Avian Risk Assessment for the Bluestone Wind Project Broome County, New York

Report

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1.0 INTRODUCTION

Bluestone Wind, LLC (Bluestone) is developing the Bluestone Wind Project (Facility Site) in Broome County, New York). The term Facility will be used to describe the locations of infrastructure (i.e., wind turbines, access roads, etc.) and the term Facility Site will be used to describe all land parcels where infrastructure will be placed. The Facility will consist of up to 33 wind turbines, with an anticipated installed generating capacity of 124 megawatts (MW).

The Facility offers a number of environmental benefits, including generating electricity with zero carbon emissions; however, Facility construction and operating turbines may present potential risks to birds. Per the Bluestone Wind Project Stipulations, the objectives of this Avian Risk Assessment (ARA) are to evaluate the potential risk to birds (in particular federally and state-listed species) resulting from the Facility as it relates to three broad categories:

- Disturbance and alteration of habitat by construction activities;
- Behavioral avoidance of turbines and associated infrastructure (i.e., displacement); and
- Direct collision mortality.

This ARA consists of a review of all pre-construction bird studies conducted in the Facility Site (Table 1.1) and relevant public literature to evaluate the risk posed by the Facility. These studies follow the New York State Department of Environmental Conservation (NYSDEC) *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects* (Guidelines; NYSDEC 2016), which recommend that the baseline studies determine:

- To what extent the area of the proposed Facility Site is used by migrating, breeding, and wintering birds and how the physical and biological features of the proposed site and surrounding area may influence such use;
- The expected and potential direct impact to birds as a result of using the Facility Site during operation; and,
- The expected and potential indirect impact to birds and their habitats as a result of construction and operation of the Facility.

A review of the publically-available results of both the pre and post-construction studies at other wind energy projects in New York and the northeastern US are included throughout where relevant to help assess the likely impact from the Facility. In addition, on-site eagle data collected by the Delaware-Otsego Audubon Society (DOAS) and on-site eagle data collected by Western EcoSystems Technology, Inc. (WEST) were compared for similarity in observed eagle use.

Table 1.1 Survey effort at the Bluestone Wind Project, Broome County, New York.

Study Type	Study Period	Reference
Critical Issues Analysis	November 2015	Haley & Aldrich 2015
Aerial Raptor Nest Survey	March – April 2017	Ritzert 2017
Eagle Observation Surveys (Year 1 - 12 points; Year 2 - 25 points)	Year 1: March 2016 – March 2017; Year 2: April 2017 – April 2018	Ritzert et al. 2018a
Raptor Migration Surveys	August 2016 – May 2017	Ritzert et al. 2017a
Pre-Construction Breeding Bird Surveys	May – July 2017	Ritzert et al. 2017b

2.0 FACILITY SITE AND FACILITY COMPONENTS

2.1 Facility Site

Bluestone began examining site suitability and started with assessing avian resources in the Year 1 Eagle Observation Survey boundary (Figure 2.1) in March 2016. The survey area expanded to a larger area in March 2017 to encompass the Year 2 Eagle Observation Survey boundary (Figure 2.1). During the site development process, Bluestone focused infrastructure to the current Facility Site (Figure 2.1). The Facility Site encompasses approximately 23 square kilometers (km^2; 5,652 acres [ac]) in Broome County in southcentral New York (Figure 2.1). The Facility Site lies within the Northern Allegheny Plateau Ecoregion, which is characterized by rolling hills, open valleys, and low mountains (USEPA 2010). The Facility Site also falls within the NYSDEC Central Appalachians Ecological Zone of New York (Edinger et al. 2014). Elevation within the Facility Site ranges from approximately 280 meters (m; 919 feet [ft) above sea level (ASL) in the lowest valley to 617 m (2,024 ft) ASL at the highest peak.

2.2 Facility Components

The Facility will include the construction and operation of up to 33 wind turbine generators (WTG) with a nameplate generating capacity of up to 124 MW. The height of a rotating turbine to be built at the Facility, or rotor swept height (RSH), is approximately 50.5-205 m (165.7-672.6 ft) above ground level (AGL). The Facility will include access roads, underground collection lines, point of interconnection, collector substation, battery storage, and Operations and Maintenance (O&M) building (Figure 2.2). Details describing the Facility can be found in Exhibit 3 of the Article 10 Application. In general, the array of 33 turbines includes turbines distributed throughout the Facility Site in a manner that optimizes power generation and minimizes impacts to identified sensitive resources (e.g., wetlands, woodlands, etc.).

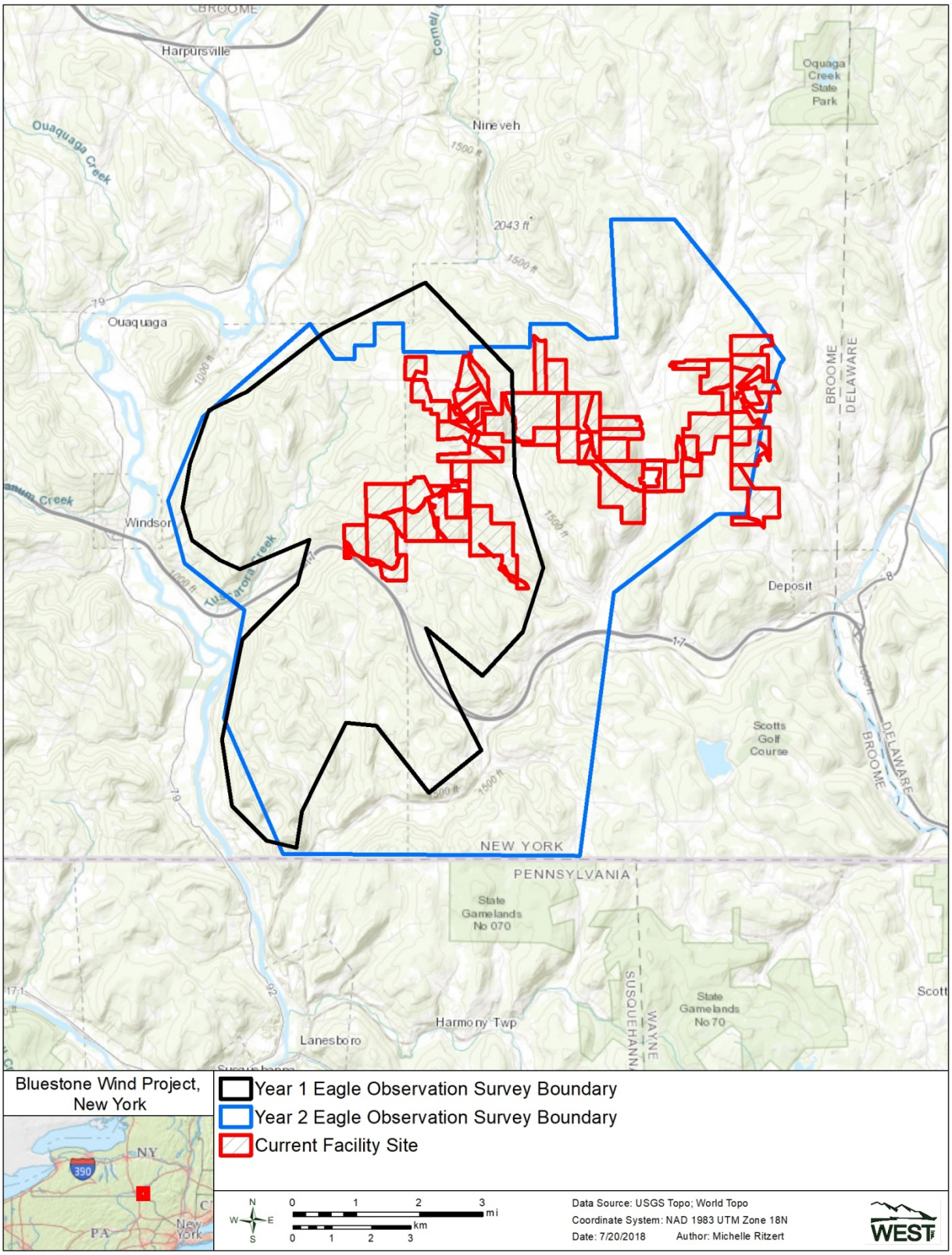

Figure 2.1 Survey area and Facility Site boundaries for the Bluestone Wind Project, Broome County, New York.

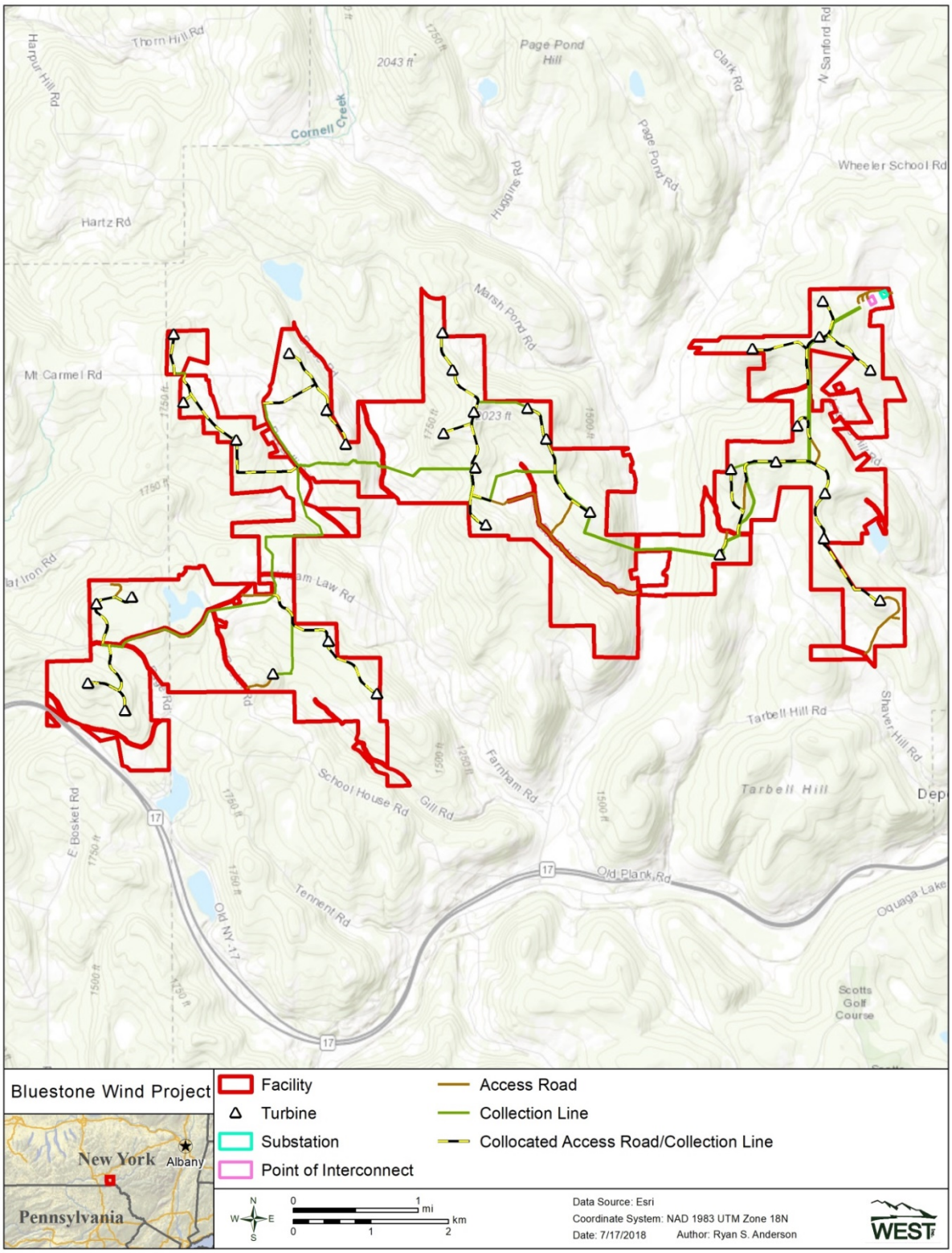

Figure 2.2 Location of the Bluestone Wind Project Facility Site and associated infrastructure in Broome County, New York.

3.0 REVIEW OF PRE-CONSTRUCTION SURVEYS

3.1 Critical Issues Analysis

A Critical Issues Analysis (CIA) was conducted in 2015, by Haley and Aldrich, to provide a preliminary assessment of potential adverse environmental impacts associated with the area of interest. The area of interest, as described in the CIA, encompasses a portion of the current Facility Area similar to the year one study area in Figure 2.1. The CIA was based primarily upon desktop review of publically available environmental and site condition data. No reconnaissance level field investigation or other site visits were performed. As a follow-up to the 2015 CIA, the potential for protected species occurrence within the Facility Area was reevaluated in 2017 by accessing the US Fish and Wildlife Service (USFWS) Information, Planning, and Conservation (IPaC) website and requesting information regarding state protected species from the New York Natural Heritage Program (NYNHP).

3.1.1 Sensitive Species Identified in the Critical Issues Analysis

At the time of the CIA, correspondence from the NYNHP on state-listed species had not been received. However, Haley and Aldrich (2015) indicated 15 birds of conservation concern[1] potentially occurred in the vicinity of the area of interest (Table 3.1). Thirteen of the species identified were listed as occurring during the breeding season, bald eagle (*Haliaeetus leucocephalus*; currently state-listed as threatened) was listed as occurring year round, and short-eared owl (*Asio flammeus*; currently state-listed as endangered) as occurring during the winter. No records of federally threatened or endangered bird species were identified within the vicinity of the area of interest at the time of the CIA.

Table 3.1. Birds of Conservation Concern identified in the Critical Issues Analysis (Haley & Aldrich 2015).

Species	Season
American bittern (*Botaurus lentiginosus)*	Breeding
bald eagle (*Haliaeetus leucocephalus)*	Year Round
black-billed cuckoo (*Coccyzus erythropthalmus)*	Breeding
blue-winged warbler (*Vermivora pinus)*	Breeding
Canada warbler (*Wilsonia Canadensis)*	Breeding
golden-winged warbler (*Verivora chrysoptera)*	Breeding
Kentucky warbler (*Oporornis formosus)*	Breeding
least bittern (*Ixobrychus exilis)*	Breeding
Louisiana waterthrush (*Parkesia motacilla)*	Breeding
pied-billed grebe (*Podilymbus podiceps)*	Breeding
prairie warbler (*Dendroica discolor)*	Breeding
red-headed woodpecker (*Melanerpes erythrocephalus)*	Breeding

[1] Birds of conservation concern are not federally threatened or endangered but represent species which USFWS has identified as a conservation priority.

Table 3.1. Birds of Conservation Concern identified in the Critical Issues Analysis (Haley & Aldrich 2015).

Species	Season
short-eared owl (*Asio flammeus)*	Wintering
wood thrush (*Hylocichla mustelina)*	Breeding
worm-eating warbler (*Helmitheros vermivorum)*	Breeding

Haley and Aldrich (2015) also reported that seven bald eagle nests occurred within 16 kilometers (km; 10 miles [mi]) of the initial area of interest and that an additional two nests were located just outside of 16 km. Several additional bald eagle nests were known to occur along the Delaware River and Cannonsville Reservoir east of the area of interest at the time of the CIA.

3.1.2 Sensitive Species Identified During Follow-up Agency Correspondence

Additional information on federally and state-listed bird species found within or near the Facility Site was solicited from the NYNHP database and USFWS IPaC database in 2017. The NYNHP database indicated the state-threatened bald eagle (also protected under the Bald and Golden Eagle Protection Act [BGEPA 1940]) and state-threatened Henslow's sparrow (*Ammodramus henslowii*) had been documented within 16 km of the Facility Site. No federally threatened or endangered bird species were identified by the IPaC database as occurring within or near the Facility Site. In addition to the 15 Birds of Conservation Concern species identified in Table 3.1, the IPaC database also identified olive-sided flycatcher (*Contopus cooperi*; currently state-listed as greatest conservation need), peregrine falcon (*Falco peregrinus*; currently state listed as endangered), and willow flycatcher (*Empidonax traillii*; currently state-listed as greatest conservation need) as *potentially* occurring during the breeding season.

3.2 Pre-Construction Field Studies

The following sections summarize the bird surveys conducted in the Facility Site. The summaries are intended to provide important results of the surveys to help assess potential impacts. The survey methods and detailed results are described in the various reports.

3.2.1 Raptor Nest Aerial Surveys

A raptor nest aerial survey was completed in 2017 (Ritzert 2017). The initial survey was conducted on March 20, 21, and 23, and a follow-up survey of recorded nests was conducted on April 18. The survey route included flying transects over the entire Facility Site to document all raptors and potential bald eagle nesting habitat within a 16-km (10-mi) buffer. Nest status was recorded following definitions from the USFWS Eagle Conservation Plan Guidance (ECPG; USFWS 2013).

No eagle nests were recorded within the Facility Site during the surveys. Twelve bald eagle nests (seven active, occupied; two inactive, occupied; and three inactive, unoccupied) were recorded in the 16-km buffer of the Facility Site. The closest active, occupied bald eagle nests were located approximately 5.1 km (3.2 mi) northwest and 5.6 km (3.5 mi) southeast of the nearest proposed turbine locations.

3.2.2 Eagle Observation Surveys

Eagle observation surveys were conducted from March 2016 to March 2017 and from March 2017 to March 2018 (Ritzert et al. 2018a) in accordance with guidelines in the USFWS ECPG (USFWS 2013) to assess risk to bald and golden eagles across the US. The objective of the Year 1 surveys was to provide information regarding levels of use of the Facility Site by eagles (bald and golden) and other large bird species, particularly raptors (defined here as kites, accipiters, buteos, harriers, falcons, and osprey). The objective of the Year 2 survey was to provide information regarding levels of eagle use of the Facility Site. The Year 2 surveys only recorded eagle and federally or state-listed species observations, as coordination with the NYSDEC and USFWS determined that no additional data on species other than eagles and state and federally listed species was needed.

The Facility Site changed between the two years of surveys (Figure 3.1). During the Year 1 surveys, a smaller Project Area was surveyed that is completely encompassed by the current Facility Site. Twelve point-count locations that were 800 m (2,625 ft) in radius and 200 m (656 ft) in height (termed “cylinders”) were surveyed once per month for one hour, for a total of 155 hours of sampling during the 2016-2017 surveys. During the Year 2 surveys, the Facility Site expanded due to a shift in focus area to incorporate new areas and landowners, increasing the size of the area to be surveyed. The USFWS was engaged between Year One and Year Two to describe the change and the change in survey effort. To account for the increase in area, 24 points were surveyed. The survey points were identical in size to the previous point counts and surveyed for one hour during each visit in Year 2. Based upon recommendations from the USFWS, survey effort was increased in Year 2 to include weekly surveys at all 24 points during fall (October 15 – December 2, 2017) and spring (February 22-March 31, 2018) to address concerns about migrating golden eagles over the Facility Site. Surveys were conducted monthly during the remainder of Year 2. A total of 563 hours of sampling were conducted during the Year 2 surveys for a total of 718 hours over two years.

The USFWS requested additional comparisons between the Project Area surveyed in Year One and Year Two to determine the similarity of the Project Areas. The USFWS determined that the Year One Project Area and Year Two Facility Site were similar and that the data collected at all EUS during both years are sufficient to address eagle risk at the Project (B. Kleuver, USFWS, pers. comm.).

3.2.2.1 <u>Eagles</u>

Eagle-minutes, either bald or golden, is each minute of observation an individual eagle was recorded within the aforementioned cylinder. Sixteen bald eagle-minutes were recorded within five of the 12 point-count cylinders during Year 1. No golden eagles were observed during Year 1. Bald eagle-minutes were evenly distributed between the five point-count cylinders with two to four eagle-minutes recorded per cylinder. Bald eagles were observed in January, May, February, and March.

During the Year 2 surveys, 191 bald eagle-minutes and 50 golden eagle-minutes were recorded. Bald eagles were recorded within all except two point-count cylinders and were

observed during all months of surveys except May and July. Golden eagles were recorded within 14 of the 24 point-count cylinders and were only observed during migration in February, March, October, November, and December.

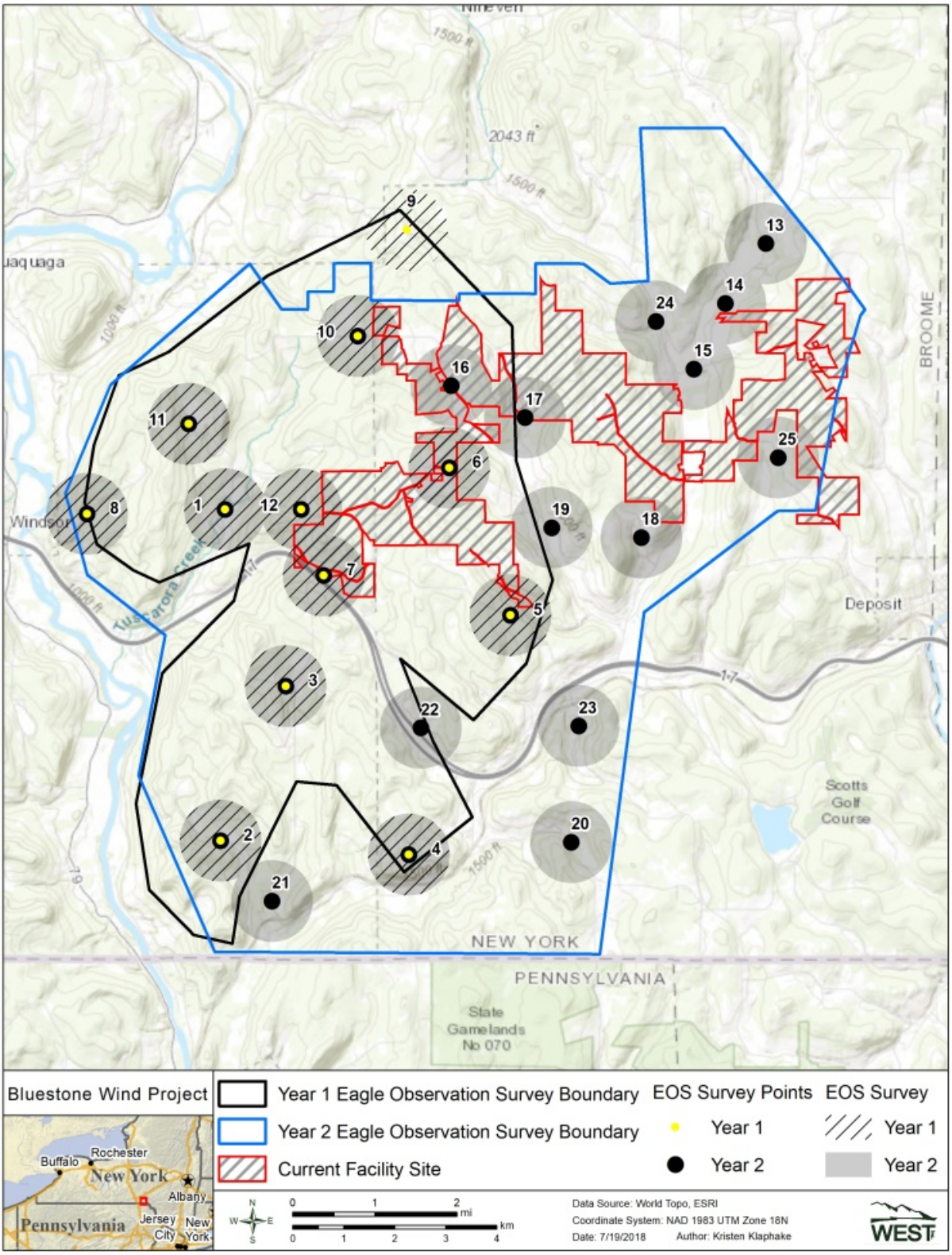

Figure 3.1 Bluestone Wind Project survey boundary changes and location of the Year 1 and Year 2 eagle observation point-count locations.

3.2.2.2 Diurnal Raptors

In addition to bald eagle, nine diurnal raptor species were recorded during the Year 1 surveys. Broad-winged hawk (*Buteo platypterus*; 35 observations) and red-tailed hawk (*Buteo jamaicensis*; 21) were the most commonly observed raptors during the Year 1 surveys, accounting for 65% of the raptor observations. Diurnal raptor use was highest during the summer, followed by spring, fall, and winter.

3.2.2.3 Waterfowl

Four species of waterfowl were observed in spring, summer, and fall during the Year 1 surveys. Canada goose (*Branta canadensis*) was the most commonly observed species and accounted for 94% of waterfowl observations. Waterfowl use was the highest during the fall, largely due to 10 groups of 194 observations of Canada goose during this time. Small groups (one to six observations) of mallards (*Anas platyrhynchos*) were observed during the spring, summer and fall, and ring-necked duck (*Aythya collaris*) and snow goose (*Chen caerulescens*) were only observed in small numbers during the spring.

3.2.2.4 Sensitive Species

No federally listed endangered or threatened species were recorded during eagle observation surveys. During both years of surveys, two state-listed endangered species (golden eagle: 32 observations and peregrine falcon: two), two state-listed threatened species (bald eagle: 214 and northern harrier [*Circus cyaneus*|: 10), and six state-listed species of special concern (common loon [*Gavia immer*]: one, Cooper's hawk [*Accipiter cooperii*]: two, northern goshawk [*Accipiter gentilis*]: four, osprey [*Pandion haliaetus*]: two, red-shouldered hawk [*Buteo lineatus*]: 12, and sharp-shinned hawk [*Accipiter striatus*]: 13 were observed. .

3.2.3 Raptor Migration Surveys

Raptor migration surveys were conducted during the fall of 2016 (August 15 – December 27) and spring of 2017 (March 16 – May 30) to estimate the spatial and temporal use of the Facility Site by migrating raptors and vultures following methods in the NYSDEC Guidelines (Ritzert et al. 2017a). Two plots were surveyed within the Facility Site during the fall and a third survey plot was added in the spring due to the expanded Facility Site, per NYSDEC and USFWS recommendations. Surveys were conducted once per week and each plot was surveyed for at least seven consecutive hours (0800 to two hours prior to sunset) per visit during conditions favorable for raptor migration during the peak period for observing migrating raptors.

3.2.3.1 Diurnal Raptors & Vultures

A total of 266 observation hours were completed during all raptor migration surveys. Thirteen unique raptor and vulture species were observed during migration surveys: 12 species in fall and 13 in spring. Including vultures, a mean of 1.18 birds/observer-hour/survey was observed in fall and a mean of 2.75 was observed in spring. The most commonly observed raptor species overall were red-tailed hawk (33) and broad-winged hawk (37).

3.2.3.2 Sensitive Species

No federally listed endangered or threatened species were recorded during raptor migration surveys. Eight state-listed species were recorded during surveys; including two endangered species (peregrine falcon [three observations] and golden eagle [seven]), two threatened species (bald eagle [29] and northern harrier [12]), and four species of special concern (Cooper's hawk [15], osprey [10], red-shouldered hawk [23], and sharp-shinned hawk [13]).

3.2.4 Pre-construction Breeding Bird Surveys

Breeding bird surveys were conducted weekly from May 16 - July 15, 2017 to investigate breeding bird use and the potential presence of sensitive or state-listed birds near areas where turbine construction was proposed and in areas away from proposed turbine construction (Ritzert et al. 2017b). Birds were surveyed along 18 300-m (984-ft) long transects placed within major vegetation types (forested and grassland/hayfield) in the Facility Site: 12 turbine transects (i.e., proposed turbine locations) and six control transects (i.e., at least 500 m [1,640 ft] from proposed turbine locations). All transects were comprised of six, 50-m (164-ft) radius point-count survey plots placed in a straight line along the transect at the following distances: 25 m (82 ft), 75 m (246 ft), 125 m (410 ft), 175 m (574 ft), 225 m (738 ft), and 275 m (902 ft). Data were collected at each point-count survey plot; the aggregate data from all six point count survey plots along a single transect were used to calculate transect-level statistics.

Ninety-six unique species of birds were observed during breeding bird surveys. The most common species were red-eyed vireo (*Vireo olivaceus*; 1,087 observations), ovenbird (*Seiurus aurocapilla*; 785*),* blue jay (*Cyanocitta cristata*; 356), chestnut-sided warbler (*Setophaga pensylvanica*; 315) and veery (*Catharus fuscescens*; 296).

3.2.4.1 Sensitive Species

Three state species of special concern were observed during surveys, including Cooper's hawk (one observation), sharp-shinned hawk (one), and red-shouldered hawk (three). Additionally, three state species of greatest conservation need (SGCN) were observed, including brown thrasher (*Toxostoma rufum*; 12 observations), Canada warbler (*Cardellina canadensis*; 22), and bobolink (*Dolichonyx oryzivorus*; 123). One state-threatened bald eagle was also observed incidentally during surveys.

3.2.5 Delaware-Otsego Audubon Society Surveys

DOAS was awarded intervenor funding through the Public Service Law Article 10 process to complete on-site fall 2017 and spring 2018 surveys of eagles and acquire global positioning system (GPS) tracking data of golden eagles from Conservation Science Global (see below). The data presented in the DOAS reports (DOAS 2017, 2018) and summarized below is consistent with WEST data and does not present data that would result in WEST altering eagle risk for the Facility Site.

3.2.5.1 DOAS On-Site Surveys

DOAS completed 23 on-site surveys at a single survey location in fall (October 25 – November 27, 2017; DOAS 2017) and 15 surveys were completed at a separate survey location in spring (March 4 – March 22, 2018; DOAS 2018).[2] DOAS completed 148 hours of observation during fall surveys and 105 hours of observation during spring surveys (DOAS 2017, 2018).

DOAS data was collected according to DOAS' NYSDEC and USFWS reviewed protocol that is similar to Hawk Migration Association of North America (HMANA) data collection standards. The fall survey location was located near the south edge of the Facility Site on Cliff Road in Sanford. The spring survey location was on North Sanford Road between Loomis Hill Road and Page Pond Road east of the hamlet of Sanford near the north edge of the Facility Site. Surveys were conducted during favorable raptor migration conditions. Each DOAS survey was 7-8 consecutive hours per visit (DOAS 2017, 2018). Surveys were conducted by nine different observers (five observers during fall and seven observers during spring; DOAS 2017, 2018).[3]

No federally listed endangered or threatened species were recorded during DOAS surveys. Six state-listed species were recorded during surveys: including one endangered species (golden eagle), two threatened species (bald eagle and northern harrier), and three species of special concern (red-shouldered hawk, northern goshawk, and sharp-shinned hawk).

3.2.5.2 Fall 2017 Survey

During fall surveys, DOAS observed 12 unique raptor and vulture species. The most commonly observed species by DOAS was red-tailed hawk and turkey vulture (*Cathartes aura*; DOAS 2017).

During the fall survey, DOAS observed 15 migrating bald eagles and 35 migrating golden eagles (DOAS 2017). DOAS characterized eagles as migratory if the eagle moved "persistently or deliberately in a direction" generally ranging from north to east. [4]

No non-migratory eagles (bald or golden) were observed by DOAS during fall surveys (DOAS 2017). DOAS characterized non-migratory eagles as eagles that were not persistently or deliberately flying in a general direction and eagles that were observed perching, foraging, and

[2] In its report, DOAS recognized the limitations imposed by having a single survey location. The single location may have impeded or limited DOAS' observations of eagles and potentially contributed to the same individual eagle being counted multiple times (DOAS 2018).

[3] By contrast to the DOAS survey methods, WEST methods followed standards recommendation in Appendix C of the USFWS ECPG (USFWS 2013) that meet the data standards set by the USFWS to be utilized in the collision risk model to apply for a USFWS eagle take permit (B. Kleuver, USFWS, pers. comm.). WEST methods included: spatial coverage across all areas considered for development, minute-by-minute data on eagle flight height and behavior, and surveys across all seasons for two years. WEST conducted hour long surveys. In addition, WEST utilized the same two biologists to complete all eagle use surveys across two years.

[4] WEST did not differentiate between migratory and non-migratory eagles. However, WEST did record flight paths and perched locations of all eagles observed and collected behavior and flight height information every minute an eagle was in view during each survey per the USFWS ECPG (USFWS 2013).

generally moving within the survey area. The lack of non-migratory eagles in the fall of 2017 may have been attributable to consistent desirable raptor migration conditions allowing eagles to migrate through the region.

3.2.5.3 Spring 2018 Survey

During the spring survey, DOAS observed eight unique raptor and vulture species. The most commonly observed species by DOAS was bald eagle. During spring surveys DOAS observed 42 migrating bald eagles and 22 migrating golden eagles (DOAS 2018).

DOAS reported 218 sightings of non-migratory bald eagles and 20 non-migratory golden eagle sightings during spring 2018 surveys (DOAS 2018). DOAS's spring report acknowledges that many of the non-migratory bald eagle sightings were "distant in an area where ridges confine a narrow valley" and that "it became impossible to clearly count or identify individuals" and "after the first day of surveys, USFWS was immediately contacted to discuss how these birds should be documented. After discussion with USFWS, the method of documenting non-migrant Bald Eagles was changed from a count of individual birds to the documentation of 'sightings' which would include possible multiple views of a single bird. Surveyors were directed to document every sighting and instructed to record as one sighting any eagle that leaves their view briefly, then returns, with the surveyor confident it is the same bird." (DOAS 2018)

3.2.5.4 Discussion

DOAS bald and golden data from the single fall 2017 survey location were compared to eagle data from a WEST survey plot (survey plot 4; Figure 3.1 [REDACTED]) during the same fall time period. The DOAS fall 2017 survey location and WEST survey plot 4 are identical locations. Based upon DOAS data, DOAS volunteers reported seeing 0.1 bald eagles per hour and 0.2 golden eagles per hour. WEST data showed similar eagle use for both species of 0.3 bald eagles per hour and 0.3 golden eagles per hour. The fall data comparison show similar levels of bald and golden eagle use recorded by DOAS and WEST at that identical location.

DOAS data from the single spring 2018 survey location was compared to eagle data from WEST survey plots 13, 14, and 15 (Figure 3.1 [REDACTED]) for the same spring period. Those WEST survey plots were located in the same valley and in close proximity to the DOAS spring location. For purposes of this comparison, all DOAS eagle sightings (migratory and non-migratory) were compared against all WEST sightings at these locations. Based upon DOAS data, DOAS volunteers reported seeing 2.5 bald eagles per hour and 0.4 golden eagles per hour. WEST data showed similar results of 1.9 bald eagles per hour and 0.4 golden eagles per hour. Therefore, DOAS and WEST both observed 0.4 golden eagles per hour and DOAS only observed 0.6 more bald eagles per hour.

Similarities in the fall and spring eagle use data demonstrate that relative number of eagles observed by DOAS were captured by WEST data and are represented and included in the risk assessment and eagle take estimate in the Net Conservation Benefit Plan using WEST data (Ritzert et al. 2018b). The DOAS reports (DOAS 2017, 2018) do not contain data that would result in WEST altering eagle risk at the Facility Site.

3.2.6 Telemetered Golden Eagle Data

The intervenor funding awarded to the DOAS acquired tracking data from GPS'd golden eagles from Conservation Science Global. These data provide broad-scale use of the surrounding landscape by tracked golden eagles over nine consecutive years. Those data were plotted in relation to the location of proposed turbine locations in Figures 3.2 – 3.4 [REDACTED]. The data show that over the nine years of data represented use over the Facility Site was lower than the surrounding landscape and that most golden eagle telemetered flights height were recorded above the rotor swept height for turbines that are being considered for construction. The low number of golden eagle flight paths over the Facility Site and the flight heights of those golden eagles above the rotor swept height indicate that migrating golden eagles may not be at high risk of collision with turbines at the Facility Site.

Figure 3.2 [REDACTED] Fall locations (2007-2016) of telemetered golden eagles (*Aquila chrysaetos*) in relation to the turbines scheduled for construction at the Bluestone Wind Project, Broome County, New York.

Figure 3.3 [REDACTED] Spring locations (2008-2017) of telemetered golden eagles (*Aquila chrysaetos*) in relation to the turbines scheduled for construction at the Bluestone Wind Project, Broome County, New York.

Figure 3.4 [REDACTED] Winter locations (2016) of telemetered golden eagles (*Aquila chrysaetos*) in relation to the turbines scheduled for construction at the Bluestone Wind Project, Broome County, New York.

4.0 RISK ASSESSMENT

Impact to birds from wind energy development is generally believed to include temporary and permanent disturbance resulting from alteration of habitat, behavioral avoidance of turbines, and direct collision mortality. For each of these risk categories, the results from monitoring in the Facility Site are reviewed in the context of results from nearby operating wind energy projects and in the broader context of what is known about the effects of wind energy on birds. Conclusions based on the available data and results are drawn for each risk category.

4.1 Disturbance and Alteration of Habitat by Construction

Each turbine will require approximately 0.03 km^2 (6.49 ac) of temporary disturbance to excavate foundations and construct the turbine. For the turbine sites a 91.44 m (300 ft) radius area centered on the turbine will be temporarily cleared of vegetation during construction. The remainder of the cleared area around the turbine will be revegetated. Disturbed areas will be restored to preconstruction contours and revegetated up to the access road and crane pad edges. The result will be habitat loss of approximately less than 0.10 km^2 (0.20 ac) per turbine or approximately 0.03 km^2 (6.60 ac) for all the turbines (Figure 2.2).

Approximately 62.76 km (39.04 mi) of 34.5-kV underground collection lines will be installed to transfer power from the turbines to the collector substation. These are installed greater than 0.91 m (3 ft) below ground surface via trenching, which results in temporary disturbance of 6.93 km^2 (1,713.25 ac) that is fully restored and revegetated following installation. No significant habitat loss is expected from the underground collection lines.

Approximately 29.69 km (18.45 mi) of roads will be constructed. Temporary disturbance to install these roads will result in 5.61 km^2 (1,385.32 ac) and permanent habitat loss will result in 0.14 km^2 (35.79 ac).

In addition, the batch plant, staging area, collector substation, O&M building, construction laydown area, and borrow area will result in a temporary loss of approximately 0.12 km^2 (29.93 ac) and permanent habitat loss will result in 0.01 km^2 (2.95 ac).

In total, the temporary habitat loss will be approximately 8.14 km^2 (2,012.53 ac) and permanent habitat loss will be approximately 0.30 km^2 (73.73 ac; approximately 1.3% of the total Facility Site; Figure 2.2).

4.2 Construction-Related Impacts to Birds

Facility construction may result in both indirect and direct impacts to birds. Indirect effects from construction include habitat loss or modification, and displacement or disturbance associated with increased human presence and noise from construction activities. Facility components have been sited to avoid and minimize impacts to undisturbed habitat with a goal of reducing impacts to birds occurring in the area. Approximately 8.1 km^2 of potential habitat will be temporarily disturbed during construction. Any displacement or disturbance impacts during construction would be temporary and localized, and therefore unlikely to have significant long-term effects to any particular species using the area.

Direct impacts from construction may include incidental injury or mortalities due to construction equipment. Potential mortality is expected to be low as equipment used in wind energy facility construction generally moves at slow rates or is stationary for long periods (e.g., cranes). The highest risk of direct mortality to birds from construction is the potential destruction of a nest during initial tree clearing. Tree clearing at the Facility Site is anticipated to occur outside of the active nesting season for forested birds from November 1 to March 31. If tree clearing needs to occur during the nesting season for forested birds (May 15 – July 15) or eagles (February 1 – April 30), Bluestone will follow the Avoidance and Minimization Measures outlined in the Net Conservation Benefit Plan (Ritzert et al. 2018b).

4.3 Operational-Related Impacts to Birds

Operational-related impacts to birds include indirect disturbance or displacement due to the presence of the Facility and direct impacts resulting from collisions. These impacts are discussed in the sections below.

4.3.1 Indirect Impacts: Disturbance or Displacement

The operation of wind turbines and other Facility infrastructure will result in habitat alteration and potential disturbance to specific species. As described in the Habitat fragmentation Analysis (Ritzert et al. 2018c), the total amount of habitat lost due to Facility components represents a very small percentage of the overall Facility Site, which will remain relatively unchanged by development of the Facility. However, indirect impacts such as disturbance or displacement to some bird species can also result from operation of the Facility. These potential impacts are addressed below.

4.3.1.1 Breeding Birds

Indirect impacts, such as disturbance or displacement, are most likely to affect breeding birds, since they remain in the vicinity of the turbines for extended periods of time. Breeding birds that are displaced may move to areas with fewer disturbances that provide lower quality or currently occupied habitat, which could affect breeding success.

Available post-construction studies have indicated some level of displacement of breeding birds in locations that are in close proximity to operational turbines; however, most of the displacement studies have been in grassland habitats where small displacement effects from approximately 100 m (328 ft) to 200 m (656 ft) have been reported (see for example Johnson et al. 2000, Leddy et al. 1999, Osborn et al. 1998). Displacement impacts to grassland species are expected to be minimal due to the limited amount of grasslands in the Facility (0.3% of Facility Site; US Geological Survey [USGS] National Land Cover Database [NLCD] 2011, Homer et al. 2015]).

There is little information available on indirect effects from wind turbine facilities on eastern forest birds. In a forested setting, breeding bird surveys conducted prior to, during, and after construction of the Green Mountain Power Corporation's Wind Power Facility in Searsburg, Vermont, the same diversity of species was detected during three survey periods following construction of the project; however, abundance and frequency of species occurrence at the study sites changed over the three periods (Kerlinger 2002a). Kerlinger (2002a) found that abundance of forest interior species declined, while abundance of habitat generalists increased from that documented during preconstruction studies. At the Marble River Wind Farm, which is located in northeastern New York in an agricultural and forested setting, surveys to monitor breeding bird avoidance of turbines indicated there may have been some avoidance by bird species; however, the overall results were inconclusive as no consistent trends were detected across bird types or species (Bay et al. 2015).

Some degree of displacement to breeding birds in the direct vicinity of turbines is anticipated for certain species as habitat will be altered and human activity will increase. Bird species documented during the breeding bird surveys in the Facility Site such as red-eyed vireo, ovenbird, black-throated green warbler (*Setophaga virens*), and Canada warbler have shown sensitivity to disturbance from wind energy development (Kerlinger 2002a). However, given the small amount of habitat in which displacement could occur compared to the total habitat available in the area surrounding the Facility, such displacement is not expected to adversely affect the viability of local populations. Additionally, if individuals of these species are displaced from the Facility Site, it is unclear if displacement impacts would persist for the life of the Facility, given that many species likely habituate to the presence of turbines as well as other anthropogenic disturbance (Ornithological Council 2007).

Avoidance of wind turbines by nesting raptors has only been reported in one study (Usgaard et al. 1997), while several studies have shown no avoidance behavior by nesting raptors (Erickson et al. 2004; Johnson et al. 2000, 2003). Avoidance behavior by nesting raptors was documented at the Buffalo Ridge facility in Minnesota, where raptor nest density on 262 km^2 (101 square miles [mi^2]) of land surrounding the wind energy facility was 5.94 nests/101 km^2 (39 mi^2), yet no nests were present in the 31 km^2 (12 mi^2) facility itself, even though habitat was similar (Usgaard et al. 1997). However, this analysis assumes that raptor nests are uniformly distributed across the landscape (an unlikely event), and only two nests would be expected for an area 12 mi^2 in size if the nests were distributed uniformly. Based on extensive monitoring using helicopter

flights and ground observations, raptors continued to nest at the Stateline wind energy facility in eastern Washington at approximately the same levels after construction, and several nests were located within a half-mile of turbines (Erickson et al. 2004). At the Foote Creek Rim wind energy facility in southern Wyoming, one pair of red-tailed hawks (*Buteo jamaicensis*) nested within 0.5 km (0.3 mi) of the turbine strings, and seven red-tailed hawk nests, one great horned owl (*Bubo virginianus*) nest, and one golden eagle nest located within 1.6 km (1.0 mi) of the wind energy facility successfully fledged young (Johnson et al. 2000). The golden eagle pair successfully nested 0.8 km (0.5 mi) from the facility for three different years after the facility became operational. In Oregon, a Swainson's hawk (*Buteo swainsoni*) also nested within 0.4 km (0.25 mi) of a turbine string at the Klondike I wind energy facility after the facility was operational (Johnson et al. 2003).

Although studies on the effects of bird displacement at wind energy facilities are limited, in particular for forested regions, most suggest indirect effects to be negligible or immeasurable (Erickson et al. 2003, Howell and Noone 1992, Johnson et al. 2000a, 2002b, Madders and Whitfield 2006, Piorkowski 2006). Additionally, reduced attractiveness of the area around turbines could be considered beneficial, as decreased use may reduce exposure to turbines and collision risk.

4.3.1.2 Waterfowl, Waterbirds, and Shorebirds

Potential displacement impacts to waterfowl, waterbirds, and shorebirds from Facility construction and operation are not expected to be significant. Open water habitats preferred by these species are limited within the Facility Site (0.5% of area; USGS NLCD 2011; Homer et al. 2015) and wind turbines will be sited in upland areas. Canada goose comprised the majority of waterfowl, waterbird, and shorebird use recorded during pre-construction and overall use by these groups was low. In addition, two years of post-construction surveys at a wind farm in Iowa that experienced high use by waterfowl due to its proximity to three wildlife management areas showed no displacement of waterfowl (Jain 2005). Based on these study results and the lack of preferred habitat present, the Facility is not anticipated to have significant displacement impacts to waterfowl, waterbirds, and shorebirds.

4.3.1.3 Raptors

Most studies on raptor displacement at wind energy facilities indicate displacement effects to be negligible (Howell and Noone 1992; Johnson et al. 2000, 2003; Madders and Whitfield 2006). Notable exceptions include a study in Scotland that described territorial golden eagles avoiding the entire wind energy Facility Site, except when intercepting non-territorial birds (Walker et al. 2005). Hen harriers (also known as northern harriers) and buzzards (*Buteo buteo*) showed reduced flight activity around turbines at a wind energy facility in Europe (Pearce-Higgins et al. 2009). A study in Wisconsin found that raptor abundance was 47% less post-development compared to pre-construction levels; however, whether this possible displacement effect will remain constant over time, become more pronounced, or decrease through habituation was unknown (Garvin et al. 2011). Finally, a study at the Buffalo Ridge wind energy facility in Minnesota found evidence of northern harriers avoiding turbines on both a small scale (less than 100 m [328 ft] from turbines) and a larger scale (105 – 5,364 m [344 – 17,598 ft]) in the

year following construction (Johnson et al. 2000). The northern harriers appeared to habituate to the facility, with no large-scale displacement of northern harriers detected two years after the facility was built (Johnson et al. 2003).

4.3.1.4 Eagles

Some displacement of bald eagles may occur due to construction and operation as Buehler et al. (1991) demonstrated that bald eagles tend to avoid development. However, the bald eagle population continues to increase rapidly in New York and the species has been observed using and showing compatibility in areas with higher human presence (72 FR 37359). The most suitable foraging habitat within the Facility Site is the small pond present in the southern portion and indirect impacts to this potential bald eagle foraging areas are expected to be minimal as Facility components will be sited in upland areas. Indirect impacts to nesting bald eagles are also expected to be minimal as no nesting bald eagles were documented in the Facility Site during aerial nest surveys. Bald eagles are more likely to nest outside of the Facility Site along the Susquehanna River and Cannonsville Reservoir as these areas likely provide more suitable nesting locations with associated foraging opportunities needed for successful bald eagle nests. Indirect impacts to golden eagles are also expected to be minimal due to the limited amount of suitable habitat within the Facility.

4.3.2 Direct Impacts: Collision Mortality

Turbines pose a collision risk for birds and every wind energy facility in the US likely results in some bird mortality. Avian fatality rates have been fairly consistent across the US at most wind energy facilities that have been studied with appropriate methods. Evaluation of 63 studies across the US of avian fatality estimates at 36 projects shows that fatality rates ranged from less than 0.50 birds/MW/year to approximately 14.0 birds/MW/year, but 42 of the 63 studies reported bird mortality rates of three birds/MW/year or fewer (Strickland et al. 2011). In the northeastern US (New York, Maine, New Hampshire, Maryland, and Pennsylvania) avian fatality rates have ranged from 0.7 birds/MW/year to 6.95 birds/MW/year at 24 wind energy facilities (44 studies; Appendix A) and at 10 facilities (17 studies) in New York bird fatality rates have ranged from 0.83 birds/MW/year to 2.66 birds/MW/year (Jain et al. 2009a, 2009b, 2009c, 2009d, 2010a, 2010b, 2010c, 2011a, 2011b, 2011c; Stantec 2009b, 2010, 2011; Tidhar et al. 2012a, 2012b, 2013b).

4.3.2.1 Migratory Landbirds

Bird fatality rates have been observed to peak during the spring and fall migration seasons at most wind energy facilities (Johnson et al. 2002, Erickson et al. 2014). Based upon differences in abundance, use of habitat, and behavior, bird types have experienced varied direct impacts from wind turbines. Table 4.1 shows the general distribution of fatalities across bird types, as reported by 67 publicly available post- construction mortality studies conducted at 30 different locations in varied habitat types (e.g., agricultural, upland, forested ridgeline, coastal, and grassland) in the northeastern US and southern Ontario, Canada region. Eighteen bird types were documented either during standard searches or as incidental observations at the various facilities. Passerines (i.e., songbirds), which are by far the most abundant group accounted for the highest percentage of wind-related fatalities in the region (Table 4.1) and across the US as a

whole (National Wind Coordinating Collaborative 2010, Erickson et al. 2014). Nocturnal migrant passerines are the bird type most commonly found at wind projects (National Research Council [NRC] 2007, Erickson et al. 2014).

Large-scale night migration-related mortality events of the type seen at communications towers (e.g., see Erickson et al. 2005) are rare at wind energy facilities. Generally, the few large-scale mortality events documented at wind energy facilities have been determined to be due to improper lighting (e.g,. upward facing lights at substations, lights left on in nacelles, etc.), and minimization measures for facility lighting have since been developed to minimize such avian attractants (Stantec 2011a and Young et al. 2004). Provided the Facility implements a light management plan (downward facing and motion-activated lights as practicable, intermittent FAA lighting, leaving lights off in nacelles, etc.), collision risk is expected to be low for migratory landbirds in the Facility.

Table 4.1 Documented avian fatalities at wind energy facilities between 1997 and 2014 in the northeastern US and southern Ontario, Canada. (Note: Data represent individuals found and are not estimates of annual mortality; data were not corrected for biases related to searcher efficiency or carcass persistence).

Bird Type	# Individual Observations	% of Total Fatalities
Passerines (Songbirds)	1,788	71.8
Unidentified Birds	169	6.8
Raptors	101	4.1
Upland Game Birds	72	2.9
Shorebirds	61	2.4
Cuckoos	53	2.1
Vultures	47	1.9
Gulls/Terns	42	1.7
Waterfowl	35	1.4
Doves/Pigeons	34	1.4
Woodpeckers	32	1.3
Swifts/Hummingbirds	26	1.0
Large Corvids	13	0.5
Waterbirds	5	0.2
Kingfishers	4	0.2
Goatsuckers	3	0.1
Owls	2	0.1
Rails/Coots	2	0.1
Loons/Grebes	1	<0.1
Total	**2,490**	**100**

Northeastern projects with publicly available fatality data are listed in Appendix A.

4.3.2.2 Waterfowl, Waterbirds, and Shorebirds

Although waterfowl, waterbird, and shorebird, mortality at wind energy facilities has been highly variable, national research has demonstrated that these groups rarely collide with inland turbines (Everaert 2003, Kingsley and Whittam 2005). Of publically-available information of wind projects in the northeastern US; waterfowl, waterbirds, and shorebirds comprised approximately 4% of all bird mortality (Table 4.1). Waterfowl do not seem especially vulnerable to turbine collisions and significant impacts are not likely based on available evidence. The relatively low percentage of waterfowl fatalities has been consistent in fatality studies for wind energy facilities

throughout the region and US. For example, at nine wind energy facilities in the Midwest and western US, waterfowl made up 2.5% of the 1,033 fatalities (Erickson et al. 2001). The NRC analyzed data from 14 studies (including four also used in Erickson et al. 2001) throughout the US and found that waterfowl composed about 2.0% of fatalities (NRC 2007). Johnson and Stephens (2011) summarized results from 21 fatality monitoring studies in western North America and found that waterfowl, primarily mallards, accounted for 1.9% of 1,247 avian fatalities. Finally, Johnson and Erickson (2011) reported a cumulative fatality rate of 2.1% for water-dependent species (waterfowl, waterbirds, and shorebirds combined) for 25 1-year studies at 23 wind energy facilities in the Columbia Plateau Ecoregion of Oregon and Washington.

At the Facility, waterbird, waterfowl, and shorebird use was documented during the year 1 eagle observations surveys and during the raptor migration surveys if groups of greater than 50 individuals were observed per NYSDEC Guidelines (see section 3.2.2). Use was mostly comprised of Canada goose observations and other species were observed in relatively low numbers. While the Facility will expose low numbers of waterbirds, waterfowl, and shorebirds to risk from the turbines, the available data suggests that impacts will be low generally due to low collision impacts for these bird types and generally low use of the Facility Site.

4.3.2.3 Raptors

The raptor migration surveys completed by WEST showed similar low numbers of raptor migration (excluding vultures) as on-site data recorded by DOAS, which was much lower compared to Hawk Migration Association of North America locations in the region (Table 4.2). High concentrations of migrating raptors are not expected as topographic and physiographical features of the Facility Site do not appear to be conducive to concentrating migrant raptors: the Facility Site is located in an area of rolling hills and there are no prominent north-south trending ridgelines. The most frequently observed raptor species were red-tailed hawk and broad-winged hawk, both of which are relatively common species. Across the northeastern US and eastern Canada, raptors comprised only 4.2% of observed mortality (Table 4.1). In New York, post-construction monitoring data available from ten facilities (17 studies) revealed that raptor mortality averaged 0.12 raptors/MW/year and ranged from zero to 0.59 raptors/MW/year (Jain et al. 2009a, 2009b, 2009c, 2009d, 2010a, 2010b, 2010c, 2011a, 2011b, 2011c; Stantec 2009b, 2010, 2011; Tidhar et al. 2012a, 2012b, 2013b). Given the moderate raptor use at the Facility, and the results of mortality monitoring studies at other New York wind facilities, raptor fatality rates at the Facility are expected to be similar to those at other northeastern wind facilities and unlikely to adversely impact raptor populations.

Table 4.2 Seasonal raptor data (number of raptor[1] observations per observer hour) collected at the Bluestone Wind Project (Western EcoSystems Technology, Inc. [WEST] and Delaware-Otsego Audubon Society [DOAS]) compared to nearby Hawk Migration Association of North America (HMANA) sites.

	HMANA Site/Survey Site					
Season	**WEST**	**DOAS**	**Franklin Mountain**	**Hawk Mountain**	**Waggoner's Gap**	**Tussey Mountain**
Fall	0.46	1.35	7.24	14.87	18.59	-
Spring	1.43	1.04	-	6.01	-	5.17

4.3.2.4 Eagles

Bald Eagle

During both years of eagle observation surveys conducted by WEST according the USFWS ECPG, 214 bald eagle observations were recorded with 96 bald eagles recorded during the spring and fall migration (Ritzert et al. 2018a).[5]

During DOAS' surveys, bald eagles were observed congregating near the northeastern portion of the Facility Site in the spring (this behavior was not observed in the fall), which is consistent with WEST eagle flight path maps that show increased eagle flight paths in the northeastern portion of the Facility Site (Ritzert et a. 2018a). After discussing the observations with locals, DOAS reported that there were several gut piles and bait piles presumably for coyote hunters in the area (DOAS 2018). The presence of the gut and bait piles were the likely attractant for these bald eagles. Taking efforts to remove the bait piles, as is proposed in the Best Management Practices in the Net Conservation Benefit Plan (Ritzert et al. 2018b), may help reduce the number of bald eagles in this area and reduce collision risk.

Out of 56 US publicly available reports that include either pre- or post-construction use surveys, seasonal bald eagle observation rates during fixed point surveys vary between zero and 0.09 bald eagle/20-min survey, with the highest numbers reported during winter in the Pacific Northwest. Twenty-eight of the 56 facilities also have a publicly available post-construction monitoring report and no bald eagle fatalities were discovered during these standard monitoring surveys. No bald eagles have been found as mortalities in New York or in Pennsylvania from 2007 to 2011 based on bird mortality data the Pennsylvania Game Commission (PGC) has collected from wind operators (PGC 2012). Since 2003, there have been 18 publicly reported bald eagle fatalities in the US and two in Canada (U. Kirkpatrick USFWS, pers. comm.). Three of the bald eagle fatalities occurred in the Northeast; one occurred in Maryland at a non-utility scale turbine, and two at a wind energy facility in Ontario, Canada.

[5] In contrast to the DOAS surveys, WEST did not differentiate between migratory and non-migratory bald eagles during the migration period as it was assumed all bald eagles observed during that time were migrating through and if they remained in the area would be observed and counted again during subsequent seasons of observation. In practice, when comparing WEST and DOAS data of total numbers of eagles observed (migratory and non-migratory) in the location of the DOAS survey points, the data collected by DOAS and WEST appear consistent.

The data collected on-site and from publically-available information suggest that there is a low risk to bald eagles at the Facility Site because bald eagles commonly soar at high altitudes while migrating, well above the RSH, but they occasionally flap low over treetops near waterbodies and marshes within the RSH when foraging (NYSDEC 2016a). However, no large waterbodies that bald eagles may use for foraging are located in the Facility Site. Areas outside of the Facility Site such as the Susquehanna River and Cannonsville Reservoir likely provide better foraging opportunities for bald eagles than the Facility Site. Additionally, no bald eagle nests were found in the Facility Site. The closest active bald eagle nests were documented near the Susquehanna River and Cannonsville Reservoir, approximately 5.1 km (3.2 mi) and 5.6 km (3.5 mi) from the closest proposed turbine, respectively. Additionally, raptor migration surveys (Table 4.2) show that raptor pass rates recorded by WEST and DOAS in spring and fall are very low compared to other prominent HMANA survey sites known for large concentrations of migrating raptors in spring and fall. Estimated bald eagle take as discussed in the Net Conservation Benefit Plan (Ritzert et al. 2018b) and are expected to be low and at levels consistent with a stable and growing bald eagle population.

Golden Eagle

During both years of eagle observation surveys conducted by WEST according the USFWS ECPG, 27 golden eagle observations were recorded evenly distributed between the spring and fall migration seasons.

No nesting golden eagles are known in New York and the highest known densities of nesting golden eagles are in eastern Canadian provinces. The highest known densities of wintering golden eagles are in Central Appalachia in West Virginia and Virginia. Therefore, the primary times that golden eagles may occur over the Facility Site are during spring and fall migration as demonstrated by the on-site survey data.

Out of 56 US publicly available reports that include either pre- or post-construction use surveys, seasonal golden eagle observation rates during fixed point surveys vary between zero and 0.49 golden eagle/20-min survey, with the highest numbers reported during winter in the Pacific Northwest and Rocky Mountains. Twenty-eight of the 56 facilities also have a publicly available post-construction monitoring report and 49 golden eagle fatalities were discovered during these standard monitoring surveys; however, none have been reported in the northeastern US. All known golden eagle fatalities at wind energy facilities are from Wyoming, California, Oregon, Nevada, and Michigan (Pagel et al. 2013). No golden eagles have been found as mortalities in New York or in Pennsylvania from 2007 to 2011 based on bird mortality data the PGC has collected from wind operators (PGC 2012

Data collected on-site and publically-available information indicate that there is a low risk to golden eagles from the Facility Site. Raptor migration surveys (Table 4.2) show that raptor pass rates recorded by WEST and DOAS in spring and fall are very low compared to other prominent HMANA survey sites, specifically the Franklin Mountain HawkWatch known for large concentrations of fall migrating golden eagles. Additional data suggest that risk to golden eagle

due to the Facility Site is low based on the level of golden eagle use observed during eagle use surveys at the Facility, the seasonality of golden eagle use (i.e., only observed during migration), the path of telemetered golden eagles during spring and fall migration, the flight height of telemetered golden eagles during spring and fall migration, the lack of known golden eagle nests in New York, the absence of any golden eagle fatalities recorded in New York during standardized post-construction monitoring, and no golden eagle fatalities recorded in the eastern US during standardized post-construction monitoring. Estimated golden eagle take and mitigation are discussed in the Net Conservation Benefit Plan (Ritzert et al. 2018b) and are expected to be offset by proposed mitigation.

4.3.3 Impacts to State-threatened or Endangered Species

4.3.3.1 Peregrine Falcon

The state endangered peregrine falcon was not identified as potentially occurring within the Facility Site during agency correspondence; however, two observations were recorded during raptor migration surveys. Peregrine falcons occur mostly in open country, including open forests, and nest high on rocky outcrops and buildings (White et al. 2002). Impacts to peregrine falcon from Facility construction and operation are expected to be low due to the limited number of observations recorded during surveys. Additionally, a review of publically available post-construction monitoring studies from wind energy facilities in New York did not indicate any records of peregrine falcon mortality (Appendix A). Peregrine falcon is considered to be at very low risk of collision at the Facility Site, and is not included in the Net Conservation Benefit Plan (Ritzert et al. 2018b).

4.3.3.2 Henslow's Sparrow

Based on the NYNHP request, the state-threatened Henslow's sparrow has been documented within 16.1 km (10 mi) of the Facility Site.[6] Henslow's sparrow typically relies on weedy hayfields and pastureland for breeding habitat (Herket et al. 2002). Though initial disturbance is predicted to remove some hay/pasture habitat from the landscape, the revegetation of cleared land with planted grasses may provide breeding habitat after initial construction disturbance in the Facility Site. However, no Henslow's sparrow were documented during on-site breeding bird surveys (Ritzert et al. 2017b) or incidentally during two years of on-site eagle use surveys (Ritzert et al. 2018a). Since Henslow's sparrow is considered to be at very low risk of collision at the Facility Site, it was not included in the Net Conservation Benefit Plan (Ritzert et al. 2018b).

4.3.3.3 Northern Harrier

The state threatened northern harrier was not identified as potentially occurring within the Facility Site during agency correspondence; however, 22 observations were recorded during

[6] NYSDEC indicated the Henslow's sparrow record identified in the NYNHP review was very old and there is a lack of suitable nesting habitat within the Facility for Henslow's sparrow.

eagle observation surveys and raptor migration surveys. Northern harriers occur in large, open wetlands and grasslands, and will nest in a variety of habitats including fields, grasslands, meadows, marshlands, and other open habitats with little or no woody vegetation (PGC 2012). Impacts to breeding northern harriers are expected to be low as the Facility Site is highly forested and there are no large open areas present for nesting. In addition, no northern harriers were observed during breeding bird surveys in the Facility Site. As discussed in Section 4.3.1.3, studies have shown some displacement impacts to northern harriers from wind energy development; however, large-scale displacement was not observed.

Northern harriers appear to be at low risk of collision with wind turbines (Garvin et al. 2011) as they are rarely found as fatalities at other wind energy facilities (Erickson et al. 2001, Whitfield and Madders 2006, Garvin et al. 2011), despite the fact that this species is observed flying at many wind energy facilities. The hunting habits of northern harriers typically involve low, coursing flights over grassland habitats, which likely decreases the potential for this species to collide with a wind turbine. Northern harriers may fly higher when conducting aerial courtship displays or during migration. However, data collected during the raptor migration surveys in the Facility Site indicate that this is a relatively uncommon event in the Facility (72.3% of flights recorded were below the likely RSH). Additionally, no northern harrier fatalities have been reported at wind energy facilities in New York with publically available data (Appendix A). Northern harriers are not expected to be especially vulnerable to turbine collisions, and impacts from Facility construction and operation are not expected to result in population declines for this species. Since northern harrier is considered to be at very low risk of collision at the Facility Site, it was not included in the Net Conservation Benefit Plan (Ritzert et al. 2018b).

4.3.3.4 Bald and Golden Eagle

The USFWS and NYSDEC raised concerns over how the Facility may impact both the state-threatened bald eagle and state-endangered species golden eagle, which were both identified within the Facility during surveys. Impacts to both species from the Facility are discussed in the Net Conservation Benefit Plan (Ritzert et al. 2018b).

4.3.3.5 State Species of Special Concern

Five state species of special concern were documented during surveys within the Facility Site (Common loon, Cooper's hawk, northern goshawk, osprey, red-shouldered hawk, and sharp-shinned hawk). One observation of common loon was recorded during the Year 1 eagle observations. No common loon nesting habitat is present within the Facility Site and impacts to this species are not expected based on the limited number of observations during all Facility surveys.

The remaining species of special concern are raptors which have shown negligible displacement impacts and lower mortality rates at wind energy projects across the northeastern US and eastern Canada (see Section 4.3.1.3 and 4.3.2.3). All of the raptor species observed likely pass through the Facility Site during migration and may be at risk of turbine collision; however, impacts from the construction and operation of the Facility are not expected to cause local population declines.

A limited number of red-shouldered hawk (three observations), sharp-shined hawk (one), and Cooper's hawk (one) observations were recorded during breeding bird surveys in the Facility Site. Forest clearing for infrastructure construction represents the most immediate impact to breeding raptors. However, forest clearing is anticipated to be conducted between October 1 and March 31, which is outside the nesting period for many forested bird species and minimizes or avoids impacts to these species. If tree clearing is needed during the nesting season for forested birds (May 15 – July 15) or eagles (February 1 – April 30), Bluestone will follow the Avoidance and Minimization measures outlined in the Net Conservation Benefit Plan (Ritzert et al. 2018b).

4.3.3.6 State Species of Greatest Conservation Need

Three state species of greatest conservation need (SGCN; brown thrasher, Canada warbler, and bobolink) were observed during breeding bird surveys in the Facility Site. While displacement impacts have been documented for Canada warbler (see Section 4.3.1.1), suitable habitat for all three species is abundant within the Facility Site and surrounding area. Additionally, these species are still considered fairly common in the region and are not listed as threatened, endangered, or of special concern. Construction and operation of the Facility is not expected to have a significant impact on local populations of these species.

4.4 Wildlife Concentration Areas

No wildlife concentration areas are located within the Facility Site; therefore, no direct impacts to wildlife concentration areas is expected. The closest potential concentration area is the globally recognized Catskills Peaks Important Bird Area (IBA; Audubon 2018a), located approximately 1.6 km (1.0 mi) from the Facility Area. This IBA includes one of the state's largest contiguous forest tracts. Numerous species of birds are known to occur within the IBA including the state threatened bald eagle, and state species of special concern cerulean warbler (*Setophaga cerulea*), Cooper's hawk, northern goshawk, osprey, red-shouldered hawk, and sharp-shinned hawk, which have all been recorded during the breeding season.

The Upper Delaware Scenic River IBA is also located less than 3.2 km (2.0 mi) southeast of the Facility Site (Audubon 2018b). This state-level IBA runs approximately 225 km (140 mi) along the Delaware River and consists of riparian habitat, woodland, fields, young scrub, hillsides, and some upland wetlands. The Upper Delaware Scenic River IBA is an important area for migrating and wading bird species and is a major bald eagle wintering site with as many as 40 bald eagles documented in during the winter months.

No direct impacts to either IBA are expected from construction and operation of the Facility. While indirect impacts to the IBAs are unlikely, some species may avoid portions of the IBAs closest to the Facility during construction and operation. However, both IBA are large and displacement impacts are expected to be minimal.

5.0 CONCLUSIONS

Construction and operation of the Facility will result in minor loss of available habitat, differing levels of disturbance and displacement across species, and collision risk with turbines that is likely to resemble that of most New York State wind projects. Based on the weight of evidence available, impacts at the Facility level are not likely to result in population level effects either locally, regionally, or range wide for species affected. A cumulative impact assessment of avian and bat impacts are presented in a separate document.

The avian use data collected at the site across multiple years, indicates a fairly typical risk profile based on species composition and abundance. Additional information on impacts to bald and golden eagles, the Best Management Practices being implemented at the Facility to reduce impacts, and mitigation plans for potential Facility impacts to eagles can be found in the Facility's Net Conservation Benefit Plan (Ritzert et al. 2018b).

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Appendix A. List of Studies at Wind Energy Facilities in the Northeast Reporting Comparable Bird Fatality Rates and Data on Bird Species found as Fatalities

Appendix A. Studies at wind energy facilities in the northeast reporting comparable bird and bat fatality rates and data on bird species found as fatalities.

Wind Energy Facility	Study Reference	Wind Energy Facility	Study Reference
Beech Ridge, WV (12)[A,B]	Tidhar et al. 2013a	Noble Altona, NY (11)	Kerlinger et al. 2011b
Beech Ridge, WV (13)[A,B]	Young et al. 2014a	Noble Bliss, NY (08)[A,B]	Jain et al.2009c
Casselman, PA (08)[A,B]	Arnett et al. 2009	Noble Bliss, NY (09)[A,B]	Jain et al. 2010c
Casselman, PA (09)[A,B]	Arnett et al. 2010	Noble Bliss/Wethersfield, NY (11)	Kerlinger et al. 2011a
Cohocton/Dutch Hill, NY (09)[A,B]	Stantec 2010	Noble Chateaugay, NY (10)[A,B]	Jain et al. 2011b
Cohocton/Dutch Hills, NY (10)[A,B]	Stantec 2011b	Noble Clinton, NY (08)[A,B]	Jain et al. 2009d
Criterion, MD (11)[A,B]	Young et al. 2012b	Noble Clinton, NY (09)[A,B]	Jain et al. 2010a
Criterion, MD (12)[A,B]	Young et al. 2013	Noble Ellenburg, NY (08)[A,B]	Jain et al. 2009e
Criterion, MD (13)[A,B]	Young et al. 2014b	Noble Ellenburg, NY (09)[A,B]	Jain et al. 2010b
High Sheldon, NY (10)[A,B]	Tidhar et al. 2012a	Noble Wethersfield, NY (10)[A,B]	Jain et al. 2011c
High Sheldon, NY (11)[A,B]	Tidhar et al. 2012b	Pinnacle, WV (12)[A,B]	Hein et al. 2013a
Jersey Atlantic, NJ (08)	New Jersey Audubon Society (NJAS 2008a, 2008b, 2009)	Pinnacle Operational Mitigation Study (12)	Hein et al. 2013b
Kibby, ME (11)[A]	Stantec 2012	Record Hill, ME (12)[A,B]	Stantec 2013a
Lempster, NH (09)[A,B]	Tidhar et al. 2010	Record Hill, ME (14)[A,B]	Stantec 2015
Lempster, NH (10)[A,B]	Tidhar et al. 2011	Rollins, ME (12)[A,B]	Stantec 2013b
Locust Ridge, PA (Phase II; 09)[A,B]	Arnett et al. 2011	Searsburg, VT (1997)	Kerlinger 2002a
Locust Ridge, PA (Phase II; 10)[A,B]	Arnett et al. 2011	Sheffield, VT (12)	Martin et al. 2013
Madison, NY (01-02)	Kerlinger 2002b	Sheffield Operational Mitigation Study (12)	Martin et al. 2013
Maple Ridge, NY (06)[A]	Jain et al. 2007	Spruce Mountain, ME (12)	Tetra Tech 2013
Maple Ridge, NY (07)[A,B]	Jain et al. 2009a	Steel Winds I, NY (07)	Grehan 2008
Maple Ridge, NY (07-08)[A.B]	Jain et al. 2009b	Steel Winds I & II, NY (12)	Stantec 2013c
Maple Ridge, NY (12)[A]	Tidhar et al. 2013b	Stetson Mountain I, ME (09)[A,B]	Stantec 2009c
Mars Hill, ME (07)[A,B]	Stantec 2008a	Stetson Mountain I, ME (11)[A,B]	Normandeau Associates 2011
Mars Hill, ME (08)[A,B]	Stantec 2009a	Stetson Mountain I, ME (13)[A,B]	Stantec 2014
Meyersdale, PA (04)	Arnett et al. 2005	Stetson Mountain II, ME (10)[A,B]	Normandeau Associates 2010
Mount Storm, WV (Fall 08)[A]	Young et al. 2009b	Stetson Mountain II, ME (12)[A,B]	Stantec 2013d
Mount Storm, WV (09)[A,B]	Young et al. 2009a, 2010b	Wolfe Island, Ont (May-June 09)	Stantec Ltd. 2010a
Mount Storm, WV (10)[A,B]	Young et al. 2010a, 2011b	Wolfe Island, Ont (July-December 09)[A]	Stantec Ltd. 2010b
Mount Storm, WV (11)[A,B]	Young et al. 2011a, 2012a	Wolfe Island, Ont (January-June 10)	Stantec Ltd. 2011a
Mountaineer, WV (03)[A,B]	Kerns and Kerlinger 2004	Wolfe Island, Ont (July-December 10)[A]	Stantec Ltd. 2011b
Mountaineer, WV (04)	Arnett et al. 2005	Wolfe Island, Ont (January-June 11)	Stantec Ltd. 2011c
Munnsville, NY (08)[A,B]	Stantec 2009b	Wolfe Island, Ont (July-December 11)[A]	Stantec Ltd. 2012
Noble Altona, NY (10)[A,B]	Jain et al. 2011a	Wolfe Island, Ont (January-June 12)	Stantec Ltd. 2014

A =Studies with comparable fatality rate data for bats; B= Studies with comparable fatality rate data for birds; all reports in this table also report other fatality data.