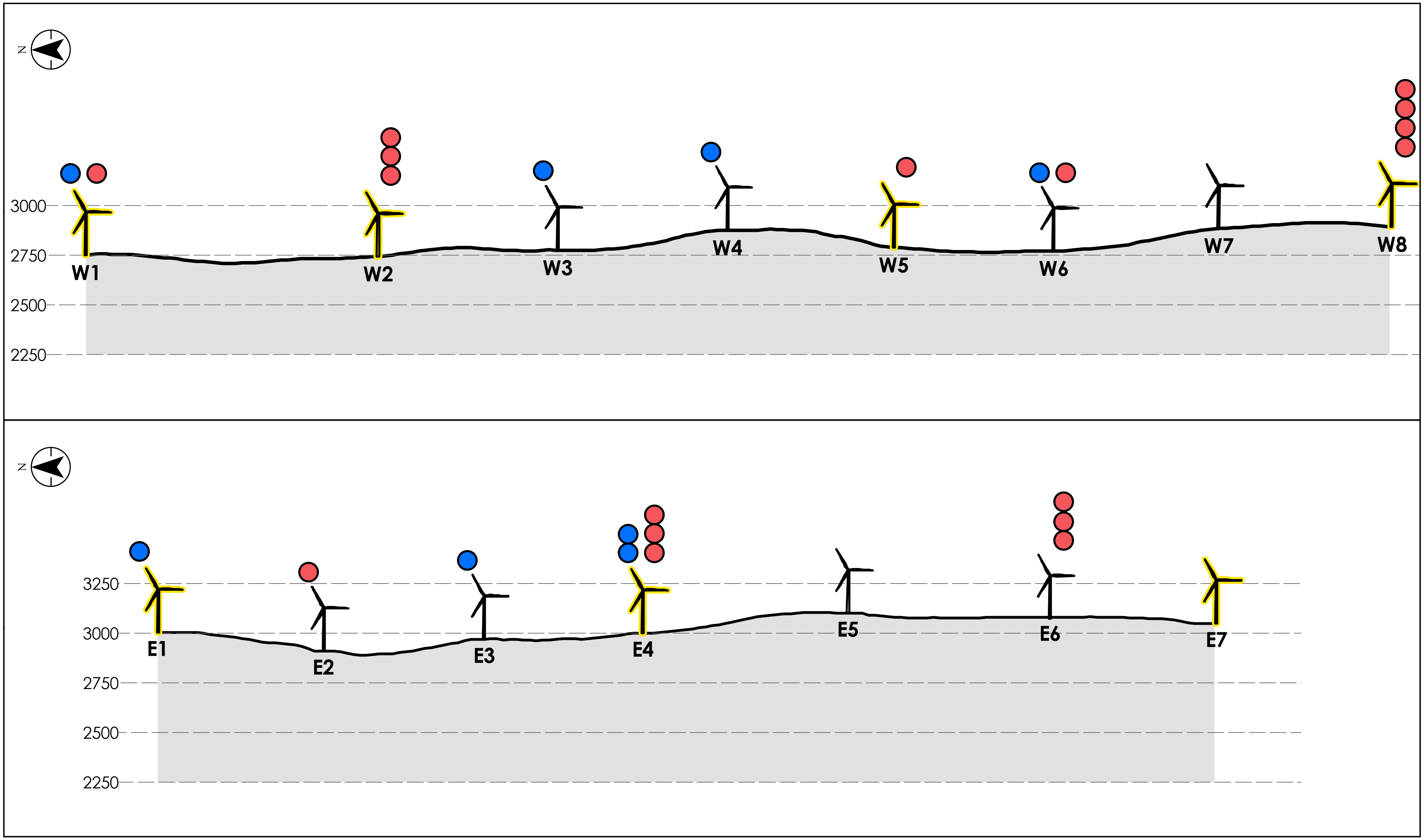


Figure 3-1. Seasonal Timing of Bird and Bat Fatalities, Deerfield Wind Project, 2022

3.4 SPATIAL DISTRIBUTION OF FATALITIES

The number of bird carcasses found at individual turbines ranged from 0 birds (Turbines E1, E3, E5, E7, W3, W4, and W7) to 4 birds (Turbine W8). Bat carcasses found at individual turbines ranged from 0 bats (Turbines E2, E5, E6, E7, W2, W5, W7, and W8) to 2 bats (Turbine E4) (Figure 3-2). Fifty-nine percent of bird carcasses (n = 10) were documented on the west ridge, and 41% of bird carcasses (n = 7) were documented on the east ridge. The number of bat fatalities was split evenly between the east and west ridges. Seventy-one percent of bird carcasses (n = 12) and 50% of bat carcasses (n = 4) were found at FAA lit turbines (Figure 3-2).

Figure 3-3 shows the locations of birds and bats found within search plots at 10-m distance increments from tower bases. Bird and bat fatalities were found in all 4 quadrants of the search plots. The birds located 85 m (279 ft) and 115 m (377 ft) from the turbine base were found outside of the search plot on an access road on a non-search day and were reported as incidental finds (Figure 3-3).



0 750 Feet

Horizontal and Vertical Scale
1:9,000 (At original document size of 8.5x11)

Notes
1. Digital elevation profile derived from USGS NED 1/3 arc-second digital elevation model.

Stantec

Legend
- 1 Bat Carcass
- 1 Bird Carcass
- Turbine Profile
- FAA Lit Turbine

Project Location
Town of Searsburg and Readsboro, Vermont

195601468
Prepared by HT on 2022-11-21
Review by LJ on 2022-11-00

Client/Project
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
3-2

Title
Ridgeline Profile and Distribution of Fatalities

V:\1956\active\195601468\03_data\gis_cad\gis\MXDs\PCM\2022\01468_3-1_ProfileFatalities2022.mxd Revised: 2022-11-21 By: hturner

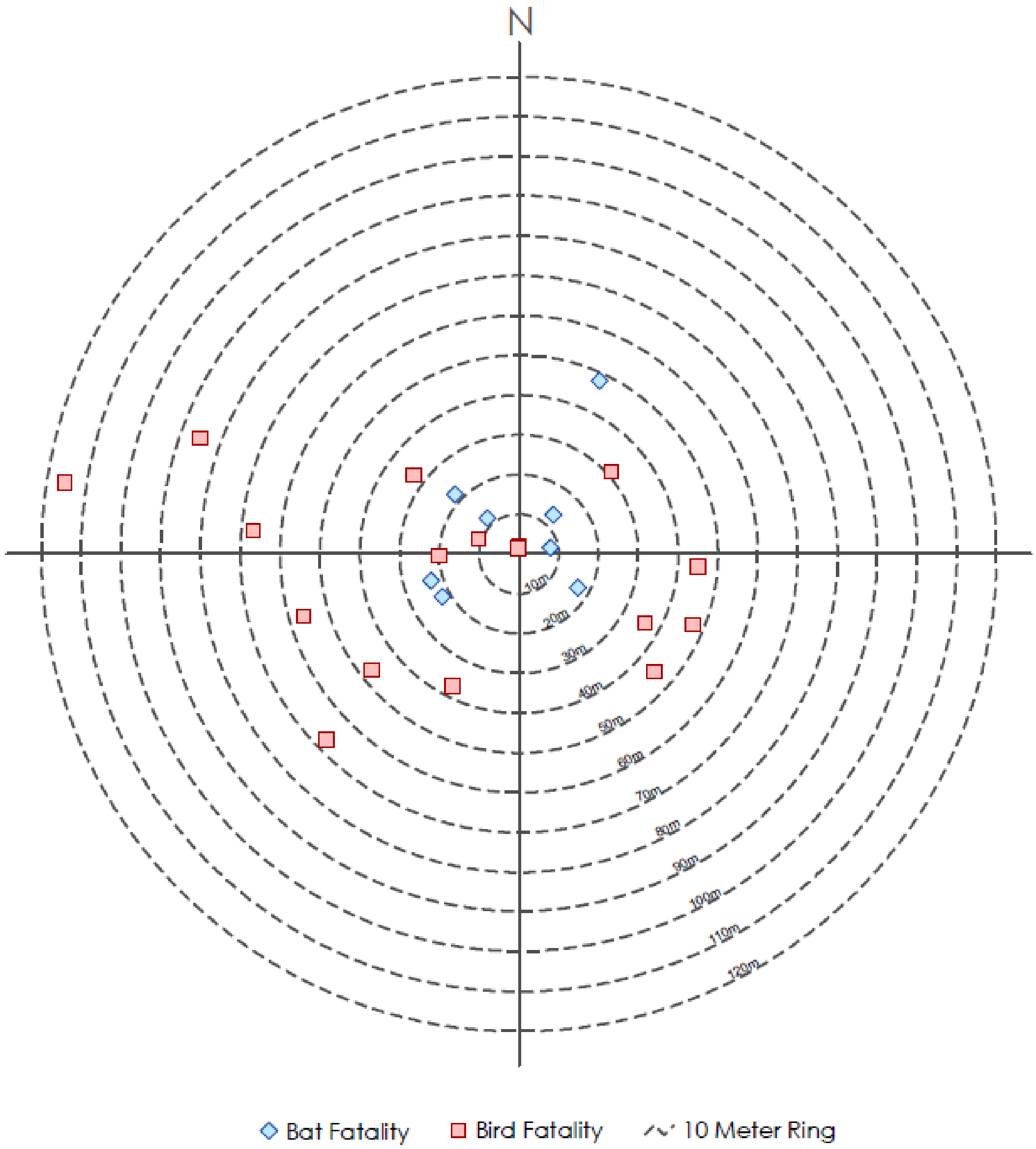


Figure 3-3. Distribution of Bats and Birds Found at All Turbines Combined at the Deerfield Wind Project, 2022. (Turbine plots consisted of 120 m by 120 m plots [60-m radius], and a 120 m radius on adjacent access roads and/or driveways).

3.5 CARCASS DISTANCES FROM TOWERS

The distance birds were found from turbine bases ranged from 1.5 to 115 m (5 to 377 ft); the average distance birds were found from turbine bases was 43.9 m (144 ft). The distances that bat carcasses were found from turbine bases ranged from 8 to 48 m (26 to 157 ft); the average distance bat carcasses were found from turbine bases was 20.6 m (68 ft). Figure 3-4 shows the distribution of bird and bat carcasses found within 10-m distance increments from turbine bases. Forty-seven percent of bird carcasses (n = 8) and 88% of bat carcasses (n = 7) were discovered 40 m (131 ft) or less from turbines.

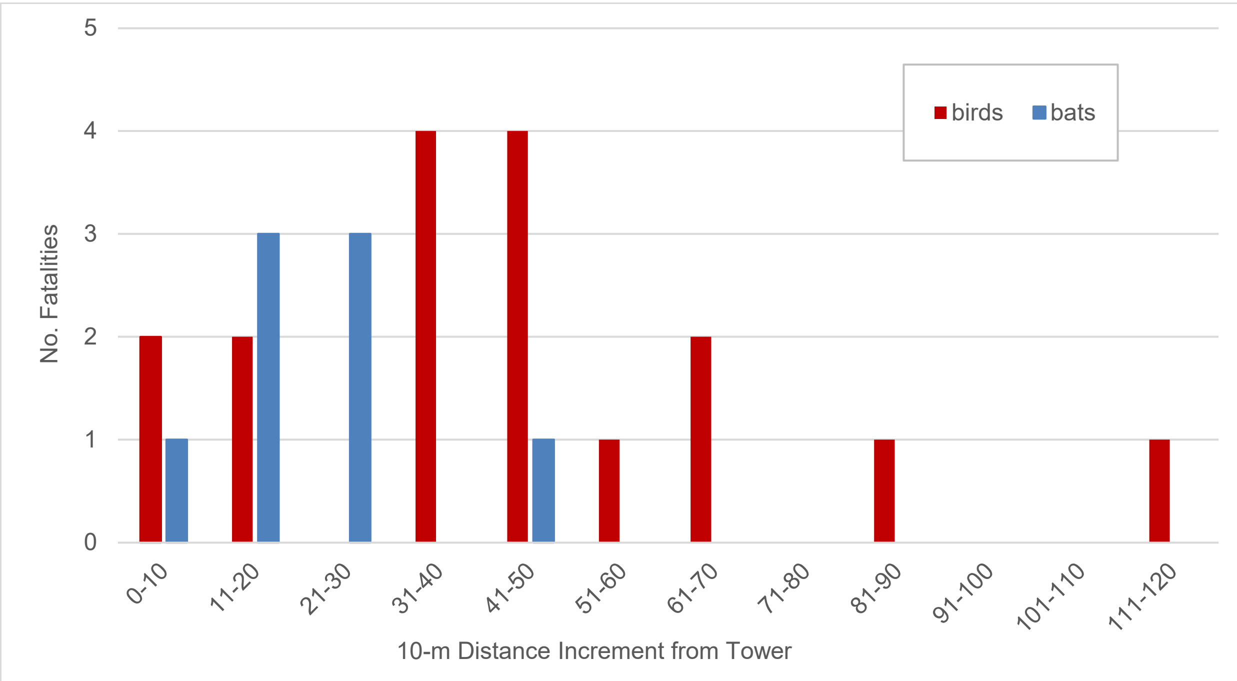


Figure 3-4. Distribution of Bird and Bat Carcasses Found in 10-m Distance Increments from Towers, Deerfield Wind Project, 2022.

3.6 WEATHER CONDITIONS AND FATALITY EVENTS

There were four days for which bird fatalities were found fresh, indicating that fatality may have occurred the previous night. The mean nightly wind speed for these previous nights ranged from 6.9 to 13.7 m/s and the mean nightly temperature for these previous nights ranged from 4.1 to 7.8°C. Moon phase was variable among these nights, and sky conditions ranged from clear to mostly cloudy (Table 3-4). The remaining bird carcasses were estimated to have died two days or more prior to discovery, thus nightly weather analysis was not done for these carcasses.

There were five days for which bat fatalities were found fresh, indicating that fatality may have occurred the previous night. The mean nightly wind speed for these previous nights ranged from 4.4 to 11.4 m/s and the mean nightly temperature for these previous nights ranged from 4.1 to 23.0ºC. Moon phase was variable among these nights, and sky conditions ranged from mostly clear to overcast, with low cloud cover occurring during two nights (Table 3-4). The remaining bat carcasses were estimated to have died two days or more prior to discovery, thus nightly weather analysis was not done for these carcasses. Figure 3-5 shows the suspected night of bird and bat fatality at the Project with average nightly weather conditions during the study period.

Table 3-4. Date of Suspected Mortality and Weather Conditions for Birds and Bats found in Excellent Condition, Deerfield Wind Project, 2022.

Date Found	Suspected Date of Collision	No. Bats and/or Birds	Nightly Mean Wind Speed (m/s)[1]	Nightly Mean Temperature (°C)[1]	Moon Phase[2]	Sky Conditions / Precipitation[3]
Birds						
5/18/2022	5/17/2022	1 bird	13.7	5.6	waning gibbous	mostly cloudy
9/29/2022	9/28/2022	3 birds	6.9	7.8	waxing crescent	clear
10/3/2022	10/2/2022	2 birds [4]	10.2	4.1	first quarter	mostly cloudy
10/4/2022	10/3/2022	2 birds	11.0	5.3	waxing gibbous	mostly clear
Bats						
5/3/2022	5/2/2022	1 bat	4.4	4.3	waxing crescent	mostly clear
5/6/2022	5/5/2022	1 bat	4.5	9.5	waxing crescent	overcast, low cloud cover
8/9/2022	8/8/2022	1 bat	11.4	23.0	waxing gibbous	overcast, low cloud cover
10/3/2022	10/2/2022	1 bat	10.2	4.1	first quarter	mostly cloudy
10/7/2022	10/6/2022	1 bat	6.7	15.4	waxing gibbous	mostly cloudy

[1] Data were downloaded from weather stations on nacelles of turbine towers.

[2] Data were downloaded from www.timeanddate.com/moon/phases/.

[3] Data were recorded nights prior to searches by observers at a location proximal to the Project.

[4] Incidental carcasses, found outside search plot on road near turbine.

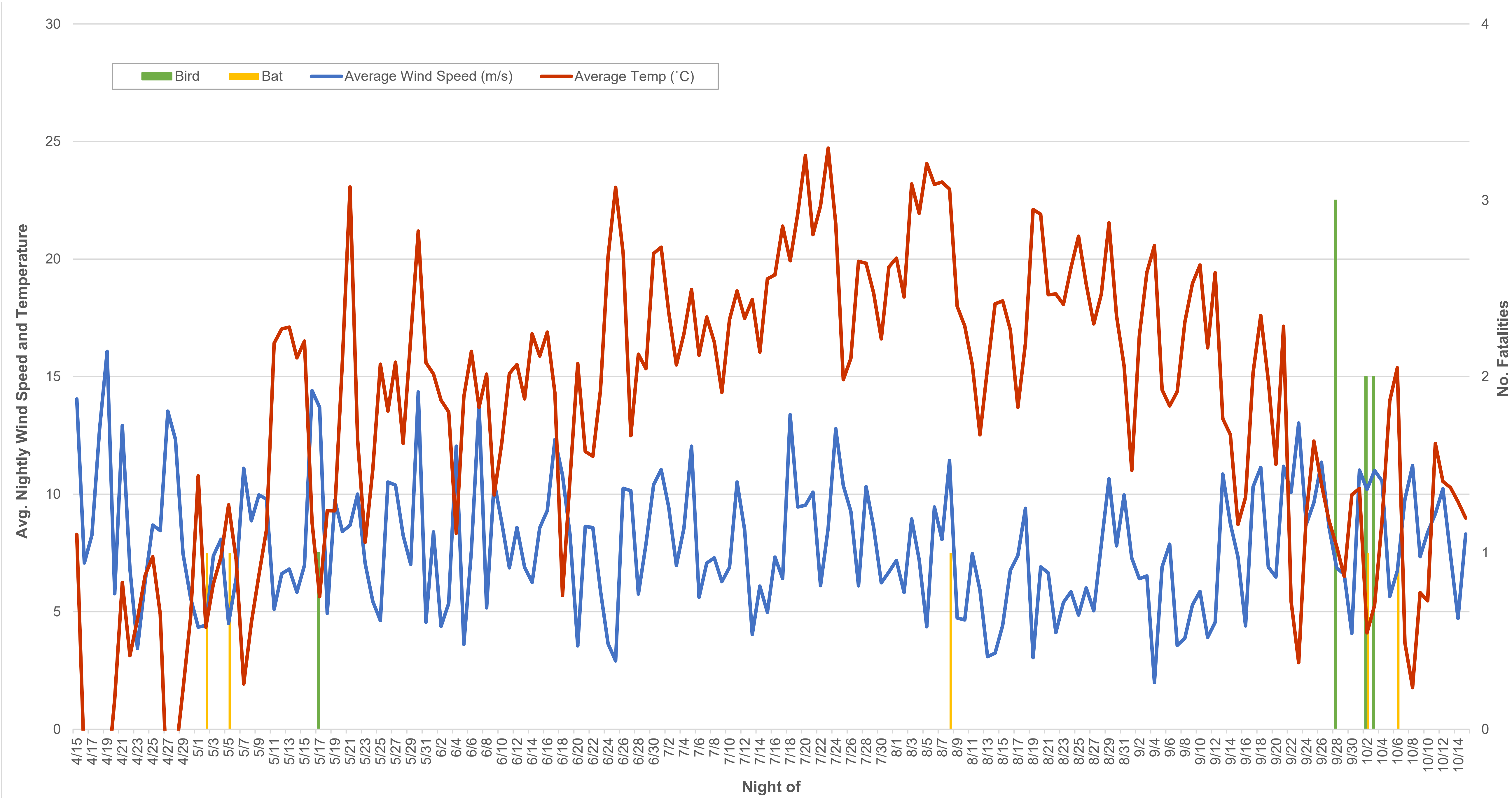


Figure 3-5. Timing and Number of Bird and Bat Carcasses Found in Relation to Average Nightly Wind Speed and Air Temperature, Deerfield Wind Project, 2022.

3.7 OPERATIONAL CONTROL AND FATALITY

Turbines at the Project were curtailed from 30 minutes prior to sunset to sunrise from June 1 to September 30, 2022, at temperatures above 10°C and wind speeds equal to or below 6 m/s. This meets the requirements set by the PCMP, the ROD, and State Permit. Operational control is a well-documented and effective method for reducing bat fatalities at wind facilities (Baerwald et al. 2009; Arnett et al. 2011, 2013; Martin et al. 2013; Arnett and Baerwald 2013; Hein et al. 2013), and curtailment was implemented to meet the purpose of reducing bat fatalities. In addition, the Project documented bat fatality rates on the lower end of the range at other Northeastern projects that had varying or no curtailment strategies (see Appendix B Table 3).

3.8 ESTIMATES OF FATALITY

3.8.1 Searcher Efficiency Results

Searcher efficiency trials were conducted throughout the study period and were conducted on the following dates:

- 5/18/2022
- 6/23/2022
- 6/24/2022
- 8/5/2022
- 8/25/2022
- 8/26/2022
- 9/26/2022

Fifty-three bats or surrogate brown mice were placed for all searcher efficiency trials combined; however, 52 remained available for the trials, as one was scavenged prior to searches (Table 3-5). The mean searcher efficiency rate for trial bats was 65%, which is within the range of 42% to 91% found at other New England projects (Stantec 2009; Curry and Kerlinger 2013).

Table 3-5. Searcher Efficiency Rate (SE) for Trial Bats, 95% Confidence Intervals, Deerfield Wind Project, 2022.

Number trial bats placed[1]	52
Number trial bats found	34
Mean SE	0.65
Lower SE	0.52
Upper SE	0.77

[1] Total does not include 1 trial carcass that was scavenged prior to turbine searches.

Fifty-three birds, all surrogate quails, were placed for all searcher efficiency trials combined; however, 50 remained available for the trials, as three were scavenged prior to searches (Table 3-6). The mean searcher efficiency rate for trial birds was 42%, which is within the range of 38% to 69% found at other New England projects (Stantec 2009; TetraTech 2013).

Table 3-6. Searcher Efficiency Rate (SE) for Trial Birds, 95% Confidence Intervals, Deerfield Wind Project, 2022.

Number trial birds placed[1]	50
Number trial birds found	21
Mean SE	0.42
Lower SE	0.28
Upper SE	0.56

[1] Total does not include 3 trial carcasses that were scavenged prior to turbine searches.

3.8.2 Carcass Persistence Results

Carcass persistence trials were conducted throughout the study period and were initiated on the following dates:

- 6/1/2022
- 7/18/2022
- 9/14/2022
- 9/29/2022

There were 50 bat carcasses (all surrogate mice) placed for all carcass persistence trials combined. Based on Huso estimate outputs, the mean number of days trial bat carcasses persisted was 8.19 days (Table 3-7), which was beyond the 3-day search interval, confirming the search interval was sufficient.

Table 3-7. Bat Carcass Persistence (CP) Estimates, 95% Confidence Intervals, Deerfield Wind Project, 2022.

Number trial bats placed	50
Mean number of days CP	8.19
Lower number of days CP	5.27
Upper number of days CP	14.36
CP rate[1]	0.87
CP lower	0.81
CP upper	0.93

[1] Percent of carcasses persisting for the 3-day search interval

There were 50 bird carcasses (all quail surrogates) placed for all carcass persistence trials combined. Based on Huso estimate outputs, the mean number of days trial bird carcasses persisted was 7.76 days (Table 3-8), which was beyond the 3-day search interval, confirming the search interval was sufficient.

Table 3-8. Bird Carcass Persistence (CP) Estimates, 95% Confidence Intervals, Deerfield Wind Project, 2022.

Number trial birds placed	50
Mean number of days CP	7.76
Lower number of days CP	5.89
Upper number of days CP	11.08
CP rate[1]	0.94
CP lower	0.91
CP upper	0.97

[1] Percent of carcasses persisting for the 3-day search interval

3.8.3 Search Area Corrections

The proportion of carcasses found per 10-m distance bin and the DWP values factored into fatality estimates are available in Table 3-9 and Table 3-10, respectively.

Table 3-9. Number Found and Proportion of Bird and Bat Carcasses per 10-meter Annuli for all Turbines Combined (includes birds and bat carcasses found during standard searches only), Deerfield Wind Project, 2022.

Distance Bin	No. Bats Found	Proportion All Bats per Bin	Distance Bin	No. Birds Found	Proportion All Birds per Bin
0-10	1	0.125	0-10	2	0.143
11-20	3	0.375	11-20	2	0.143
21-30	3	0.375	21-30	0	0.000
31-40	0	0.000	31-40	4	0.286
41-50	1	0.125	41-50	4	0.286
51-60	0	0.000	51-60	0	0.000
61-70	0	0.000	61-70	2	0.143
Total	**8**		**Total**	**14**	

Table 3-10. Density-Weighted Proportion Area Searched Value for Birds and Bats, Deerfield Wind Project, 2022.

Turbine No.	DWP Value	
	Bats	Birds
E1	0.621	0.369
E2	0.602	0.388
E3	0.717	0.426
E4	0.641	0.396
E5	0.758	0.498
E6	0.991	0.860
E7	0.731	0.386
W1	0.796	0.516
W2	0.748	0.404
W3	0.761	0.469
W4	0.818	0.497
W5	0.736	0.440
W6	0.713	0.438
W7	0.588	0.349
W8	0.600	0.389

3.8.4 Fatality Estimates

Estimates for bat and bird fatality were generated with and without area corrections using the Huso estimator (Table 3-11).

Table 3-11. Huso Estimates of Bat and Bird Fatality, With and Without Area Corrections, Deerfield Wind Project, 2022.

Result	Bats Without Area Corrections	Birds Without Area Corrections
Number carcasses found	6	9
Adjusted fatality/turbine/study period	**0.71**	**1.52**
95% CI lower	0.58	0.88
95% CI upper	0.92	2.59
Adjusted fatality/study period	**11**	**23**
95% CI lower	9	14
95% CI upper	14	39
Adjusted fatality/MW/study period	**0.37**	**0.77**
Result	**Bats With Area Corrections**	**Birds With Area Corrections**
Number carcasses found	6	9
Adjusted fatality/turbine/study period	**1.01**	**3.51**
95% CI lower	0.82	1.82
95% CI upper	1.31	6.07
Adjusted fatality/study period	**16**	**53**
95% CI lower	13	28
95% CI upper	20	92
Adjusted fatality/MW/study period	**0.53**	**1.77**

[1]The number of carcasses included in the Huso model was different than the total found because incidentals were not included and Huso also recommends not including those carcasses believed to have died during a previous search interval.

4.0 DISCUSSION

4.1 BIRD AND BAT FATALITY

4.1.1 Birds

Most bird fatalities documented at the Project in 2022 were passerine species (n = 16, 94%). Nocturnal migrant passerines represent bird carcasses most commonly found at operational wind projects (Erickson et al. 2005; NRC 2007; NWCC 2010); this group is one of the most diverse and abundant bird groups in the world. Other standardized post-construction monitoring studies at wind energy projects in the Northeast region, which include New England and Mid-Atlantic states, have documented passerines as the most common bird group found during monitoring (Stantec 2011, 2014; Normandeau Associates 2010, 2011). Standardized post-construction monitoring studies at three other wind energy facilities in Vermont (Georgia Mountain Community Wind [Georgia], Kingdom Community Wind [Kingdom], and

Sheffield Wind [Sheffield]), and 2018 and 2020 post-construction monitoring at the Project have all documented passerines as the most common bird group found during standardized post-construction monitoring studies (Stantec 2013a,b, 2015a,b, 2019, 2021; Martin et al. 2013, 2014). This group of birds is susceptible to collisions with manmade structures during nocturnal migration in spring and fall, particularly during inclement weather conditions when birds may be flying at lower heights and may become disoriented by sources of artificial light (Erickson et al. 2005).

The loss of 3.51 birds/turbine/period, or 53 birds/period at Project turbines, is small considering the regional populations of the species of birds that were found at the Project, according to the Partners in Flight Land-based Bird Population Estimates Database[5]. Combined among all three survey years, red-eyed vireo, bay-breasted warbler (*Setophaga castanea*), black-throated blue warbler, black-throated green warbler (*Setophaga virens*), magnolia warbler (*Setophaga magnolia*), ovenbird (*Seiurus aurocapilla*), and yellow-bellied sapsucker (*Sphyrapicus varius*) were the species most commonly documented (n = 26, 41%). The Partners in Flight Land-based Bird Population Estimates Database estimates that the North American populations of these species ranges from 2.4 million (black-throated blue warbler) to 130 million (red-eyed vireo) (PIF 2020). Further, impacts associated with wind power remain relatively low compared to other sources of human-induced fatality, including collisions with other manmade structures, destruction of habitat, exposure to chemicals, and predation by domestic and feral cats (Loss et al. 2012). Population-level effects have not been attributed to collision mortality at wind projects (Loss et al. 2013; Erickson et al. 2014).

There were no federally or state-listed endangered or threatened bird species documented during 2022 surveys (VFWD 2015a). One bird species of Vermont Greatest Conservation Need was documented—black-throated blue warbler (n = 1)—which is listed as medium priority in Vermont (VFWD 2015b).

4.1.2 Bats

Bat fatalities found at the Project in 2022 consisted of two migratory tree-roosting bat species (hoary bat and silver-haired bat), and one cave-dwelling bat species (big brown bat). The migratory tree-roosting bat species group is most commonly found during standardized post-construction monitoring studies at wind energy facilities in North America, including the Northeast region (Kunz et al. 2007; Arnett et al. 2008; Baerwald et al. 2009; Taucher et al. 2012; Arnett and Baerwald 2013; West 2014). The 2022 Project fatality estimate for bats (1.01 bats/turbine/period) is on the low end of the range of bat fatalities reported at other recent wind projects in the Northeast (Appendix B Table 3; Appendix B Figure 1).

There were no federally or state-listed endangered or threatened bat species found during 2022 surveys (VFWD 2015a). All bat species found are species of Vermont Greatest Conservation Need. Hoary bat and silver-haired bat are listed as species of high priority in Vermont, and big brown bat is listed as a species of medium priority (VFWD 2015b).

[5] Available at http://pif.birdconservancy.org/

4.2 FATALITY TIMING

4.2.1 Birds

During the 2022 study period, 53% of bird fatalities occurred during the spring migration period of May through early June, and 42% of bird fatalities occurred during the fall migration period of September through October. No bird fatalities were discovered in April or July, and only one was discovered in August. These results are typical compared to the timing of bird fatalities found at other wind projects in the region (Normandeau Associates 2010, 2011; Stantec 2011, 2014; Tidhar et al. 2010, 2011), at the Project in 2018 and 2020 (Stantec 2019, 2021), and at other similar projects in Vermont (Stantec 2013a,b, 2015a,b, 2016, 2019; Martin et al 2013, 2014).

4.2.2 Bats

Bat fatality at the Project in 2022 peaked in May, August, and October (n = 2 each month; 25% each month); no carcasses were found during April or July. These results are consistent with available information that suggests that the majority of bat fatalities in the region occur in the late-summer and fall (Erickson et al. 2002; Johnson 2005; Arnett et al. 2008; Taucher et al. 2012; Arnett and Baerwald 2013). These results are also consistent with the timing of bats found at the Project in 2018 and 2020, and at Georgia, Kingdom, and Sheffield in Vermont (Stantec 2013a,b, 2015a,b, 2016, 2019, 2021; Martin et al. 2013, 2014).

4.3 SPATIAL DISTRIBUTION OF CARCASSES

Available studies suggest that the majority of carcasses are expected to fall within search plots, even within the restricted size of search plots of turbines on forested ridgelines (Fiedler et al. 2007). Other examples include the Meyersdale project in Pennsylvania where Kerns and Kerlinger (2004) reported that the majority of bird and bat fatalities were found within approximately 30 m of the turbine bases, and Kerns et al. (2005) reported that greater than 80% of bat fatalities were found within 40 m of turbines at Meyersdale and Mountaineer, WV. The mean distances carcasses were found from turbines at the Project in 2022 was 43.9 m for birds and 20.6 m for bats. The mean distances carcasses were found from turbines at the Project in 2018 was 40.2 m for birds and 30.3 m for bats and in 2020 was 20 m for birds and 15.8 m for bats (Stantec 2019, 2021). The mean distances carcasses were found from turbines at Georgia and Kingdom in 2013 and 2014 ranged from 22.3 m to 29.6 m (Stantec 2013a,b, 2015a,b). These trends and the carcass distance distributions observed at the Project suggest that few carcasses may have landed beyond 60 m from turbines.

Fifty-nine percent of bird fatalities (n = 10) were found on the west ridge of the Project compared to 41% of bird fatalities (n = 7) on the east ridge. Bat fatalities were evenly distributed between both ridges. These results are fairly consistent with 2018 and 2020 surveys at the Project, where 77% of birds (n = 20) and 80% of bats (n = 8) were found on the west ridge in 2018, and 64% percent of birds (n = 11) and 63% of bats (n = 17) were found on the west ridge in 2020 (Stantec 2019, 2021). Elevations of turbines on the west ridge are lower than those on the east ridge (2,745–2,895 ft on the west ridge compared to 2,911–3,100 ft on the east ridge). The west ridge is predominantly hardwood forest with American beech, red maple, and sugar maple, and the east ridge is predominantly coniferous forest dominated by spruce. However; due to the low sample size of fatalities found and the small number of turbines on each ridge, it cannot be statistically determined whether ridgeline characteristics influenced fatality at the Project.

4.4 WEATHER CONDITIONS AND FATALITY EVENTS

Bat fatalities are observed to be positively correlated with temperature and negatively correlated with wind speed (Fiedler 2004; Reynolds 2006). Among all three survey years, most bat fatalities at the Project (n = 19; 42%) were observed in August, when average temperatures were relatively high, and most nights when bat fatalities were suspected to occur (i.e., nights prior to the discovery of fresh bat carcasses) were characterized by average nightly wind speeds of less than 6 m/s (n = 9; 53%). Avian collision risk is greater during periods of inclement weather (e.g., fog or mist) (Kerlinger et al. 2010). In 2018, 63% of nights prior to finding fresh bird carcasses were characterized by rain, thunderstorms, or snow for a portion of the night, and in 2020, the night prior to the discovery of 11 fresh bird carcasses was characterized by overcast skies, low clouds, and fog. Nightly weather prior to bird fatalities in 2022 was variable, with skies ranging from clear to mostly cloudy. However, any observable trends in the relationship of bat and bird fatalities to weather events at the Project should be interpreted with caution due to the low sample size of fresh fatalities.

4.5 BIRD AND BAT FATALITY ESTIMATES

Use of the Huso estimator was specified in the PCMP and was chosen because it is one of the more recent methods that has been vetted by accredited statisticians, and it has been used for 2018 and 2020 surveys at the Project, and at all operational wind facilities in Vermont to-date.

The Huso (2010) and Huso et al. (2012) estimator model is subject to less bias when searcher efficiency and carcass removal rates remain constant over time. However, when these rates vary over time, the estimator, like most other available estimators, results in greater bias. Huso (2010) indicates that for sites with short persistence times (< 4.2 days) and short search intervals (1–7 days), the estimator tends to overestimate fatality. There were relatively long carcass persistence intervals at the Project in 2022 (7.76 days for birds and 8.19 days for bats), though because the search interval was relatively short (approximately 3 days), fatality estimates may be overestimated by the Huso estimator.

Similar to other studies in the region, estimates for bird and bat fatality were generated with and without DWP area corrections (Stantec 2013a,b, 2014). Fatality estimates without area corrections are lower because they don't account for carcasses present in portions of the plots that were not searched. Though fatality estimates with area corrections are considered more accurate due to per-turbine DWP adjustments, fatality estimates without area corrections are also provided to compare to older post-construction fatality studies in the region that used estimators that at the time did not include area corrections.

4.5.1 Regional Comparison of Fatality Estimates

Direct comparisons of fatality estimates among sites should be made with caution due to variable methods and survey objectives: studies from the eastern US used a variety of fatality estimators; search plot size at different projects was variable (i.e., studies in relatively flat agricultural areas vs. studies on forested ridge tops); operational control was implemented during some of the regional surveys; and, some studies included search area corrections, while others did not (Appendix B Table 3). All of these studies, however, included adjustments for searcher efficiency and carcass persistence.

Searcher efficiency rates at the Project in 2022 (65% for bats and 42% for birds) were slightly higher than those at other Vermont sites, which ranged from 41% to 49% (pooled for birds and bats combined). Carcass persistence rates (7.76 days for birds 8.19 days for bats) were slightly lower than those at other Vermont sites, which ranged from 8.45 days to 43.00 days (pooled for birds and bats combined) (Stantec 2013a,b, 2015a,b, 2019).

Bat fatality rates at the Project in 2022 were lower than the median reported for the Northeast region in the American Wind and Wildlife (AWWI) database (6.78 bats/turbine/period [3.99 bats/MW/period]) and the median reported nationally (5.98 bats/turbine/period [3.01 bats/MW/period]) (AWWI 2020a). Bird fatality rates at the Project in 2022 were slightly higher that the median reported for the Northern Forest region cited in the AWWI database, which includes New England and portions of the upper Midwest (2.35 birds/turbine/period [1.43 birds/MW/period]), and the median reported nationally (2.18 birds/turbine/period [1.26 birds/MW/period]) (AWWI 2020b).

When comparing the Project bat fatality estimate (with search area corrections) to recent estimates from other projects in the eastern US, the estimate of bat fatality (1.01 bats/turbine/period) is at the very low end of the range of these other studies (0.18 to 63.90 bats/turbine/period) and is below the median estimate (5.67 bats/turbine/period) of these other studies. The 2022 bat fatality estimate at Deerfield is lower than estimates at Georgia, Kingdom, and Sheffield, which ranged from 1.94 to 14.65 bats/turbine/period (Appendix B Table 3; Appendix B Figure 1).

When comparing the Project bird fatality estimate (with search area corrections) to recent estimates from other projects in the eastern US, the estimate of bird fatality (3.51 birds/turbine/year) is at the low end of the range of these other studies (0.56 to 27.40 birds/turbine/period) and is below the median estimate (4.03 birds/turbine/period) of these other studies. The 2022 bird fatality estimate at Deerfield is at the low end of the range of estimates at Georgia, Kingdom, and Sheffield, which ranged from 2.13 to 13.17 birds/turbine/period (Appendix B Table 3; Appendix B Figure 1).

4.6 THREE YEAR STUDY COMPARISON

Standardized post-construction fatality monitoring at the Project in 2022 followed the same survey methods as in 2018 and 2020, though 2020 surveys were delayed due to the COVID-19 pandemic. As outlined in the PCMP, all 15 turbines were searched every 3 days, and carcass persistence and searcher efficiency trials occurred throughout all three survey years. Surveys in 2022 included the same plot boundaries as in 2018 and 2020, though most of the ground cover classified as bare ground in 2018 was re-classified as grass in 2020 and 2022.

Species composition was similar between the three survey years, as bird fatalities consisted primarily of passerine species and bat fatalities consisted primarily of tree-roosting species. No federally or state-listed bird species and no federally listed bat species were documented during the three survey years. One state-endangered bat species, little brown bat (*Myotis lucifugus*; n = 1) was documented in 2020.

The bird fatality rate in 2022 was 3.51 birds/turbine/period, which was in the middle of the range among survey years (0.56 birds/turbine/period in 2020 and 8.01 birds/turbine/period in 2018). The bat fatality rate was lowest in 2022 (1.01 bats/turbine/period) compared to 2018 (1.47 bats/turbine/period) and 2020 (2.53 bats/turbine/period) (Table 4-1).

The searcher efficiency rate for birds in 2022 (42%) was lower compared to 2018 (58%) and 2020 (54%), while the searcher efficiency rate for bats was similar among all survey years, ranging from 60–70% (Table 4-1). The carcass persistence rate for birds in 2022 (7.76 days) fell between the range of rates in 2018 and 2020 (5.27 days in 2020 and 10.03 days in 2018). The carcass persistence rate for bats in 2022 (8.19 days) was similar to 2018 (8.41 days) and both rates were approximately twice as low as in 2020 (16.78 days) (Table 4-1). More quail and mouse surrogates were used in 2018 and 2022 due to the limited number of carcasses available during those years, which may partially account for the differences between years. Native species are presumed to provide more realistic carcass persistence data (DeVault et al. 2017).

Table 4-1. 2018, 2020, and 2022 Survey Results, Deerfield Wind Project

	2018	2020	2022
survey period	4/15-10/15	5/8-10/15	4/15-10/13
no. searches	993	837	943
no. bird fatalities	26 (0 incidental)	21 (12 incidental)	17 (3 incidental)
no. bat fatalities	10 (0 incidental)	27 (0 incidental)	8 (0 incidental)
bird SE	0.58	0.54	0.42
bat SE	0.6	0.7	0.65
bird CP	10.03	5.27	7.76
bat CP	8.41	16.78	8.19
birds/turbine/period (birds/MW/period)	8.01 (4.03)	0.56 (0.30)	3.51 (1.77)
bats/turbine/period (bats/MW/period)	1.47 (0.77)	2.53 (1.27)	1.01 (0.53)

4.7 OPERATIONAL CONTROL

Operational control is a well-documented and effective method for reducing bat fatalities at wind facilities: multiple research projects have documented the effectiveness of altering turbine cut-in speed to reduce bat fatalities (Baerwald et al. 2009; Arnett et al. 2011, 2013; Martin et al. 2013; Arnett and Baerwald 2013; Hein et al. 2013). Although studies have varied in design, such as type of treatment (e.g., assigned cut-in speed), number of treatments, treatment duration, and methods of conducting fatality searches, available studies have reported a reduction in bat fatalities (~22 to 93%) when raising turbine cut-in speed and feathering below cut-in (Arnett et al. 2011, 2013; Baerwald et al. 2009).

The Project implemented the most stringent operational curtailment program in Vermont, and accordingly had three of the lowest overall bat fatality rates in 2018, 2020, and 2022 (1.47 bats/turbine/period, 2.53 bats/turbine/period, and 1.01 bats/turbine/period, respectively) among Vermont projects. Georgia, which had estimated bat fatality rates of 11.7 bats/turbine/period in 2013 and 2.29 bats/turbine/period in 2014, implemented a regime that was shorter in duration and at a lower wind speed, specifically July 1 to September 30 when temperatures reached 9.4ºC (49ºF) and when wind speeds were less than 5 m/s (Stantec 2013b, 2015b). Kingdom and Sheffield implemented curtailment regimes with turbines randomly assigned to two different cut-in speeds to test the effectiveness. At Kingdom, which had estimated bat fatality rates of 1.94 bats/turbine/period in 2013 and 4.96 bats/turbine/period in 2014, 10 turbines were set to a 5 m/s cut-in speed, and 11 turbines were set to a 6 m/s cut-in speed from June 1 to September 30. Both turbine groups were programmed to curtail when temperatures exceeded 9.4ºC (49ºF) (Stantec 2013a, 2015a). At Sheffield, which had estimated bat fatality rates of 14.65 bats/turbine/period in 2012 and 2.80 bats/turbine/period in 2013, 8 turbines were fully operational (i.e., cut-in speed at 4 m/s) and 8 turbines were set to a 6 m/s cut-in speed when temperatures exceeded 9.5ºC (49ºF) from June 3 to September 30 (Martin et al. 2013, 2014). Ultimately, following these tests both Kingdom and Sheffield implemented curtailment at 6 m/s likely due to small sample sizes and inability to test the difference between treatments for significance. Regardless of the differences at each project, all four operational curtailment programs have shown effectiveness in avoiding impacts to federal or state-listed bat species.

Operational control was in effect at the Project for from June 1 to September 30 during all three study years, except for three weeks in August 2020 where the curtailment system was not operating due to a temperature sensor malfunction. Aside from this brief period, curtailment was implemented to meet the purpose of reducing bat fatalities. This is reflected in the results for which the Project documented bat fatality rates at the lower end of the range of other projects in the Northeast (1.01 to 2.53 bats/turbine/period for all three study periods).

5.0 LITERATURE CITED

American Wind Wildlife Institute (AWWI). 2020a. AWWI Technical Report: 2nd Edition: Summary of Bat Fatality Monitoring Data Contained in AWWIC. Washington, DC. Available at www.awwi.org.

AWWI. 2020b. AWWI Technical Report: 2nd Edition: Summary of Bird Fatality Monitoring Data Contained in AWWIC. Washington, DC. Available at www.awwi.org.

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

Arnett, E.B., M. Schirmacher, M.P. Huso, J.P. Hayes. 2010. Effectiveness of changing wind turbine cut-in speed to reduce bat fatalities at wind facilities. A final report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International. Austin, Texas, USA.

Arnett, E.B., M.M.P. Huso, M.R. Schirmacher, and J.P. Hayes. 2011. Altering Turbine Speed Reduces Bat Mortality at Wind-Energy Facilities. Frontiers in Ecology and the Environment 9: 209–214.

Arnett, E.B., and E.F. Baerwald. 2013. Impacts of Wind Energy Development on Bats: Implications for Conservation, Chapter 21. R.A. Adams and S.C. Pedersen (eds). Bat Evolution, Ecology, and Conservation. DOI 10.1007/978-1-4614-7397-8_21. Spring Science+Business Media New York 2013.

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. Bat Conservation International. Austin, Texas, USA.

Baerwald, E.F., J. Edworthy, M. Holder, and R.M. Barclay. 2009. A Large-Scale Mitigation Experiment to Reduce Bat Fatalities at Wind Energy Facilities. Journal of Wildlife Management 73: 1077–1081.

Bernardino, J., R. Bispo, H. Costa, and M. Mascarenhas. 2013. Estimating bird and bat fatality at wind farms: a practical overview of estimators, their assumptions and limitations, New Zealand Journal of Zoology, 40:1, 63-74.

Curry and Kerlinger, LLC. 2013. Post-Construction mortality study Granite Reliable Power Wind Park, Coos County, New Hampshire, Annual Report January 2013. Prepared for Granite Reliable Power, LLC.

DeVault, T.L., T.W. Seamans, K.E. Linnell, D.W. Sparks, and J.C. Beasley. 2017. Scavenger removal of bird carcasses at simulated wind turbines: Does carcass type matter? *Ecosphere*, *8*(11).

Erickson, W., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, and K. Sernka. 2002. Synthesis and Comparison of Baseline Bird and Bat Use, Raptor Nesting and Mortality

Information from Proposed and Existing Wind Developments. Western EcoSystems Technology, Inc. Cheyenne, Wyoming, USA.

Erickson, W.P., J. Jeffrey, K. Kronner, and K. Bay. 2004. Stateline Wind Project wildlife monitoring final report: July 2001 - December 2003. Prepared for FPL Energy, Stateline Technical Advisory Committee, and the Oregon Energy Facility Siting Council. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, USA and Walla Walla, Washington, USA and Northwest Wildlife Consultants, Pendleton, Oregon, USA.

Erickson, W.P., G.D. Johnson, and D.P. Young, Jr. 2005. A summary and comparison of bird mortality form anthropogenic causes with an emphasis on collisions. U.S. Department of Agriculture Forest Service General Technical Report PSW-GTR-191, Albany, California, USA.

Erickson, W.P., M.M. Wolfe, K.J. Bay, D.H. Johnson, and J.L. Gehring. 2014. A Comprehensive Analysis of Small-Passerine Fatalities from Collision with Turbines at Wind Energy Facilities. PLoS ONE 9(9): e107491. https://doi.org/10.1371/journal.pone.0107491.

Fiedler, J.K. 2004. Assessment of bat mortality and activity at Buffalo Mountain Windfarm, eastern Tennessee. Thesis, University of Tennessee, Knoxville, Tennessee, USA.

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

Hein, C.D., A. Prichard, T. Mabee, and M.R. Schirmacher. 2013. Effectiveness of an operational mitigation experiment to reduce bat fatalities at the Pinnacle Wind Farm, Mineral County, West Virginia, 2012. An annual report submitted to Edison Mission Energy and the Bats and Wind Energy Cooperative. Bat Conservation International. Austin, Texas, USA.

Huso, M.M.P. 2010. An Estimator of Wildlife Fatality from Observed Carcasses. Environmetrics. Wiley Blackwell. DOI:10.1002/env.1052

Huso, M., N. Som, and L. Ladd. 2012. Fatality estimator user's guide: U.S. Geological Survey Data Series 729, 22 p.

Huso, M.M.P. and D. Dalthorp. 2014. Accounting for Unsearched Areas in Estimating Wind Turbine-Caused Fatality. Journal of Wildlife Management 78(2), pp. 347–358.

Johnson, G.D. 2005. A Review of Bat Mortality at Wind-Energy Developments in the United States. Bat Research News 46: 45–49.

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. Curry and Kerlinger, LLC. McLean, Virginia, USA.

Kerns, J., W.P. Erickson, and E.B. Arnett. 2005. Bat and Bird Fatality at Wind Energy Facilities in Pennsylvania and West Virginia. In: E.B. Arnett (Eds). Relationships between Bats and Wind

Turbines in Pennsylvania and West Virginia: An Assessment of Bat Fatality Search Protocols, Patterns of Fatality, and Behavioral Interactions with Wind Turbines. Bat Conservation International. Austin, Texas, USA.

Kerlinger, P., J.L. Gehring, W.P. Erickson, R. Curry, A. Jain, and J. Guarnaccia. 2010. Night Migrant Fatalities and Obstruction Lighting at Wind Turbines in North America. The Wilson Journal of Ornithology 122(4):744–754.

Korner-Nievergelt, F., O. Behr, R. Brinkmann, M.A. Etterson, M.M.P Huso, D. Dalthorp, P. Korner-Nievergelt, T. Roth, and I. Niermann. 2015. Mortality estimation from carcass searches using the R-package carcass – a tutorial. Wildlife Biology 21, p. 30–43

Kunz, T.H., E.B. Arnett, B.P. Cooper, W.P. Erickson, R.P. Larkin, T. Mabee, M.L. Morrison, M.D. Strickland, and J.M. Szewczak. 2007. Assessing impacts of wind-energy development on nocturnally active birds and bats: A guidance document. Journal of Wildlife Management 71:2449-2486.

Loss, S.R., T. Will, and P.P. Marra. 2012. Direct human-caused mortality of birds: improving quantification of magnitude and assessment of population impact. Frontiers in Ecology and the Environment 10(7). pp. 357-364.

Loss, S.R., T. Will, and P.P. Marra. 2013. Estimates of bird collision mortality at wind facilities in the contiguous United States. Biological Conservation 168. pp. 201-209.

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. March 25, 2013.

_____. 2014. Evaluating Bird and Bat Post-Construction Impacts at the Sheffield Wind Facility, Vermont. 2013 Annual Report. Prepared for Bat Conservation International and First Wind. May 13, 2014.

National Research Council (NRC). 2007. Environmental Impacts of Wind-Energy Projects Committee on Environmental Impacts of Wind Energy Projects, National Research Council ISBN: 0-309-10835-7. Available at http://www.nap.edu/catalog/11935.html

National Wind Coordinating Collaborative (NWCC). 2010. Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions. Available at http://www1.eere.energy.gov/wind/pdfs/birds_and_bats_fact_sheet.pdf

Normandeau Associates. 2010. Stetson Mountain II Wind Project Year 1 Post-Construction Avian and Bat Mortality Monitoring. Prepared for First Wind, LLC.

_____. 2011. Year 3 Post-construction avian and bat casualty monitoring at the Stetson I Wind Farm. Prepared for First Wind, LLC.

Partners in Flight (PIF). 2020. Population Estimates Database, version 2020. Available at http://pif.birdconservancy.org/.

R Core Team. 2016. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Available at https://www.R-project.org/.

Reynolds, D.S. 2006. Monitoring the potential impacts of a wind development site on bats in the Northeast. Journal of Wildlife Management 70(5):1219 – 1227.

Stantec Consulting Services Inc. (Stantec) 2009. Post-construction Monitoring at the Mars Hill Wind Farm, Maine – Year 2, 2008. Prepared for First Wind Management, LLC. January 2009.

_____. 2011. Cohocton and Dutch Hill Wind Farms Year 2 Post-Construction Monitoring Report, 2010 for the Cohocton and Dutch Hill Wind Farms In Cohocton, New York. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC.

_____. 2013a. Kingdom Community Wind 2013 Post-Construction Monitoring Report – Year 1. Orleans County, Vermont. Prepared for Green Mountain Power Corporation. December 2013.

_____. 2013b. Georgia Mountain Wind 2013 Post-Construction Monitoring Report – Year 1. Milton, Vermont. Prepared for Georgia Mountain Community. December 2013.

_____. 2014. Record Hill Wind Project Year 2 Post-Construction Wildlife Monitoring Report, 2014. Prepared for Record Hill Wind LLC.

_____. 2015a. Kingdom Community Wind 2014 Post-Construction Monitoring Report – Year 2. Orleans County, Vermont. Prepared for Green Mountain Power Corporation. January 2015.

_____. 2015b. Georgia Mountain Wind 2014 Post-Construction Monitoring Report – Year 2. Milton, Vermont. Prepared for Georgia Mountain Community. January 2015.

_____. 2016. Georgia Mountain Wind 2015 Post-Construction Monitoring Report – Year 3. Milton, Vermont. Prepared for Georgia Mountain Community. January 2016.

_____. 2017. Deerfield Wind Project Post-Construction Monitoring Plan: Birds and Bats. Prepared for Deerfield Wind, LLC. September 29, 2017.

_____. 2019. Post-Construction Monitoring Report Year 1, Deerfield Wind Project. Stantec Consulting Services Inc., Topsham, Maine, USA. 37 pages + appendices.

_____. 2021. Post-Construction Monitoring Report Year 2, Deerfield Wind Project. Stantec Consulting Services Inc., Topsham, Maine, USA. 37 pages + front matter and appendices.

Taucher, J., T. Librandi Mumma, and W. Capouillez. 2012. Pennsylvania Game Commission Wind Energy Voluntary Cooperation Agreement Third Summary Report. Available at http://www.pccd.state.pa.us/portal/server.pt/document/1378280/pgc_3rd_wind_energy _summary_report_2012_pdf

TetraTech. 2013. Spruce Mountain Wind Project Post-Construction Bird and Bat Fatality and Raptor Monitoring Year 1 Annual Report. Prepared for Patriot Renewables. May 2013

Thompson, S.K. 1992. Sampling. John Wiley & Sons, Inc. New York.

Tidhar, D., W. Tidhar, and M. Sonnenberg. 2010. Post-Construction Fatality Surveys for Lempster Wind Project. Prepared for Lempster Wind, LLC.

Tidhar, D., W. Tidhar, L. McManus, and Z. Courage. 2011. 2010 Post-Construction Fatality Surveys for Lempster Wind Project. Prepared for Lempster Wind, LLC.

United States Department of Agriculture (USDA). 2012. Deerfield Wind Project Record of Decision. January 3, 2012.

Vermont Agency of Natural Resourced (VANR). 2016. Bat-Wind Guidelines. Available at: https://vtfishandwildlife.com/sites/fishandwildlife/files/documents/Conserve/RegulatoryReview/Guidelines/ANRBatWindGuidelines20161006.pdf

Vermont Fish and Wildlife Department (VFWD). 2015a. Endangered and Threatened Animals of Vermont. 28 March 2015. https://vtfishandwildlife.com/sites/fishandwildlife/files/documents/Learn%20More/Library/REPORTS%20AND%20DOCUMENTS/NONGAME%20AND%20NATURAL%20HERITAGE/ENDANGERED%2C%20THREATENED%20AND%20RARE%20SPECIES%20LISTS/Endangered%20and%20Threatened%20Animals%20of%20Vermont.pdf.

_____. 2015b. Vermont's Wildlife Action Plan, Chapter 5: Species of Greatest Conservation Need. September 2015. https://vtfishandwildlife.com/sites/fishandwildlife/files/documents/About%20Us/Budget%20and%20Planning/WAP2015/5.-SGCN-Lists-Taxa-Summaries-%282015%29.pdf

West. 2014. Current understanding of impacts to bats. As presented in proceedings of the 10th Wind Wildlife Research Meeting (NWCC), Broomfield CO, 4 December 2014.

Appendix A HUSO FATALITY ESTIMATOR

The Huso estimator, developed in 2010 (and updated in 2012) based on Thompson (1992), is one of the leading methods for developing fatality rates in the United States and is available in a U.S. Geological Survey software application. This estimator has been used for other recent post-construction fatality studies in Vermont, including past surveys at the Project. It has been developed and thoroughly tested with simulated data by leading statisticians and is geared specifically for estimating fatalities at wind turbines. The model is suitable for fatality studies because it is stochastic, meaning it can generate estimates of probability distributions of potential results by allowing for random variation in 1 or more model inputs over a period of time. As such, the Huso estimator was used to estimate fatality at the Project in 2018, 2020, and again in 2022. Only carcasses found during standardized turbine searches were included in estimates of fatality due to bias that may be introduced into the model by carcasses found incidentally. Injured birds and bats, if found during searches, were also included in fatality estimates. A detailed description of the software is available in Huso (2010) and Huso et al. (2012). The software, available at http://pubs.usgs.gov/ds/729/, was run with the statistical program R (R Core 2016; Korner-Nievergelt et al. 2015).

The Huso estimator assumes carcass equilibrium between search intervals, where all carcasses are either found by searchers or scavenged prior to the next search (M. Huso, U.S. Geological Survey, personal communication). The estimator assumes a zero probability of searchers observing a carcass on a subsequent search if it was missed on the first search. However, field data indicate that some carcasses do persist on the ground for longer than a single interval and that searchers find some of these carcasses. To account for this bias in the model, Huso recommends that only those carcasses that died since the previous search (based on stage of decomposition) be input into the model. Otherwise, the software could overestimate fatality rates because the proportion of older carcasses are separately accounted for in the measurement of searcher efficiency (i.e., if searcher efficiency is determined to be 50% then there is a 50% probability of a carcass being missed on the first search). Therefore, only carcasses believed to have died since the last turbine search were input into the model for this analysis.

The formula for Huso's model is available in Bernardino et al. (2013):

$$\hat{M} = \frac{1}{\pi} \frac{C}{p\left[\frac{\bar{t}(1-e^{-i/\bar{t}})}{d}\right]v}$$

- $\hat{M}$ is the estimated dead animal population size (including variance parameters);
- C is the actual (unadjusted) number of dead animals found;
- π is defined as the product of the proportion of actual fatalities contained in the searchable area of the plot, and the probability of including that plot in the sample;
- p is the average probability that the carcass is detected by the searchers;
- $\bar{t}$ is the mean carcass persistence time;
- d = min(i, $\tilde{i}$), with $\tilde{i}$ representing the length of time beyond which the probability of a carcass persisting is ≤ 1% (i.e., $\tilde{i}$ is such that P[T > $\tilde{i}$] ≤ 0.01);
- $\tilde{i}$ can be estimated as $\tilde{i}$= -log(0.01)x$\bar{t}$ (based on an exponential distribution [e]);

- v is the effective search interval, where v = min (1, $\tilde{\imath}$ / i), with $\imath$ representing the interval between searches ($\imath$ is measured in days).

Because turbine towers were not centered within turbine clearings at the Project, and due to the narrow ridgeline, carcasses may have landed over forested areas. To account for this, the empirical distribution of bird and bat carcass distances was determined by applying a density-weighted proportion (DWP) area searched value in the model (the value for π). Area corrections were based on methods proposed by Korner-Nievergelt et al. (2015) and Huso and Dalthorp (2014), which assume that carcass density decreases with distance from turbine, and unsearched area increases with distance from turbine. The proportion of the total birds and bats found during searches was determined per 10-m concentric distance increment radiating out from tower bases. The proportion of the area that was searchable (i.e., not cut off by forest edge) within each of these distance bands was determined. The percent area searched per distance band was multiplied by the proportion of bat and bird carcasses found within each distance band to find a DWP value per distance band. The DWP value for each band was summed to find a value for each turbine for birds and for bats. Turbine-specific DWP values were input into the model to adjust the number of carcasses by the proportion of carcasses found within the proportion of the plots that was searchable. This DWP analysis provides a per-turbine adjustment for the total number of bird and bat carcasses that would have been found from the turbine had that entire area at each plot been available to be searched. It should be noted that a small sample size of carcasses found does not allow for a robust estimate of DWP.

For the Huso estimator to calculate estimates of fatality for birds and bats separately, a sample size of at least 10 bird and 10 bat carcasses for both the searcher efficiency and carcass persistence trials is required. The results of searcher efficiency trials were input into the model as 1 (if trial carcass was found) and 0 (if trial carcass was not found). These values are distributed as binary random variables within the model, with 'Found' indicated by the highest numeric value. A generalized linear model of the binary response is fit to the data, with a modeled response of $\log_e$ (odds of observing a carcass = $\log_e$ (p/1-p)).

The results of carcass persistence trials were input into the model based on the following trial outcomes:

- Carcass gone at first check on 'Day 1' of trial, left censoring = 2
- Carcass still present (visible) on last day of trial, right censoring = 0
- Carcass was removed between checks, interval censoring = 3

Carcass persistence times are modeled with a log-linear parametric accelerated failure time model and are assumed to follow a probability distribution. When persistence time is not known or is censored, the model is appropriately modified. Each time the model is run, one of the following distributions of carcass persistence must be selected by the user for the model: Exponential, Loglogistic, Lognormal, or Weibull. Huso recommends running trials of the dataset with each distribution to compare values of Akaike information criterion (AIC), the measure of the relative goodness of fit of the model, where *k* is the number of parameters in the statistical model, and *L* is the maximized value of the likelihood function for the estimated model.

$$AIC = 2k - \ln(L)$$

The preferred distribution for the model is the one with the minimum AIC value. For this analysis, carcass persistence was modeled using Lognormal distribution for both birds and bats.

Because detection bias, persistence bias, and proportion of carcasses within search areas are estimated, the Huso estimator uses a bootstrapped estimate of variance based on methods proposed by Erickson et al. (2004), where the fatality adjustment (π) and total fatality (M) are calculated for each bootstrapped sample. This analysis used 5,000 bootstrap resample iterations, as recommended by Huso et al. (2012). The alpha value was defined as 0.05; therefore, all confidence intervals were calculated at 95%.

Appendix B FATALITY TABLES AND FIGURES

Appendix B Table 1. Bird Fatality at Deerfield Wind Project, 2022.

Date	Location	Search Type	Common Name	Scientific Name	Subgroup	Age	Sex	Condition	Estimated Time of Death	Position	Distance from Turbine (m)	Direction from Turbine (Azimuth)
5/12/2022	E4	search	black-throated blue warbler	*Setophaga caerulescens*	passerine	adult	male	fresh	2-3 days	face up	67	275
5/15/2022	W8	search	blue-headed vireo	*Vireo solitarius*	passerine	adult	male	decomposing - late	unknown	face down	11	291
5/18/2022	W8	search	scarlet tanager	*Piranga olivacea*	passerine	adult	male	fresh	last night	on side	45	131
5/21/2022	W8	search	warbling vireo	*Vireo gilvus*	passerine	adult	unknown	fresh	2-3 days	face up	47	232
5/23/2022	E6	search	black-and-white warbler	*Mniotilta varia*	passerine	adult	unknown	fresh	2-3 days	face down	37	207
5/24/2022	W5	search	unidentified passerine	*Passeriformes (fam, gen, sp)*	passerine	unknown	unknown	n/a (feather spot)	unknown	on side	20	269
5/27/2022	W8	search	red-eyed vireo	*Vireo olivaceus*	passerine	unknown	unknown	decomposing - early	4-7 days	face down	67	226
6/1/2022	E6	search	northern parula	*Setophaga americana*	passerine	unknown	unknown	decomposing - late	7-14 days	face up	31	48
6/6/2022	E6	search	unidentified passerine	*Passeriformes (fam, gen, sp)*	passerine	unknown	unknown	decomposing - late	7-14 days	face down	45	94
8/23/2022	W2	search	red-eyed vireo	*Vireo olivaceus*	passerine	adult	unknown	decomposing - late	2-3 days	face up	2	1
9/29/2022	W1	search	yellow-bellied sapsucker	*Sphyrapicus varius*	woodpecker	adult	male	fresh	last night	face up	1.5	350
9/29/2022	W2	search	pine warbler	*Setophaga pinus*	passerine	adult	male	fresh	last night	face down	36	119
9/29/2022	W2	search	ruby-crowned kinglet	*Regulus calendula*	passerine	unknown	unknown	fresh	last night	face down	47	112
10/3/2022	E4	incidental	winter wren	*Troglodytes hiemalis*	passerine	adult	unknown	fresh	last night	on side	85	290
10/3/2022	E4	incidental	white-throated sparrow	*Zonotrichia albicollis*	passerine	adult	male	fresh	last night	face up	115	279
10/4/2022	W6	incidental	brown creeper	*Certhia americana*	passerine	adult	unknown	fresh	last night	face down	56	254
10/4/2022	E2	search	magnolia warbler	*Setophaga magnolia*	passerine	adult	male	fresh	last night	face up	33	307

Appendix B Table 2. Bat Fatality at Deerfield Wind Project, 2022.

Date	Location	Search Type	common name	Scientific Name	Subgroup	Age	Sex	Condition	Estimated Time of Death	Position	Distance from Turbine (m)	Direction from Turbine (Azimuth)
5/3/2022	E4	search	silver-haired bat	*Lasionycteris noctivagans*	tree-roosting bat	unknown	unknown	fresh	last night	face up	17	120
5/6/2022	E1	search	silver-haired bat	*Lasionycteris noctivagans*	tree-roosting bat	unknown	unknown	fresh	last night	face up	12	319
6/1/2022	E4	search	silver-haired bat	*Lasionycteris noctivagans*	tree-roosting bat	adult	unknown	decomposing - early	4-7 days	face up	8	78
8/9/2022	W3	search	hoary bat	*Lasiurus cinereus*	tree-roosting bat	unknown	unknown	fresh	last night	on side	48	25
8/30/2022	W6	search	silver-haired bat	*Lasionycteris noctivagans*	tree-roosting bat	unknown	unknown	decomposing - late	2-3 days	face up	22	313
9/15/2022	W1	search	silver-haired bat	*Lasionycteris noctivagans*	tree-roosting bat	adult	unknown	decomposing - late	4-7 days	face up	13	41
10/3/2022	W4	search	silver-haired bat	*Lasionycteris noctivagans*	tree-roosting bat	adult	unknown	fresh	last night	face up	23	253
10/7/2022	E3	search	big brown bat	*Eptesicus fuscus*	cave-dwelling bat	adult	unknown	fresh	last night	face down	22	241

Appendix B Table 3. Results of Bird and Bat Fatality Studies in the Eastern US.

Site	Habitat type (# turbines)	Dates surveyed	Search interval	# BATS found during surveys (incidental)	Estimated BATS/turbine/period (total)	# BIRDS found during surveys (incidental)	Estimated BIRDS/turbine/period (total)	Reference
Massachusetts								
MMA turbine	coastal (1)	April 24 - November 30, 2006	4-12 searches per week	0	n/a	3	2.15 (2.15)	Vlietstra, L.S. 2007. Potential Impact of the Massachusetts Maritime Academy Wind Turbine on Common and Roseate Terns
Maryland								
Criterion	forested ridgeline (28)	April 5 to November 15, 2011	daily	706	39.03 (1,093)	262	16.01 (449)	Young, D., M. Lout, Z. Courage, S. Nomani, and K. Bay. 2012. 2011 Post-Construction Monitoring Study Criterion Wind Project Garrett County, Maryland, April-November 2011. Technical report prepared for: Criterion Power Partners, LLC, Oakland, Maryland.
Criterion	forested ridgeline (28)	April 1 to November 15, 2012	weekly at 50%	82	19.5 (546)	28	5.47 (153)	Young, D., C. Nations, M. Lout, and K. Bay. 2013. 2012 Post-Construction Monitoring Study Criterion Wind Project Garrett County, Maryland, April-November 2012. Technical report prepared for: Criterion Power Partners, LLC, Oakland, Maryland.
Criterion	forested ridgeline (28)	April 2 to November 15, 2013	weekly at 50%	40	13.3 (373)	23	8.74 (245)	Young, D., M. Kauffman, M. Lout, and K. Bay. 2014. 2013 Post-Construction Monitoring Study Criterion Wind Project Garrett County, Maryland, April-November 2013. Technical report prepared for: Criterion Power Partners, LLC, Oakland, Maryland.
Maine								
Kibby Mountain	forested ridgeline (44)	May 2 to June 20; July 11 to October 14, 2011	22 3 times every 2 wks	6 (3)	spring: (0); fall: 0.37 (16)	17 (4)	spring: 0.72 (32); fall: 0.29 (12)	Stantec Consulting. 2011. 2011 Post-Construction Monitoring Report Kibby Wind Power Project, Franklin County, Maine. Prepared for TransCanada Hydro Northeast, Inc.
Mars Hill	forested ridgeline (28)	April 23-June 3, July 15-Sept 23, 2007	2 of 28 daily, 28 of 28 weekly, seasonal dog searches	22 (2)	0.43-4.4 (12.1-122.5)	19 (3)	0.44-2.5 (27-69)	Stantec Consulting. 2008. Spring, Summer, and Fall Post-construction Bird and Bat Mortality Study at the Mars Hill Wind Farm, Maine. Unpublished report prepared for UPC Wind Management, LLC.
Mars Hill	forested ridgeline (28)	April 19 - June 6, July 15-Oct 8, 2008	28 of 28 weekly, seasonal dog searches	5 (0)	0.17-0.68 (5-19)	17(4)	2.4-2.65 (57-74)	Stantec Consulting. 2009. Post-construction Monitoring at the Mars Hill Wind Farm, Maine – Year 2. Unpublished report prepared for First Wind Management, LLC.
Record Hill	forested ridgeline (22)	April 15 to June 7 and July 7 to October 15, 2012	22 3 times every 2 wks	44 (0)	6.78 (150) [4]	46 (7)	8.46 (187) [4]	Stantec Consulting. 2012. Record Hill Wind Project Post-Construction Monitoring Report, 2012. Prepared for Record Hill Wind, LLC.
Rollins	forested ridgeline (40)	April 15 to October 15, 2012	20 weekly	2 (0)	0.18 (7.2) [4]	9 (7)	2.94 (118) [4]	Stantec Consulting. 2012. Rollins Wind Project Post-Construction Monitoring Report, 2012. Prepared for First Wind, LLC.
Stetson Mountain I	forested ridgeline (38)	April 20 to Oct 21, 2009	19 weekly	5 (0)	2.11 (80)	30 (9)	4.03 (153)	Stantec Consulting. 2010. Stetson I Mountain Wind Project, Year 1 Post-Construction Monitoring Report, 2009. Prepared for First Wind Management, LLC.
Stetson Mountain I	forested ridgeline (38)	April 18 to October 21, 2011	19 weekly	4 (0)	0.43 (16)	7 (0)	1.77 (67)	Normandeau Associates. 2010. Year 3 Post-construction avian and bat casualty monitoring at the Stetson I Wind Farm. Prepared for First Wind, LLC.
Stetson Mountain I	forested ridgeline (38)	April 15 to Oct 25, 2013	19 weekly	1 (0)	0.26 (10)	32 (0)	10.42 (396)	Stantec Consulting. 2014. Stetson I Wind Project, 2013 Post-Construction Monitoring Report, Year 5. Prepared for First Wind Management, LLC.
Stetson Mountain II	forested ridgeline (17)	April 19 to Oct 15, 2010	17 weekly	14 (0)	2.48 (42.12)	11 (0)	2.14 (36.41)	Normandeau Associates. 2010. Stetson Mountain II Wind Project Year 1 Post-Construction Avian and Bat Mortality Monitoring. Prepared for First Wind, LLC.
Stetson Mountain II	forested ridgeline (17)	April 15 to October 15, 2012	17 weekly	4 (0)	2.06 (36) [4]	5 (0)	2.83 (49) [4]	Stantec Consulting. 2012. Stetson II Wind Project Post-Construction Monitoring Report, 2012. Prepared for First Wind, LLC.

Maine (continued)								
Bull Hill	coastal upland (19)	April 15-Oct 15, 2013	19 weekly April 15-June 14, 10 daily 9 weekly June 15-Oct 15	19	0.94 (9.4)	78 (1)	7.72 (147)	Stantec Consulting. 2014. Bull Hill Year 1 Post-Construction Wildlife Monitoring Report, 2013. Prepared for First Wind, LLC.
Spruce Mountain	forested ridgeline (10)	April 11 to November 1, 2012	10 weekly	6	2.43 (24)	3 (2)	1.49 (15)	TetraTech. 2013. Spruce Mountain Wind Project Post-construction Bird and Bat Fatality and Raptor Monitoring Year 1 Annual Report. Prepared for Patriot Renewables.
Hancock[7]	forested ridgeline (17)	April 15 to Oct 15, 2017	3-day	3	0.89, 1.03, 1.14	8 (1)	2.76, 4.56, 6.99	TRC. 2017b. Hancock Wind Project Post-Construction Bird and Bat Fatality Monitoring Report Year 1 (2017). Prepared for Novatus Energy, LLC.
Hancock[7]	forested ridgeline (17)	April 15 to Oct 15, 2018	2 searches per week	3	0.97, 1.23, 2.6	7 (1)	2.35, 3.94, 6.06	TRC. 2018. Hancock Wind Project Post-Construction Bird and Bat Fatality Monitoring Report Year 2 (2018). Prepared for Novatus Energy, LLC.
Hancock[7]	forested ridgeline (17)	April 15 to Oct 15, 2021	2 searches per week	1	0.17, 0.29, 0.41	9 (1)	0.90, 2.10, 2.14	Stantec. 2022a. Hancock Wind Project Post-Construction Bird and Bat Fatality Monitoring Report - Year 5. Prepared for Onward Energy
Oakfield[7]	forested ridgeline (48)	April 20 to Oct 15, 2017	3-day	6	1, 1.54, 2.32	68 (3)	10.13, 12.7, 27.4	TRC. 2017c. Oakfield Wind Project Post-Construction Bird and Bat Fatality Monitoring Report Year 2 (2017). Prepared for Novatus Energy, LLC.
Oakfield	forested ridgeline (48)	May 7 to Oct 15, 2020	3-day	9	2.95	26	7.31	Stantec. 2020. Oakfield Wind Project Post-Construction Bird and Bat Fatality Monitoring Report - Year 5. Prepared for Onward Energy
Bingham[7]	forested ridgeline (56)	April 15 to Oct 15, 2017	3-day	2	0.32, 0.74,1.73	27 (7)	5.98, 11.43, 25.09	TRC. 2017b. Hancock Wind Project Post-Construction Bird and Bat Fatality Monitoring Report Year 1 (2017). Prepared for Novatus Energy, LLC.
Bingham[7]	forested ridgeline (56)	April 19 to Oct 15, 2021	2 searches per week	16 (1)	1.40, 1.01, 1.64	48 (5)	4.26, 6.36, 7.04	Stantec. 2022b. Bingham Wind Project Post-Construction Bird and Bat Fatality Monitoring Report - Year 5. Prepared for Onward Energy
Passadumkeag [7]	forested ridgeline (13)	Apr 15 - Oct 14, 2016	3-day	5	0.56, 0.79, 0.87	27 (31)	4.28, 6.32, 8.15	Ritzert, J. P. M. Ritzert, S. Conover, and K. Nasman. 2017. Post-Construction Monitoring Study for the Passadumkeag Wind Project Penobscot County, Maine. April – October 2016. Prepared for Southern Power Company. February 10, 2017.
Passadumkeag [7]	forested ridgeline (13)	Apr 16 - Oct 15, 2018	3-day	7 (1)	0.91, 0.92, 1.02	24 (2)	3.35, 4.01, 4.29	Ritzert, J. P., J. Stein, F. Hornsby, and G. DiDonato. 2018. Post-Construction Monitoring Study for the Passadumkeag Wind Project, Penobscot County, Maine. April – October 2018. Prepared for Southern Power Company. December 2018.
New Hampshire								
Granite Reliable	forested ridgeline (33)	April 22 - October 27, 2012	13 weekly thru Aug 18, 23 weekly thru Oct 27	2 (1)	2.6-3.0 (86-99) [6]	1	2.0-2.8 (66-92) [6]	Curry and Kerlinger. 2013. Post-construction mortality study Granite Reliable Power Wind Park, Coos County, New Hampshire, Annual Report January 2013. Prepared for Granite Reliable Power, LLC.
Groton	forested ridgeline (24)	April 15 - October 31, 2013	24 weekly	18	n/a	23	n/a	*West 2013 preliminary data*
Lempster	forested ridgeline (12)	April 15-June 1; July 15-Oct 31, 2009	4 daily	10 (2)	spring: 0.58 (7); fall: 5.51 (66)	9 (4)	spring: 0.80 (10); fall: 5.95 (71)	Tidhar, D., W. Tidhar, and M. Sonnenberg. 2010. Post-Construction Fatality Surveys for Lempster Wind Project. Prepared for Lempster Wind, LLC.
Lempster	forested ridgeline (12)	April 15-June 1; July 15-Oct 31, 2010	12 weekly	14 (5)	spring (0); fall 7.13 (86)	11 (0)	spring: 1.16 (14); fall: 4.12 (49)	Tidhar, D., W. Tidhar, L. McManus, and Z. Courage. 2011. 2010 Post-Construction Fatality Surveys for Lempster Wind Project. Prepared for Lempster Wind, LLC.
Antrim	forested ridgeline (9)	April 16 - October 12, 2020	5-day	43	5.21 (curtailed), 14.07 (control)	8	3.65	Stantec. 2021. Post-Construction Monitoring Report Year 1, Antrim Wind Project, 2020. Antrim, New Hampshire. Prepared for Antrim Wind Energy, LLC.
Antrim	forested ridgeline (9)	April 15 - October 15, 2021	5-day	8	2.6	5 (1)	1.72	Stantec. 2022. Post-Construction Monitoring Report Year 2, Antrim Wind Project, 2021. Antrim, New Hampshire. Prepared for Antrim Wind Energy, LLC.

New York								
Altona	primarily woodlots (65)	April 26 to October 15, 2010	22 weekly, 8 daily from July 18 to Sept 18	24 (7)	daily: 6.51 (423); weekly: 3.87 (252)	14 (6)	daily: 1.55 (101); weekly: 2.76 (180)	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2011. Annual Report for the Noble Altona Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC.
Bliss	agricultural, woodland (67)	April 21 to Nov 14, 2008	8 daily, 8 every 3-days, 7 weekly	74 (15)	daily: 7.58 (508); 3-day:14.66 (983); weekly: 13.01 (872)	20 (7)	daily: 4.30 (288); 3-day: 0.66 (44); weekly: 0.74 (50)	Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Quant, D. Pursell. 2009. Annual Report for the Noble Bliss Windpark, LLC. Postconstruction Bird and Bat Fatality Study – 2008. Prepared by Curry and Kerlinger, LLC.
Bliss	agricultural, woodland (67)	April 15 to November 15, 2009	8 daily, 15 weekly	36 (0)	daily: 8.24 (552); weekly: 4.46 (299)	25 (7)	daily: 4.45 (298); weekly: 2.87 (192)	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2010. Annual Report for the Noble Bliss Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC.
Chateaugay	agricultural, woodlots (71)	April 26 to Oct 15, 2010	24 weekly	22 (7)	3.66 (260)	19 (9)	2.40 (170)	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2011. Annual Report for the Noble Chateaugay Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC.
Clinton	agricultural, woodland (67)	April 26 to October 13, 2008	8 daily, 8 every 3-days, 7 weekly	39 (14)	daily: 5.45 (365); 3-day: 4.81 (322); weekly: 3.76 (252)	14 (9)	daily: 1.43 (956); 3-day: 3.26 (218); weekly: 2.48 (166)	Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Histed, and J. Meacham. 2009. Annual Report for the Noble Clinton Windpark, LLC. Postconstruction Bird and Bat Fatality Study – 2008. Prepared by Curry and Kerlinger, LLC.
Clinton	agricultural, woodland (67)	April 15 to November 15, 2009	8 daily, 15 weekly	36 (6)	daily: 9.72 (651); weekly: 5.16 (3.46)	16 (8)	daily: 1.50 (101); weekly: 1.76 (118)	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2010. Annual Report for the Noble Clinton Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC.
Cohocton and Dutch Hill	agricultural, woodland (50)	April 15 to Nov 15, 2009	5 daily, 12 weekly	62 (7)	daily: 40.4 (2002); weekly: 13.8 (804)	15 (3)	2.9 - 4.7 (147-235)	Stantec Consulting. 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.
Cohocton and Dutch Hill	agricultural, woodland (50)	April 26 to October 22, 2010	17 weekly except when 12 weekly and 5 daily from July 15-Sept 17	63 (5)	daily: 25.62 (1281); weekly A): 5.04 (252); weekly B): 10.44 (522)	9 (1)	daily: 2.06 (103); weekly 1: 0.82 (41); weekly 2: 1.16 (58)	Stantec Consulting. 2011. Cohocton and Dutch Hill Wind Farms Year 2 Post-Construction Monitoring Report, 2010 for the Cohocton and Dutch Hill Wind Farms In Cohocton, New York. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC.
Cohocton and Dutch Hill	agricultural, woodland (50)	July 8 to October 15, 2013	17 turbines every 5 days	44	8.03 (401.5)	22 (2)	3.96 (198)	Stantec Consulting. 2014. Cohocton and Dutch Hill Wind Farms 2013 Post-Construction Wildlife Monitoring Report. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC.
Ellenburg	agricultural, woodland (54)	April 28 to Oct 13, 2008	6 daily, 6 every 3-days, 6 every 7-days	34 (25)	daily: 8.17 (441); 3-day: 6.94 (375); weekly: 4.19 (226)	12 (10)	daily: 2.09 (113); 3-day: 1.37 (74); weekly: 1.18 (64)	Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, A. Fuerst, and C. Hansen. 2009. Annual Report for the Noble Ellenburg Windpark, LLC. Postconstruction Bird and Bat Fatality Study – 2008. Prepared by Curry and Kerlinger, LLC.
Ellenburg	agricultural, woodland (54)	April 15 to November 15, 2009	6 daily, 12 weekly	28 (4)	daily: 8.01 (433); weekly: 3.70 (200)	19 (2)	daily: 5.69 (307); weekly: 2.29 (124)	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2010. Annual Report for the Noble Ellenburg Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2009. Prepared for Noble Environmental Power, LLC.
Hardscrabble	agricultural/woodland (37)	April 15 to October 15, 2012	12 daily (12 weekly supplemental)	171 (7)	21.34 (790)	48 (6)	6.86 (254)	West/Jason P. Ritzert, Rhett Good, and Shay Howlin. 2013. 2012 Post-Construction Study and AnaBat Study Hardscrabble Wind Project Herkimer County, New York April 15 – October 15, 2012. Prepared for: Iberdrola Renewables, LLC.
Howard	agricultural/woodland (27)	April 15-Nov 15, 2012	5 daily, 5 weekly	138 (10)	20.09 (542) [5]	16	2.5 (67.5)[5]	West. 2013. 2012 Post-Construction Monitoring Studies for the Howard Wind Project Steuben County, New York. Prepared for Howard Wind, LLC.
Maple Ridge	woodland, grassland, agricultural (120)	June 17 - Nov 15, 2006	10 every 3-days, 30 7-days, 10 daily	326 (58)	11.39-20.31 (1367-2437.2)	123 (15)	3.10-9.48 (372-1,138)	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. Prepared for PPM Energy and Horizon Energy. http://www.wind-watch.org/documents/wp-content/uploads/maple_ridge_report_2006_final.pdf
Maple Ridge	woodland, grassland, agricultural (195)	April 30 - Nov 14, 2007	64 weekly	202 (81)	15.54-18.53 (3030-3614)	64 (32)	5.67-6.31 (1,106-1,230)	Jain, A. P. Kerlinger, R. Curry, and L. Slobodnik. 2008. Annual report for the Maple Ridge wind power project post-construction bird and bat fatality study—2007. Annual report prepared for PPM Energy and Horizon Energy. Curry and Kerlinger, Cape May Point, New Jersey, USA.
Maple Ridge	woodland, grassland, agricultural (195)	April 15 - Nov 9, 2008	64 weekly	140 (76)	8.18 - 8.92 (1595-1739)	74 (23)	3.42-3.76 (667-733)	Jain, A. P. Kerlinger, R. Curry, and L. Slobodnik. 2009. Annual report for the Maple Ridge wind power project post-construction bird and bat fatality study—2007. Annual report prepared for PPM Energy and Horizon Energy. Curry and Kerlinger, Cape May Point, New Jersey, USA.

New York (continued)								
Maple Ridge	woodland, grassland, agricultural (195)	July 12 - October 15, 2012	weekly at 105 small plot and 5 large plots	68 (2)[5]	13.38 (2609)	11	n/a	Tidhar, D., J. Ritzert, M. Sonnenberg, M. Lout, and K. Bay. 2013. 2012 Post-construction Fatality Monitoring Study for the Maple Ridge Wind Farm, Lewis County, New York. Final Report: July 12 – October 15, 2012. Prepared for EDP Renewables North America
Munnsville	agricultural forested uplands (23)	April 15-Nov 15, 2008	12 of 23 weekly, seasonal dog searches	9 (1)	0.70-2.90 (16-67)	7 (3)	1.71-2.22 (39-51)	Stantec Consulting. 2009. Post-construction monitoring at the Munnsville Wind Farm, New York, 2008. Prepared for E.ON Climate and Renewables.
Steel Winds I & II	Lake Erie shoreline (14)	March 10 to May 31, July 15 to Nov 20, 2012	7 weekly	18 (1)	5.83 (82)[4]	6 (5)	3.97 (56)	Stantec Consulting. 2013. Steel Winds I and II Post-Construction Monitoring Report, 2012. Prepared for First Wind Management, LLC
Steel Winds I & II	Lake Erie shoreline (14)	March 10 to May 31, July 15 to September 30, 2013	7 once every 3 days	31 (3)	15.30 (214)	23 (6)	15.50 (217)	Stantec Consulting. 2014. Steel Winds I and II Post-Construction Monitoring Report, 2013. Prepared for First Wind Management, LLC
Wethersfield	agricultural, woodlots (84)	April 15 to Oct 15, 2010	28 weekly	62 (13)	24.45 (2054)	11 (7)	2.55 (214)	Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K., Harte, A. 2011. Annual Report for the Noble Wethersfield Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2010. Prepared for Noble Environmental Power, LLC.
Pennsylvania								
Casselman	forested ridge, grassland mine ridge (23)	July 27 - October 9, 2008	22 daily	32 [3]	24.2 (557)	N/A	N/A	Arnett, E.B., M. Schirmacher, M.P. Huso, J.P. Hayes. 2010. Effectiveness of changing wind turbine cut-in speed to reduce bat fatalities at wind facilities. A final report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International. Austin, Texas, USA.
Casselman	forested ridge, grassland mine ridge (23)	July 26 - October 8, 2009	22 daily	39 [3]	17.4 (400)	N/A	N/A	Arnett, E.B., M. Schirmacher, M.P. Huso, J.P. Hayes. 2010. Effectiveness of changing wind turbine cut-in speed to reduce bat fatalities at wind facilities. A final report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International. Austin, Texas, USA.
Meyersdale	forested ridgeline (20)	Aug 2 - Sept 13, 2004	10 daily, 10 weekly	262 (37)	25 (400-660)	13 (4)	n/a	Arnett, E.B., W.P. Erickson, J. Kerns, and J. Horn. 2005. Relationships between bats and wind turbines in Pennsylvania and West Virginia: an assessment of fatality search protocols, patterns of fatality, and behavioral interactions with wind turbines. Bats and Wind Energy Cooperative.
Somerset County	agricultural (8)	2000 (12 months)	n/a	0	n/a	0	n/a	Kerlinger, P. 2006. Supplement to the Phase I Avian Risk Assessment and Breeding Bird Study for the Deerfield Wind Project, Bennington County, Vermont. Prepared for Deerfield Wind, LLC.
Tennessee								
Buffalo Mtn	reclaimed mine on ridge (18)	April - Dec 10, 2005	18 of 18 every week, every 2 weeks, or every 2-5 days	243 (14)	63.9 (1,149)	9 (2)	1.8 (112)	Fiedler, J.K., T.H. Henry, R.D. Tankersley, and C.P. Nicholson. 2007. Results of Bat and Bird Mortality Monitoring at the Expanded Buffalo Mountain Windfarm, 2005 June 28, 2007. Prepared for Tennessee Valley Authority.
Vermont								
Searsburg	forested (11)	June 30 - Oct 18, 1997	11 total (4 per search) 2 to 6 days per month	0	n/a	0	n/a	Kerlinger, P. 2002. An Assessment of the Impacts of Green Mountain Power Corporation's Wind Power Facility on Breeding and Migrating Birds in Searsburg, Vermont. Prepared for the Vermont Department of Public Service Montpelier, Vermont.
Sheffield	forested ridgeline (16)	April 1 – Oct 31, 2012	daily at 50% April-June, Oct; 100% July, Aug, Sept	87	14.65 (235)	35	13.17 (211)	Martin, C., E. Arnett, M. Wallace. 2013. Evaluating Bird and Bat Post-Construction Impacts at the Sheffield Wind Facility, Vermont 2012 Annual Report. Prepared for Bat Conservation International and First Wind.
Sheffield	forested ridgeline (16)	April 23 - Oct 31, 2013	daily at 8 April 23 – June 2 and Oct 1–3, daily at 16 June 3–30 and Sep, 2013	19	2.80 (45)	29 (2)	8.01 (129)	Martin, C., E. Arnett, M. Wallace. 2014. Evaluating Bird and Bat Post-Construction Impacts at the Sheffield Wind Facility, Vermont 2013 Annual Report. Prepared for Bat Conservation International and First Wind.
Kingdom Community	forested ridgeline (21)	April 15-Oct 15, 2013	all 21 weekly April 15-May 31, every 3-days June 1-Oct 15	15 (2)	1.94 (41)	61 (13)	10.76 (226)	Stantec. 2014. Kingdom Community Wind 2013 Post-Construction Monitoring Report - Year 1. Prepared for Green Mountain Power.
Kingdom Community	forested ridgeline (21)	April 15-Oct 15, 2014	all 21 weekly April 15-May 31, every 3-days June 1-Oct 15	21	4.96 (105)	36 (6)	9.11 (192)	Stantec. 2015. Kingdom Community Wind 2014 Post-Construction Monitoring Report - Year 2. Prepared for Green Mountain Power.

Vermont (continued)								
Georgia Mountain	forested ridgeline (4)	April 16 - Oct 16, 2013	all 4 every 3 days	12 (1)	11.7 (47)	6 (0)	6 (26)	Stantec. 2014. Georgia Mountain Community Wind 2013 Post-Construction Monitoring Report - Year 1. Prepared for Georgia Mountain Community Wind, LLC.
Georgia Mountain	forested ridgeline (4)	April 16 - Oct 16, 2014	all 4 every 3 days	3	2.29 (9)	1	2.13 (9)	Stantec. 2015. Georgia Mountain Community Wind 2014 Post-Construction Monitoring Report - Year 2. Prepared for Georgia Mountain Community Wind, LLC.
Deerfield Wind	forested ridgeline (15)	April 23-October 15, 2018	3-day	10	1.47 (23)	26	8.01 (121)	Stantec. 2019. Post-Construction Monitoring Report Year 1, Deerfield Wind Project. Stantec Consulting Services Inc., Topsham, Maine, USA. 37 pages + appendices.
Deerfield Wind	forested ridgeline (15)	May 8-October 15, 2020	3-day	27	2.53 (38)	21 (12)	0.56 (9)	Stantec. 2021. Post-Construction Monitoring Report Year 2, Deerfield Wind Project. Stantec Consulting Services Inc., Topsham, Maine, USA. 37 pages + front matter and appendices.
Deerfield Wind	**forested ridgeline (15)**	**April 15-October 13, 2022**	**3-day**	**8**	**1.01 (16)**	**17 (3)**	**3.51 (53)**	**This report**
West Virginia								
Mount Storm	forested ridgeline (82)	July 18 - Oct 17, 2008	18 weekly, 9 daily	182 (27)	daily: 24.21 (1985) weekly: 7.76 (636)	29 (8)	2.41-3.81 (198-312)	Young, D.P., W.P. Erickson, K. Bay, S. Normani, W. Tidhar. 2009. Mount Storm Wind Energy Facility, Phase 1: Post-construction Avian and Bat Monitoring. Prepared for: NedPower Mount Storm, LLC.
Mount Storm	forested ridgeline (82)	July-October, 2010	25 daily	308 (73)	22.39 (1836)	36 (11)	2.77 (227)	Young, D.P., S. Nomani, W. Tidhar, and K. Bay. 2010. Mount Storm Wind Energy Facility Post-construction Avian and Bat Monitoring, July-October 2010. Prepared for NedPower Mount Storm, LLC.
Mountaineer	forested ridgeline (44)	April 4 - Nov 11, 2003	2x per week	475	47.53 (2092)	69 [1]	4.04 (178 + 33 due to substation lighting)	Kerns, J., and P. Kerlinger. 2004. A study of bird and bat collision fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia, USA: annual report for 2003. <http://www.responsiblewind.org/docs/MountaineerFinalAvianRpt3-15-04PKJK.pdf>
Mountaineer	forested ridgeline (44)	July 31- Sept 11, 2004	22 daily, 22 weekly	398 (68)	38 (1364-1980)	15	n/a	Arnett, E.B., W.P. Erickson, J. Kerns, and J. Horn. 2005. Relationships between bats and wind turbines in Pennsylvania and West Virginia: an assessment of fatality search protocols, patterns of fatality, and behavioral interactions with wind turbines. Bats and Wind Energy Cooperative.

*****Comparison of fatality rates across survey sites and survey periods should be interpreted with caution, as Deerfield implemented a 6 m/s curtailment program on all turbines, whereas other sites implemented different or no operational control measures.**

1 33 birds found on May 23, 2003 at turbines near a substation and at substation associated with sodium vapor lights.

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

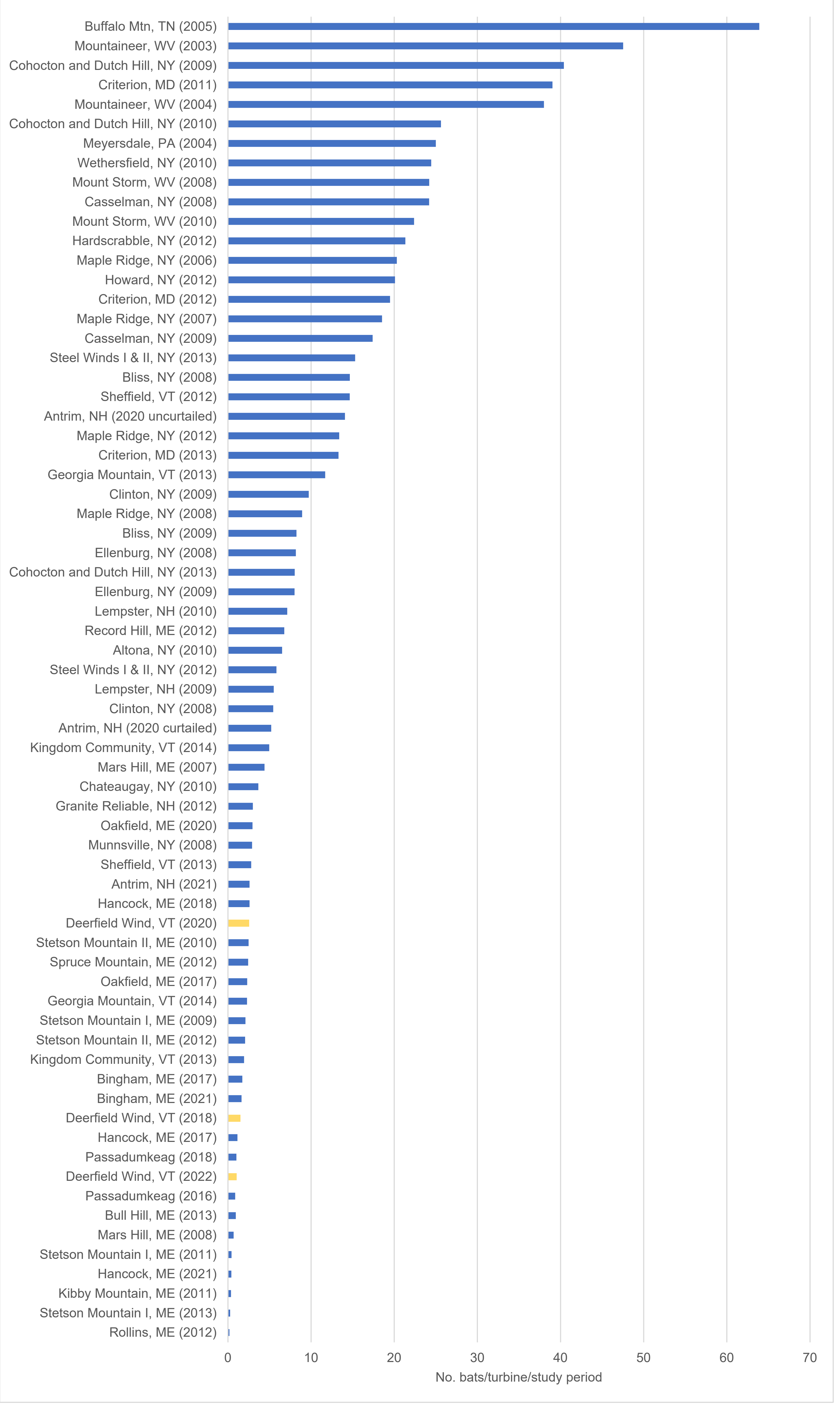
3 Fresh bats found at curtailment treatment turbines reported only.

4 Based on the Huso fatality estimator not including search area corrections.

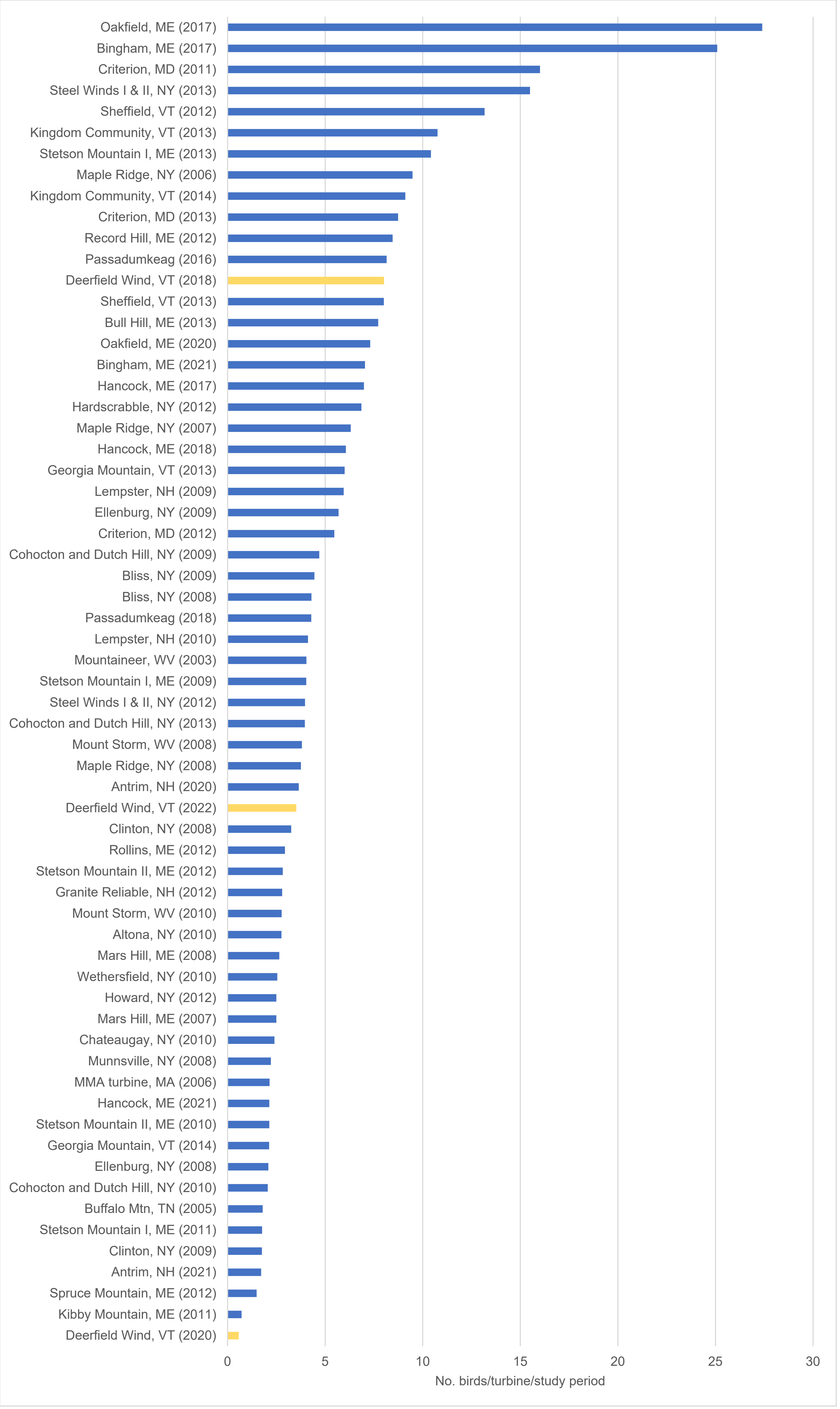
5 Included incidental carcasses in estimates of fatality.

6 Based search area corrections on distribution of carcasses found at the Maple Ridge Wind Project, New York.

7 More than one estimator was used in this analysis

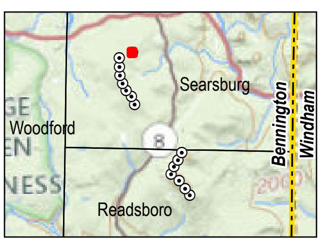


Appendix B Figure 1. Fatality Rates for Bats (Bats/Turbine/Study Period) from Publicly Available Studies at Wind Energy Facilities in the Eastern US, as Shown in Appendix B Table 3 (For studies with multiple rates, the highest rate is shown).



Appendix B Figure 2. Fatality Rates for Birds (Birds/Turbine/Study Period) from Publicly Available Studies at Wind Energy Facilities in the Eastern US, as Shown in Appendix B Table 3 (For studies with multiple rates, the highest rate is shown).

Appendix C TURBINE SEARCH PLOTS



Legend
- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Rock
- Search Plot

Visibility Rating
1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet
(At original document size of 8.5x11)
1:1,000

N

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

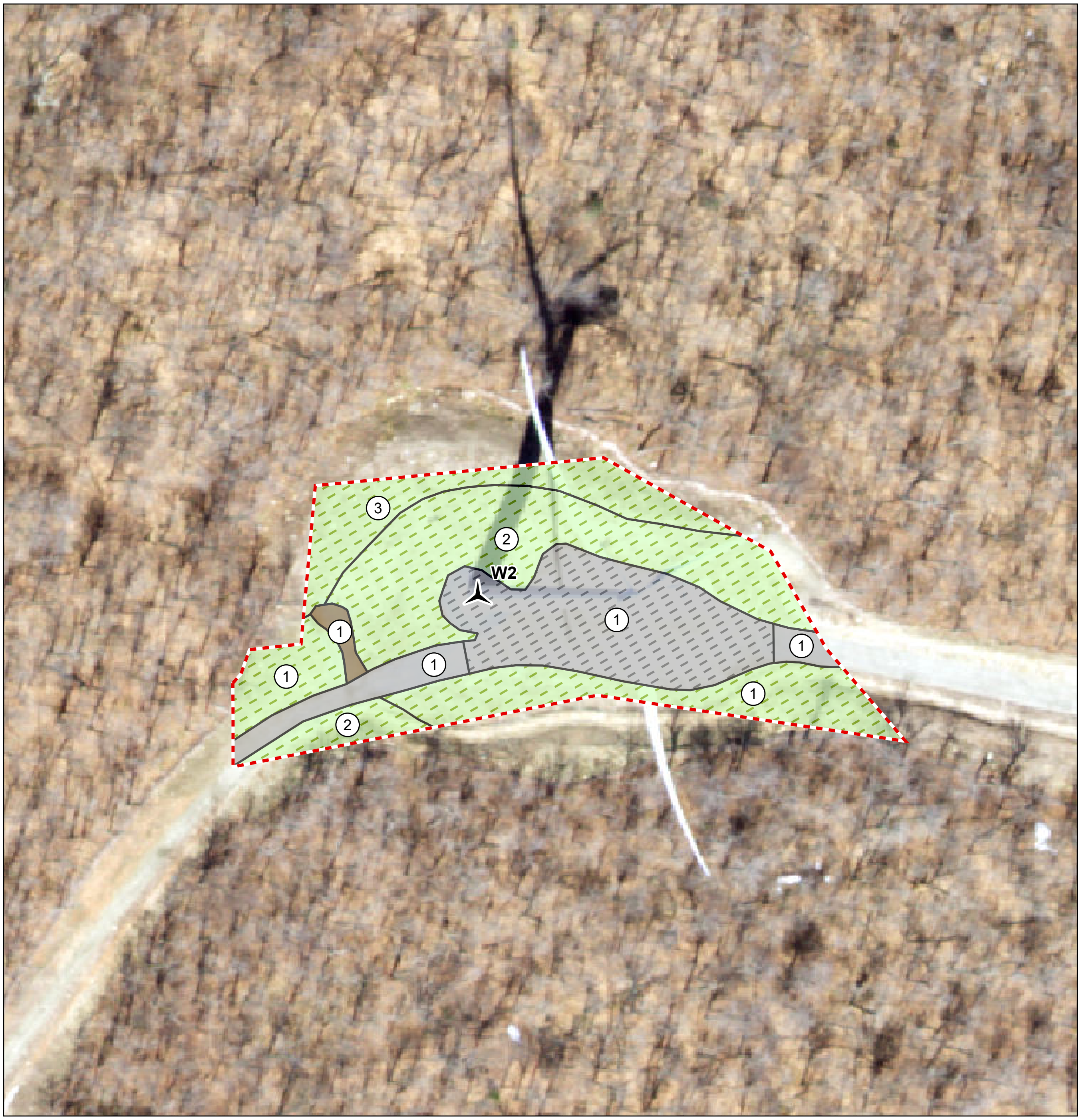
195601468

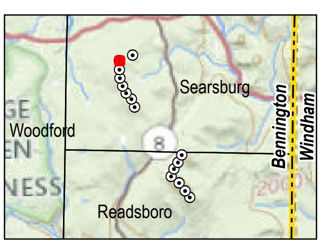
Client/Project
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
1 of 15

Title
W1 Vegetation Mapping

Notes
1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal





Legend

- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Bare Ground
- Search Plot

Visibility Rating

1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet

(At original document size of 8.5x11)
1:1,000

N

Notes

1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

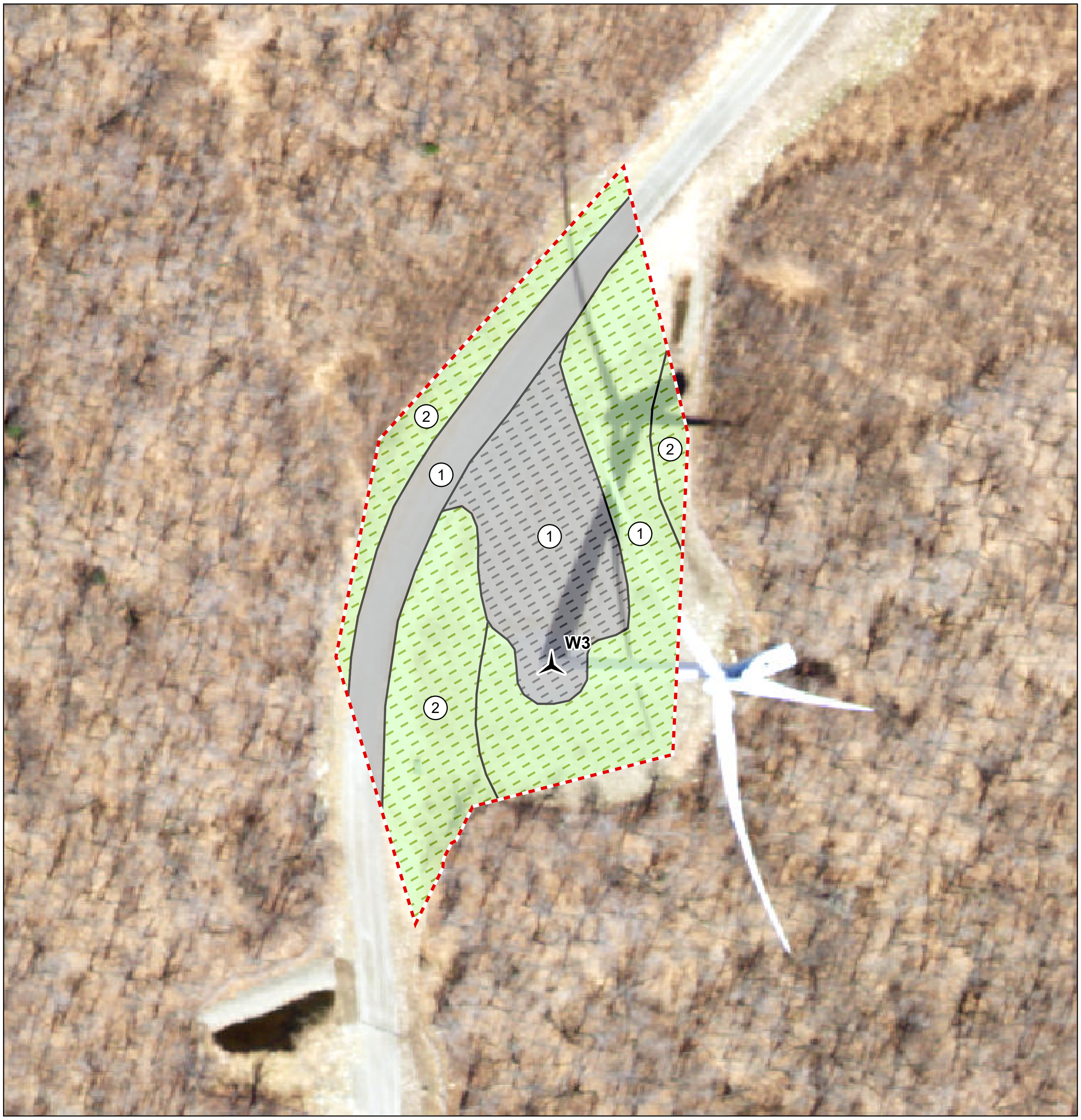
Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

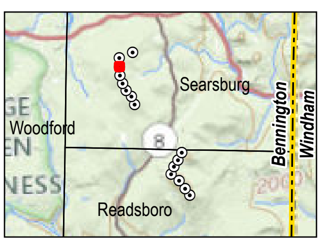
Client/Project
195601468
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
2 of 15

Title
W2 Vegetation Mapping

V:\1956\active\195601468\03_data\gis_cad\gis\MXDs\PCM\2022\01468_Deerfield_PCM_2022_VegMapping\01468_Deerfield_PCM_2022_VegMapping.aprx Revised: 2022-11-21 By: hturner





Legend

- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Search Plot

Visibility Rating

1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet
(At original document size of 8.5x11)
1:1,000

N

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

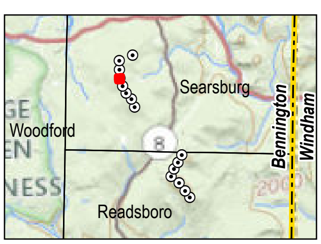
Client/Project
195601468
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
3 of 15

Title
W3 Vegetation Mapping

Notes
1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

V:\1956\active\195601468\03_data\gis_cad\gis\MXDs\PCM\2022\01468_Deerfield_PCM_2022_VegMapping\01468_Deerfield_PCM_2022_VegMapping.aprx Revised: 2022-11-21 By: hturner



Legend
- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Search Plot

Visibility Rating
1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet
(At original document size of 8.5x11)
1:1,000

N

Notes
1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

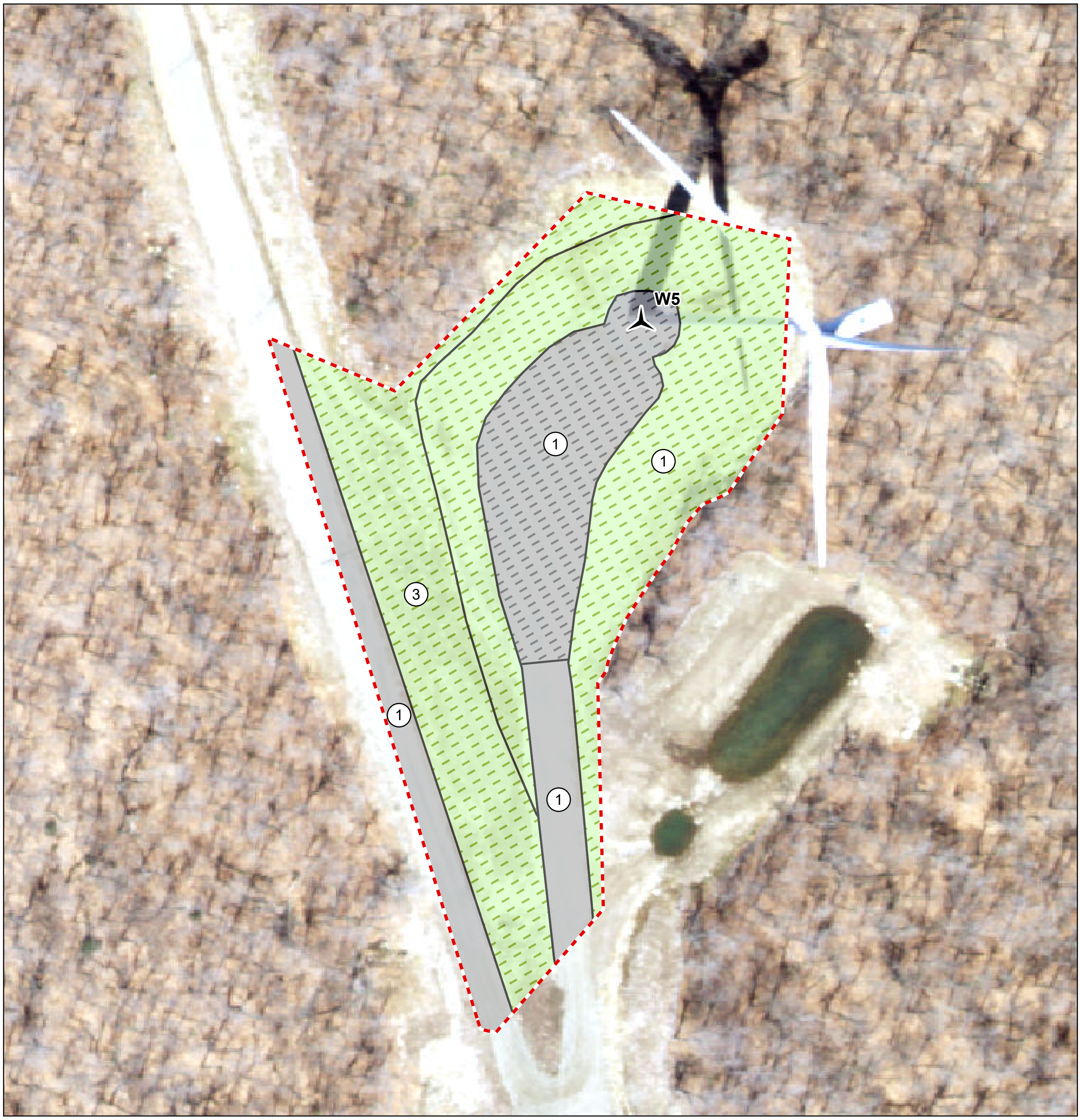
Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

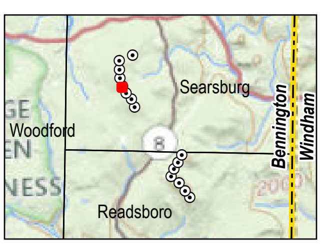
195601468

Client/Project
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
4 of 15

Title
W4 Vegetation Mapping





Legend

- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Search Plot

Visibility Rating

1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet
(At original document size of 8.5x11)
1:1,000

N

Notes

1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

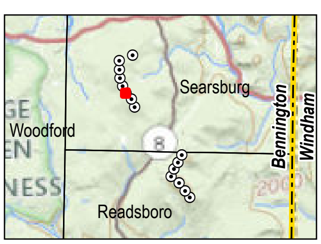
195601468

Client/Project
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
5 of 15

Title
W5 Vegetation Mapping

V:\1956\active\195601468\03_data\gis_cad\gis\MXDs\PCM\2022\01468_Deerfield_PCM_2022_VegMapping\01468_Deerfield_PCM_2022_VegMapping.aprx Revised: 2022-11-21 By: hturner



Legend

- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Search Plot

Visibility Rating

1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet
(At original document size of 8.5x11)
1:1,000

N

Notes
1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

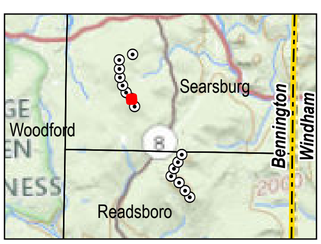
195601468

Client/Project
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
6 of 15

Title
W6 Vegetation Mapping

V:\1956\active\195601468\03_data\gis_cad\gis\MXDs\PCM\2022\01468_Deerfield_PCM_2022_VegMapping\01468_Deerfield_PCM_2022_VegMapping.aprx Revised: 2022-11-21 By: hturner



Legend

- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Search Plot

Visibility Rating

1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet
(At original document size of 8.5x11)
1:1,000

N

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

195601468

Client/Project
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
7 of 15

Title
W7 Vegetation Mapping

Notes
1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

V:\1956\active\195601468\03_data\gis_cad\gis\MXDs\PCM\2022\01468_Deerfield_PCM_2022_VegMapping\01468_Deerfield_PCM_2022_VegMapping.aprx Revised: 2022-11-21 By: hturner

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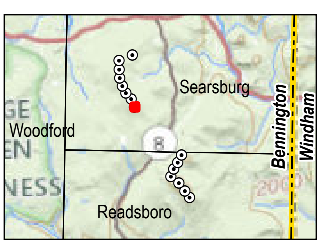


Legend

- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Rock
- Search Plot

Visibility Rating

1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet

(At original document size of 8.5x11)
1:1,000

N

Stantec

Project Location
Town of Searsburg and
Readsboro, Vermont

Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

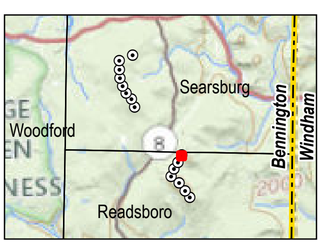
Client/Project
195601468

Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
8 of 15

Title
W8 Vegetation Mapping

Notes
1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal



Legend
- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Grass
- Search Plot

Visibility Rating
1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet
(At original document size of 8.5x11)
1:1,000

N

Notes
1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

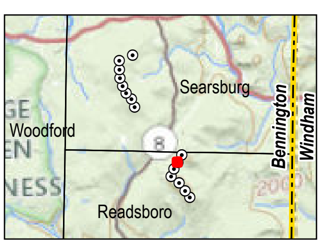
195601468

Client/Project
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
9 of 15

Title
E1 Vegetation Mapping

V:\1956\active\195601468\03_data\gis_cad\gis\MXDs\PCM\2022\01468_Deerfield_PCM_2022_VegMapping\01468_Deerfield_PCM_2022_VegMapping.aprx Revised: 2022-11-21 By: hturner



Legend
- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Rock
- Search Plot

Visibility Rating
1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet
(At original document size of 8.5x11)
1:1,000

N

Notes
1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

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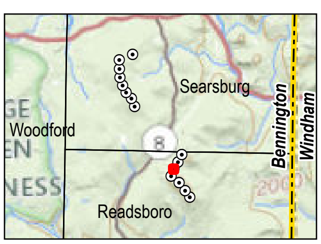
IR Review by LJ on 2022-11-00

Client/Project
195601468
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
10 of 15

Title
E2 Vegetation Mapping

V:\1956\active\195601468\03_data\gis_cad\gis\MXDs\PCM\2022\01468_Deerfield_PCM_2022_VegMapping\01468_Deerfield_PCM_2022_VegMapping.aprx Revised: 2022-11-21 By: hturner



Legend

- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Grass
- Grass/Shrub
- Rock
- Search Plot

Visibility Rating

1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet

(At original document size of 8.5x11)
1:1,000

N

Notes

1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

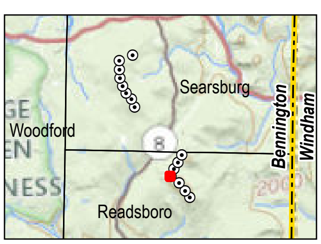
195601468

Client/Project
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
11 of 15

Title
E3 Vegetation Mapping

V:\1956\active\195601468\03_data\gis_cad\gis\MXDs\PCM\2022\01468_Deerfield_PCM_2022_VegMapping\01468_Deerfield_PCM_2022_VegMapping.aprx Revised: 2022-11-21 By: hturner



Legend

- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Grass
- Search Plot

Visibility Rating

1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet
(At original document size of 8.5x11)
1:1,000

N

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

195601468

Client/Project
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
12 of 15

Title
E4 Vegetation Mapping

Notes
1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

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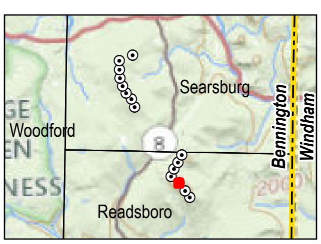

Legend

- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Grass
- Rock
- Search Plot

Visibility Rating

1 = Easy
2 = Moderate
3 = Difficult

0 — 100 Feet
(At original document size of 8.5x11)
1:1,000

N

Notes

1. Coordinate System: NAD 1983 StatePlane Vermont FIPS 4400 Feet
2. Data Sources: Stantec, Deerfield Wind, LLC
3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

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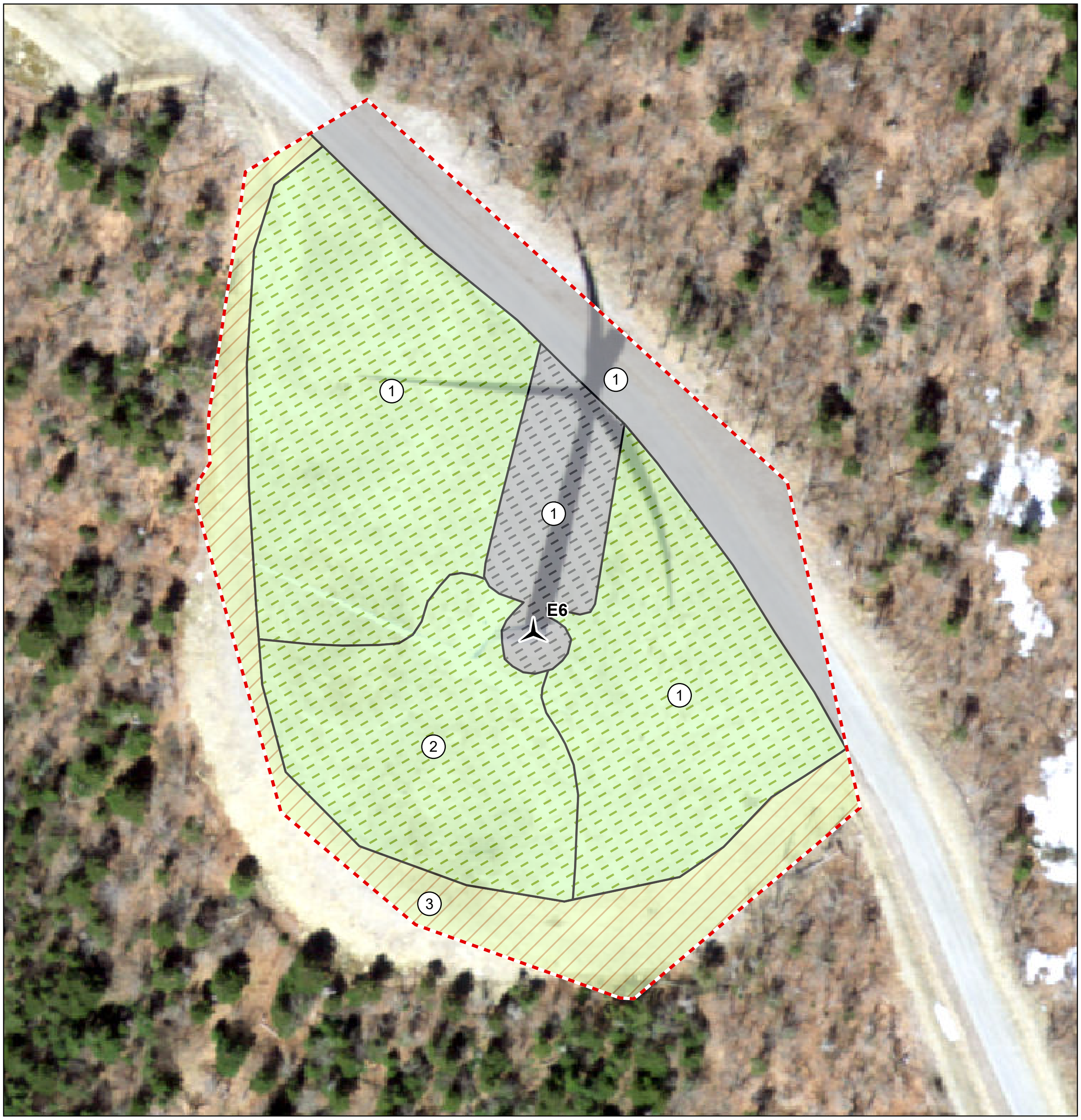
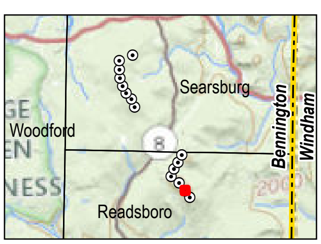
195601468

Client/Project
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
13 of 15

Title
E5 Vegetation Mapping





Legend

- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Grass/Shrub
- Search Plot

Visibility Rating

1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet
(At original document size of 8.5x11)
1:1,000

N

Notes

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3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

Stantec

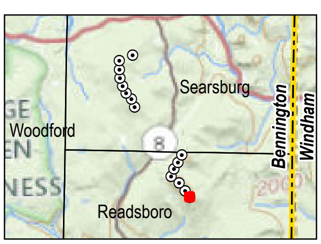
Project Location
Town of Searsburg and Readsboro, Vermont

Prepared by HCT on 2022-11-18
TR Review by KH on 2022-11-18
IR Review by LJ on 2022-11-00

Client/Project
195601468
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
14 of 15

Title
E6 Vegetation Mapping



Legend

- Turbine Location
- Pad/Gravel
- Road
- Grass/Weeds
- Grass
- Shrub
- Search Plot

Visibility Rating

1 = Easy
2 = Moderate
3 = Difficult

0 100 Feet

(At original document size of 8.5x11)
1:1,000

N

Notes

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3. Background: 2019 Orthoimagery provided by VT Open Geodata Portal

Stantec

Project Location
Town of Searsburg and Readsboro, Vermont

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195601468

Client/Project
Deerfield Wind, LLC
Deerfield Wind Project
2022 Post Construction Monitoring

Figure No.
15 of 15

Title
E7 Vegetation Mapping

V:\1956\active\195601468\03_data\gis_cad\gis\MXDs\PCM\2022\01468_Deerfield_PCM_2022_VegMapping\01468_Deerfield_PCM_2022_VegMapping.aprx Revised: 2022-11-21 By: hturner

STATE OF VERMONT
PUBLIC UTILITY COMMISSION

Amended Petition of Deerfield Wind, LLC for a certificate of public good authorizing it to construct and operate 15 turbine, 30 MW wind generation facility, and associated transmission and interconnection facilities, on approximately 80 acres in the Green Mountain National Forest, located in Searsburg and Readsboro, Vermont, with 7 turbines to be placed on the east side of Route 8 on the same ridgeline as the existing GMP Searsburg wind facility (Eastern Project Area), and 8 turbines along the ridgeline to the west of Route 8 in the northwesterly orientation (Western Project Area)	)	Docket No. 7250

CERTIFICATE OF SERVICE

I, Catie Michael, certify that on February 28, 2023, I forwarded copies of Deerfield Wind, LLC's: *Letter to the PUC re Submission of Final Report Under Bird and Bat Post-Construction Monitoring Plan* to the following service list by the delivery method noted:

By Email and First-Class Mail:
Ms. Holly Anderson, Clerk
Vermont Public Utility Commission
112 State Street, Drawer 20
Montpelier, VT 05620-2701
PUC.Clerk@vermont.gov

By First-Class Mail:
Ms. Deidre Matthews
National Grid
40 Sylvan Road
Waltham, MA 02451

By Email:
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Vermont Dept. of Public Service
112 State Street, Drawer 20
Montpelier, VT 05620-2601
erin.brennan@vermont.gov

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Vermont Dept. of Housing & Comm. Affairs
Agency of Commerce and Community Dev.
c/o John Kessler, Esq.
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Deane C. Davis Building, 6th Floor
Montpelier, VT 05620-0501
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Zakir Hakim
Deerfield Wind, LLC
Avangrid Renewables
1125 NW Couch St., Suite 700
Portland, Oregon 97209
Rob.Batarags@avangrid.com
zakir.hakim@avangrid.com

Dated at Burlington, Vermont, this 28th day of February 2023.

By:

Catie Michael
Paralegal
SRH Law PLLC