EE-003932-0001-01-B3624

# Bird and Bat Risk Assessment
# Proposed Crown City Wind Farm
# Cortland County, New York

**August 2012**

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# List of Abbreviations and Acronyms

| | |
|---|---|
| ABR | ABR, Inc. – Environmental Research & Services |
| agl | above ground level |
| amsl | above mean sea level |
| BBA | Breeding Bird Atlas |
| BBRA | bird and bat risk assessment |
| BBS | breeding bird surveys |
| BCA | bird conservation area |
| BCI | Bat Conservation International |
| BWEC | Bats and Wind Energy Cooperative |
| C & K | Curry and Kerlinger, LLC |
| CBC | Christmas bird count |
| E & E | Ecology and Environment, Inc. |
| GAO | Government Accountability Office |
| GE | General Electric |
| HMANA | Hawk Migration Association of North America |
| hr | hour |
| IBA | important bird areas |
| kHz | kiloHertz |
| km | kilometer |
| kV | kilovolt |
| kW | kilowatt |
| met | Meteorological (tower) |
| MW | megawatt |
| NHP | Natural Heritage Program |
| NWCC | National Wind Coordinating Collaborative |
| NWI | National Wetland Inventory |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSOA | New York State Ornithological Association |

## List of Abbreviations and Acronyms (cont.)

| | |
|---|---|
| O&M | operation and maintenance |
| Project | Crown City Wind Farm |
| ROW | right-of-way |
| TCI | Air Energy TCI Inc. |
| TNC | The Nature Conservancy |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| WMA | wildlife management area |
| WNS | white-nose syndrome |

# 1 Introduction

## 1.1 Project Description

Air Energy TCI Inc. (TCI) is proposing to develop a wind-powered generating facility, the Crown City Wind Farm (the Project), in the towns of Cortlandville, Homer, Solon, and Truxton in Cortland County, New York (see Figure 1-1). The Project consists of generation and transmission components.

The proposed Project is located approximately 1.4 miles (2.3 kilometers) northwest of the hamlet of Solon, 1.0 mile (1.6 kilometers) north-northeast of the village of McGraw, and 4 miles (6.4 kilometers) east of the city of Cortland (as measured from the nearest proposed turbine site). It is located east of Interstate 81, bordered to the west-northwest by State Route 13, to the south by State Route 41, to the northeast by Cheningo Creek and to the east by the Solon-Taylor town line (see Figure 1-1). The proposed Project would be located on approximately 9,500 acres of leased private land in northeastern Cortlandville, southeastern Homer, northern Solon, and southwestern Truxton, centrally located in Cortland County, New York. Most of this acreage would remain unaffected by the Project, and it is anticipated that no more than approximately 1% of the leased private land (i.e., up to 95 acres) would be converted to built facilities as a result of permanent access roads turbine crane pads, the operation and maintenance (O&M) facility, and the substation/interconnect facility.

### 1.1.1 Crown City Project Area

Currently, the Project will include the following:

- Installation and operation of up to 44 wind turbines with a capacity of up to 72 megawatts (MW) (see Figure 1-2);

- Construction and use of approximately 20 miles of gravel access roads that will connect each wind turbine to a town or county roadway to allow equipment and vehicle access for construction and subsequent maintenance of the facilities (see Figure 1-2);

- Construction and use of two new, permanent 100-meter (328-foot) tall meteorological towers (from four meteorological tower sites currently under consideration);

- Construction and use of 30 miles (48 kilometers) of buried 34.5 kilovolt (kV) electrical interconnect lines;

- Construction and use of a new collection substation within the Project Area in the Town of Homer that will transform the power from 34.5 kV up to 115 kV;

- Construction and use of 0.5 mile (0.8 kilometer) of overhead 115 kV interconnection transmission line in Homer, from the collection substation to an interconnection facility located adjacent to an existing 115 kV transmission line in the Town of Homer; and

- Construction and use of an operations and maintenance building (O&M facility) to house operations personnel, equipment, and materials and provide staff parking.

### 1.1.2 Turbine Description

The wind turbines that will be installed will be General Electric (GE) 1.6 – 100 wind turbines (or equivalent) with a rated capacity of 1.6 MW. The turbine is a three-bladed, upwind, horizontal-axis wind turbine with a rotor diameter of 328 feet (100 meters). The nacelle is located at the top of each tower and contains the electrical generating equipment. The turbine rotor and nacelle are mounted on top of a 328-foot (100-meter) tall tubular tower (see Figure 1-2). The maximum height for the turbine is 492 feet (150 meters) when a rotor blade is at the top of its rotation.

## 1.2 Project Background

In order to provide supporting documentation for the environmental permitting, TCI undertook pre-construction studies to assess the potential for impacts to birds and bats associated with the Project. TCI conducted bird and bat studies in the Project Area in 2008 through its consultant, Ecology and Environment, Inc. (E & E). The study had the following objectives:

1. Collect information on the number of raptor species, number of individuals, flight direction, and estimated flight altitude in the Project Area during raptor migratory seasons.

2. Collect acoustical information on the occurrence of bat species in the Project Area during bat migratory seasons and summer months.

3. Collect information on the occurrence and distribution of bird species, including threatened or endangered species, in the Project Area during migratory and breeding seasons.

4. Determine whether suitable habitat for threatened or endangered species is found within the Project Area.

The findings in this report are based on information obtained from the literature and site surveys, comparing data collected at this site with data collected at operating wind facilities at other locations, and by reviewing site features and geography with local bird and bat distribution and use (see Section 2, Methodology).

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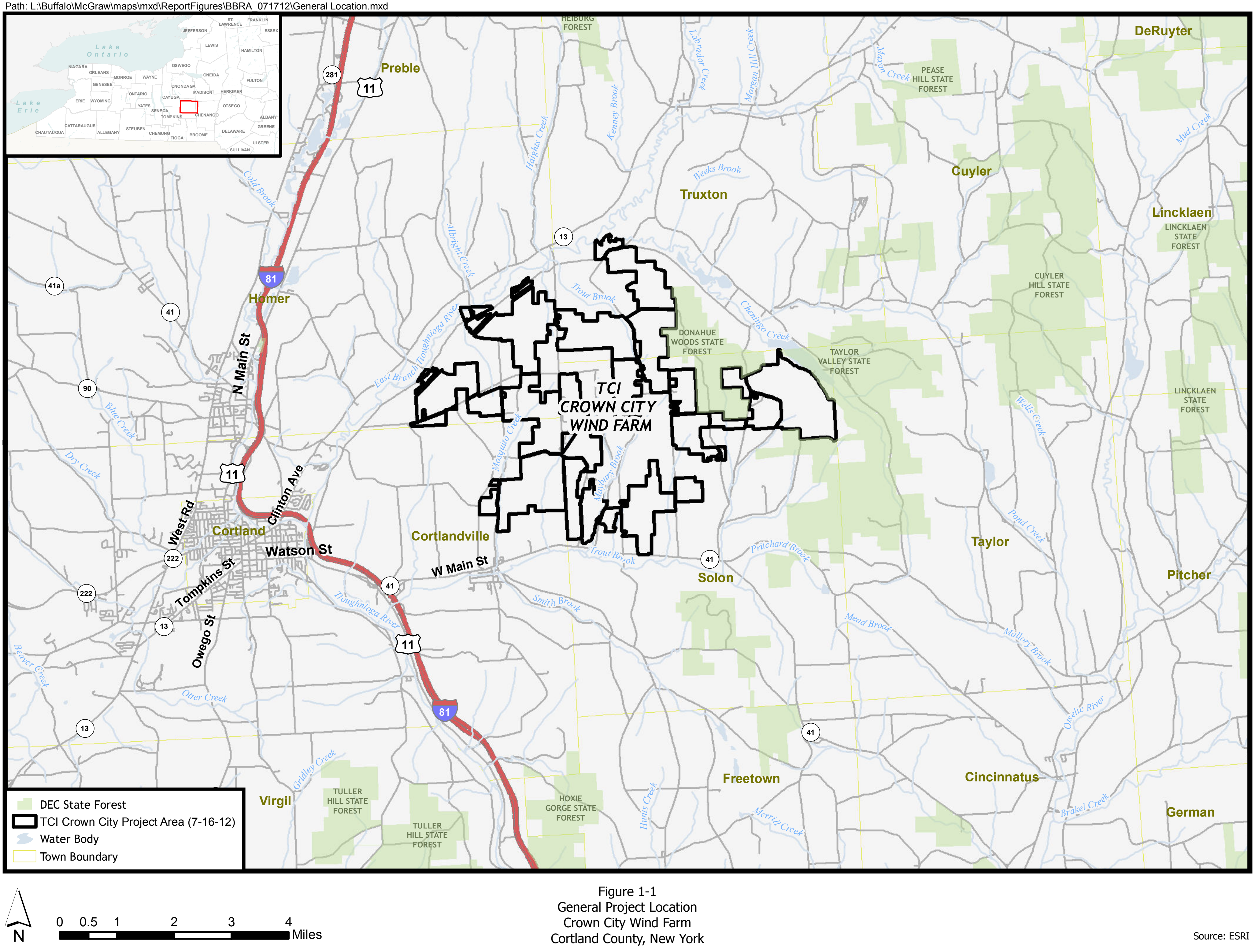


Figure 1-1
General Project Location
Crown City Wind Farm
Cortland County, New York

Source: ESRI

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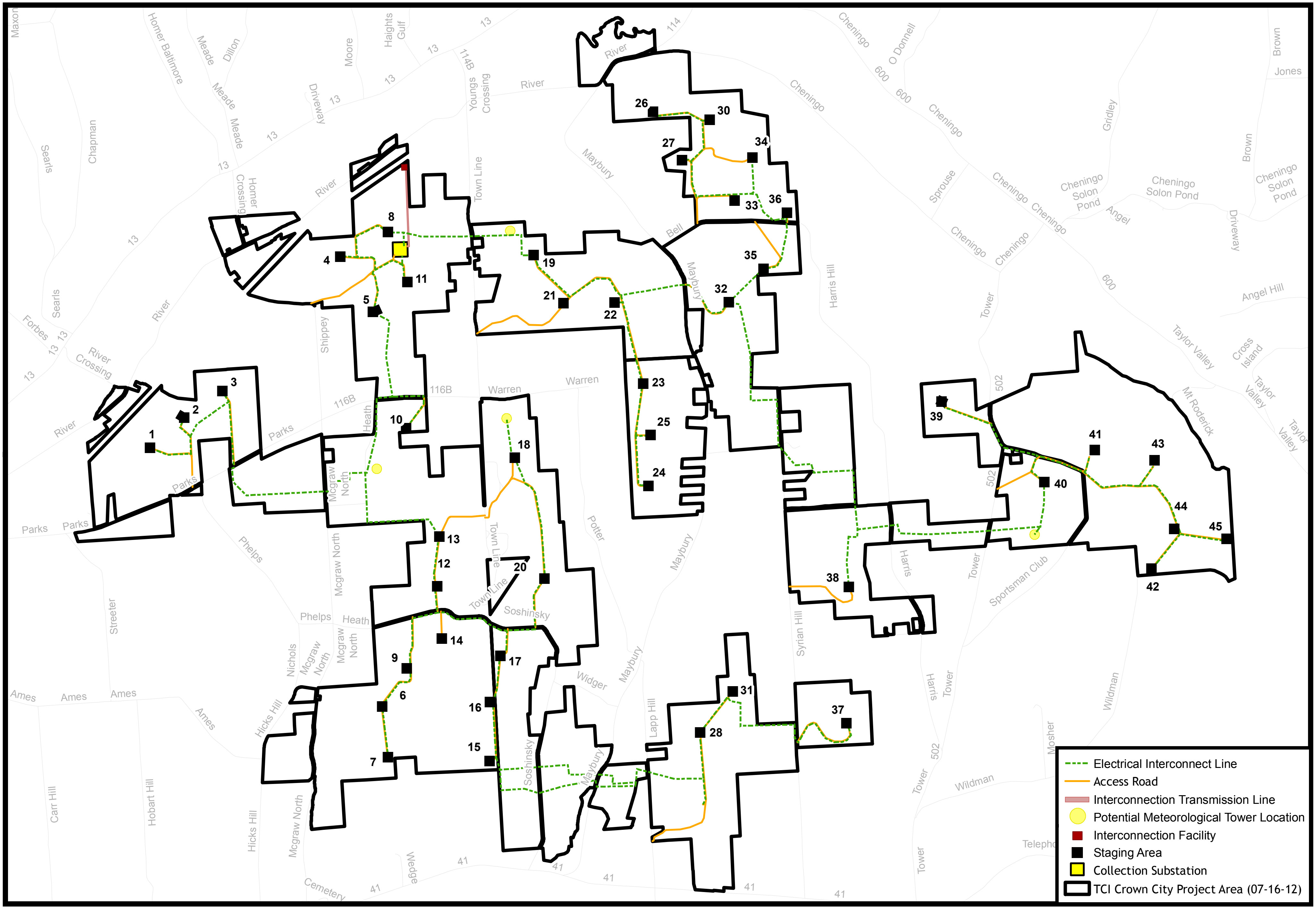


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Figure 1-2
Crown City Wind Farm
Project Facilities

Source: ESRI

# 2 Methodology

The methodology for this bird and bat risk assessment (BBRA) includes the following components:

- Performing a habitat assessment;
- Conducting a literature review and contacting agencies to gather background data for birds and bats in the Project Area;
- Conducting field studies; and
- Evaluating the potential impacts to birds and bats from the Project.

The methodology is consistent with the draft Work Plan for Preconstruction Bird and Bat Studies at the Proposed Crown City Wind Farm, Cortland County, New York (E & E 2008) that was submitted to the New York State Department of Environmental Conservation (NYSDEC) and the United States Fish and Wildlife Service (USFWS) for review in March 2008. The work plan included studies that were consistent with NYSDEC Draft Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects (Draft Guidelines) (NYSDEC 2007a). On April 21, 2008, TCI and E & E met with several NYSDEC and USFWS staff to review the draft work plan. One or both agencies provided the following recommendations on the draft work plan regarding proposed studies:

1. Conduct an additional four spring migratory raptor surveys (one per week) in March 2009 because surveys were not initiated until early April 2008;
2. Conduct fall migratory raptor surveys weekly through December 15;
3. Conduct active acoustical monitoring for bats either once per week or in two sets of three nights rather than the proposed total of four nights of sampling in June to August 2008 and to locate as many survey points as possible for this survey effort at proposed turbine locations;
4. Conduct the migratory bird surveys and breeding bird surveys at proposed turbine locations rather than roadside locations to the extent possible; and

5. Consider conducting a nocturnal radar study to evaluate passage rates and flight altitudes for migrating birds and bats.

The draft work plan was not finalized following the meeting as there were continued discussions regarding the recommendation for conducting a nocturnal radar study (item 5 from above). Items 3 and 4 from above were implemented as part of the 2008 field studies. The March 2009 spring migratory raptor surveys were not conducted as the proposed Project was put on hiatus. Ten fall migratory surveys were conducted as proposed in the draft work plan with surveys extended into early December as per item 2 from above.

## 2.1 Habitat Assessment

The habitat and topography of the Project Area were evaluated in a desktop review based on interpretation of aerial photography and through United States Geological Survey (USGS) land use and land cover figures. The general description developed is useful for understanding the existing environment for birds and bats.

## 2.2 Literature Review

A literature review was conducted to obtain existing information about the occurrence and distribution of birds and bats in the Project Area. Sources of bird information that were reviewed included the New York State Breeding Bird Atlas (BBA) project, USGS breeding bird surveys (BBS), National Audubon Society Christmas Bird Counts (CBC), regional publications, the Audubon New York Important Bird Areas (IBA) program, and bird and bat studies conducted for other proposed wind projects in the vicinity of the Project Area. Sources of bat information that were reviewed included NYSDEC mobile surveys, publications of the NYSDEC, the USFWS, Bat Conservation International (BCI), and other reference sources. In addition to conducting a literature review, requests were made to NYSDEC and USFWS for information on threatened and endangered species in the Project Area.

## 2.3 Field Studies

### 2.3.1 Migratory Raptor Surveys

#### 2.3.1.1 Spring 2008

Two migratory raptor surveys were conducted approximately every other week over the spring migration season for a total of 10 surveys (conducted on April 2, 3, 10, 17, 18, 19 and May 3, 4, 11, and 14, 2008). One sampling location was used for the surveys that offered favorable viewing in all directions from an elevated location (see Figure 2-1). Field data on migrating raptors were collected for species identification, number of individuals, flight direction, and estimated flight altitude (above or below 500 feet [approximately 150 meters] above ground level). Additionally, weather information, such as temperature, precipitation, cloud

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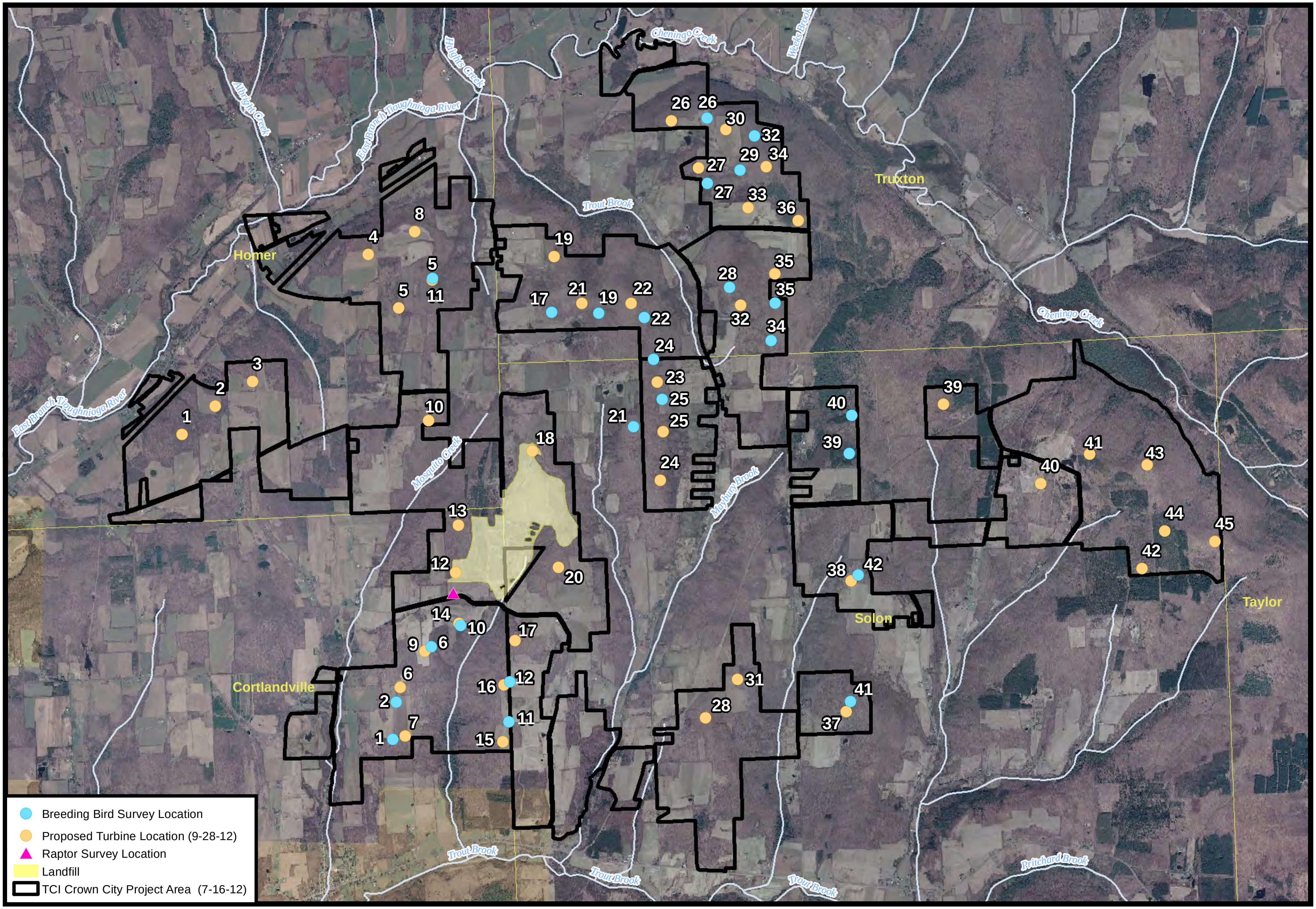


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0 0.25 0.5 1 Miles

Figure 2-1
Bird and Bat Survey Points (Part 1)
TCI Crown City Wind Farm

Source: NY Statewide Digital Orthoimagery Program (NYSDOP), 2006

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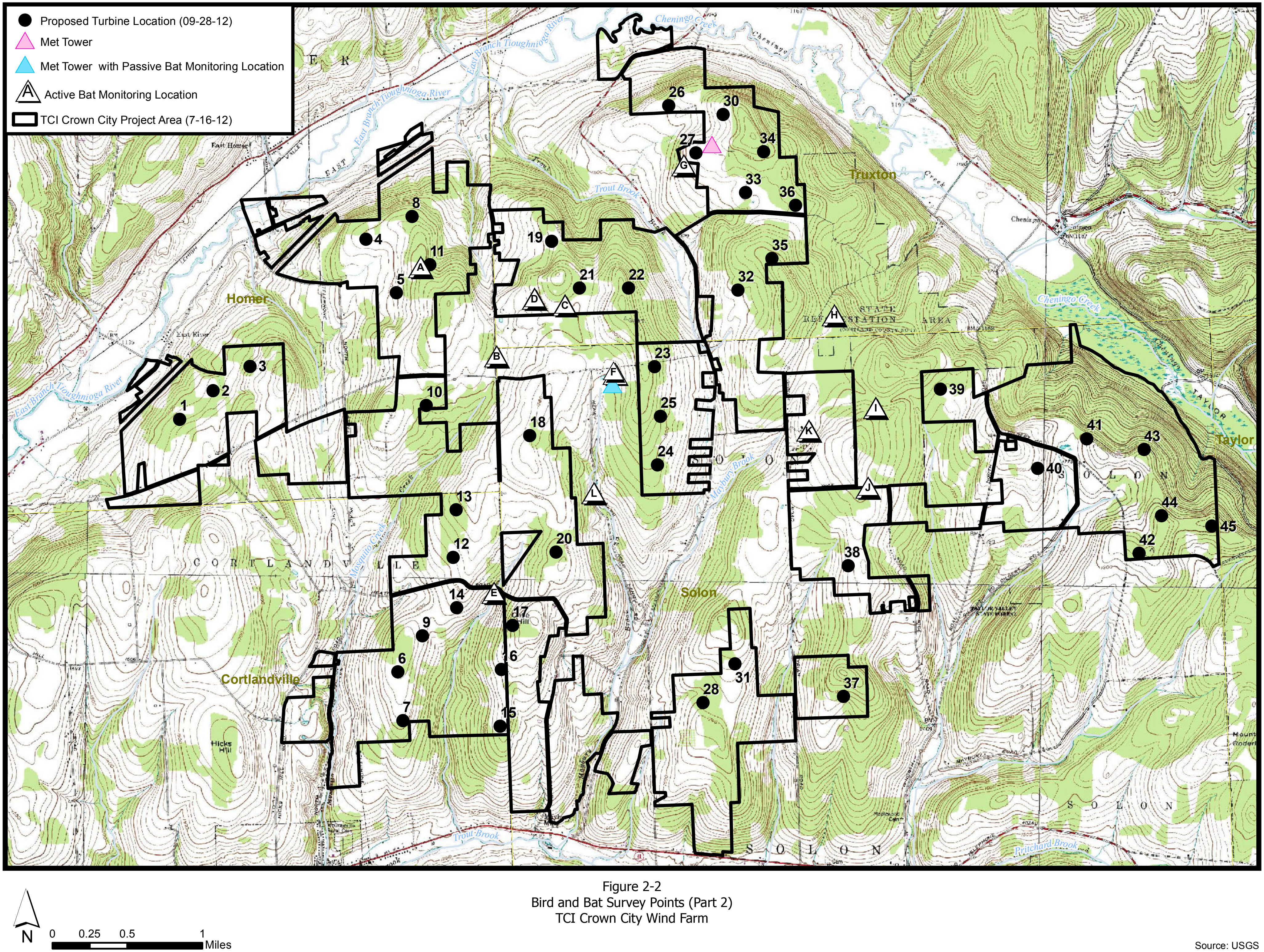


Figure 2-2
Bird and Bat Survey Points (Part 2)
TCI Crown City Wind Farm

Source: USGS

cover, visibility, wind speed, and wind direction, were also recorded in the field. The surveys were conducted from 9:00 a.m. to 4:00 p.m. on days of preferable raptor migration weather (little or no precipitation, warmer than average temperatures, and light or southerly winds) to the extent possible.

The results from this study were compared with the counts made at regional hawk watches (i.e., Braddock Bay and Derby Hill) and with other raptor studies conducted for wind energy development in New York State.

Data from these surveys were also used to document the occurrence of bird species in the Project Area and help identify the presence/absence of listed species. In particular, the observers noted behaviors of threatened/endangered species during surveys to help identify if and how migrant or local birds utilize the Project Area.

##### 2.3.1.2 Fall 2008

Migratory raptor surveys were conducted approximately every week during peak fall raptor migration season and approximately once every two weeks during non-peak migration periods for a total of ten surveys (conducted on September 2, 10, 18, 25 and October 7, 15, 31, and November 12, 21, and December 3, 2008). The same sampling location and protocol for spring 2008 migratory raptor surveys was used for fall 2008 surveys (see Figure 2-1).

#### 2.3.2 Migratory Bird Surveys

##### 2.3.2.1 Spring 2008

E & E conducted four baseline migratory bird surveys in the Project Area during the spring (migratory) season in 2008. Surveys were conducted on May 10, 15, 20, and 28.

Twenty sampling points were selected prior to field activities in 2008 based on the turbine locations proposed at that time, viewing distances, a variety of habitats (agricultural [row crops], grassland [hayfield or pasture], reverting field [scrub habitat], and forest), and areas suited for avian occurrence (see Figure 2-1). The observer documented all birds (except the unprotected Rock Pigeon, European Starling, and House Sparrow) identified by sight or sound in 5-minute periods at each survey point. Because avian activity is greatest in the morning, the surveys were conducted during the morning hours from half an hour before sunrise to 10 a.m.

The effort also included conducting reconnaissance surveys to document bird species and searching for threatened and endangered species and appropriate habitat. Following the point surveys, field observers drove the Project Area looking for possible threatened and endangered species or habitat. If habitat was found, visual surveys and passive listening were conducted.

Data from these surveys were used to document the occurrence and distribution of bird species in the Project Area and help identify the presence/absence of listed species and areas of higher/lesser migratory bird activity.

#### 2.3.2.2 Fall 2008

The same twenty sampling points used during the spring 2008 migratory bird surveys were used for the fall 2008 surveys. A total of four surveys were conducted weekly in the month of September (surveys were conducted on September 3, 11, 19, and 26, 2008.

Sampling protocol used for spring 2008 surveys was repeated for the fall 2008 surveys (refer to Section 2.3.2.1).

### 2.3.3 Breeding Bird Surveys

Breeding bird surveys were conducted in the Project Area during the primary breeding season of June. Two two-day surveys were conducted on June 9 and 10, and June 24 and 25, 2008. Surveys were performed with an observer recording all birds identified by sight or sound in 5-minute periods at each survey point. Birds observed flying through the area were also documented and noted separately on the datasheets because they are less likely to breed or be associated with the surrounding habitat, but tend to live in the general area (Ralph et al. 1995).

Twenty-four survey points were selected in consultation with TCI based on turbine locations proposed at that time, accessibility, and a variety of habitats (agricultural [row crops], grassland [hayfield or pasture], reverting field [scrub habitat], and forest; see Figure 2-2). All surveys were conducted from near sunrise until 10 a.m. Species observed during other site visits and surveys in the Project Area were also documented, as was breeding behavior.

Similar to the migratory surveys effort, reconnaissance surveys and targeted searches for threatened and endangered species and appropriate habitat were conducted following the point surveys. If habitat was found, visual surveys and passive listening were conducted.

Data from these surveys were used to document the occurrence and distribution of breeding bird species in the Project Area and help identify the presence/absence of listed species and areas of higher/lesser breeding bird activity.

### 2.3.4 Acoustical Monitoring for Bats

During the 2008 field season, Crown City Wind Farm conducted two different bat acoustical studies within the project area, both using Anabat bat detectors. The first study consisted of a passive acoustical monitoring which was conducted during May 2 through October 15, 2008. The second study consisted of an active monitoring study conducted from late spring through early summer (June 3 through 5, 2008 and July 1, 2, and 28, 2008). AnaBat detectors are frequency-division detectors, dividing the frequency of ultrasonic calls made by bats so that they are audible to humans. Frequency division detectors were selected based upon their widespread use for this type of survey, their ability to be deployed for long periods of time, and their ability to detect a broad range of frequencies.

During the passive survey, call files were extracted from the data files using CFC-read© software, with default settings in place. Call files were visually screened to remove files caused by wind, insect noise, and other static so that only bat calls remain. For the active survey, the call files were copied off the PDA memory card. In both surveys, call files were examined visually and assigned to species categories, when possible, based on comparison to libraries of known bat reference calls. The categorization of calls was possible only when clear calls were recorded and only with certain species. Due to similarity of call signatures between several species, all classified calls were categorized to the lowest possible taxonomic level and then were grouped into one of four species groups established by Gannon et al. (2003):

- **Big Brown, Silver-haired, and Hoary Bats**. This species group is also referred to as the big brown group. These species' call signatures commonly overlap and have, therefore, been included as one species group in this report;
- **Eastern Red Bat and Tri-colored Bat**. Eastern red bats and tri-colored bats are included in this species group. Like so many other northeastern bats, these two species can produce calls distinctive only to each species. However, significant overlap in the call pulse shape, frequency range, and slope can also occur;
- **Myotis Species**. Bats of the genus *Myotis*. While there are some general characteristics believed to be distinctive for several of the species in this genus, these characteristics do not occur consistently enough for any one species to be relied upon at all times when using AnaBat recordings; and
- **Unknown**. Call sequences with too few pulses (less than five) or of poor quality such as indistinct pulse characteristics or background static. ABR additionally classified these files as high frequency (calls above 35 kilohertz [kHz] or low frequency (calls below 35 kHz) calls, which may provide information about the bats in the area.

Grouping calls in this way is considered a conservative approach to bat call identification.

#### 2.3.4.1 Passive Study

Passive acoustical bat monitoring was conducted by ABR, Inc. - Environmental Research & Services (ABR) with Project coordination provided by E & E (ABR's report is attached in Appendix A). ABR installed three AnaBat detectors on a metrological (MET) tower located in the Project Area (see Figure 2-2) with one unit installed at 60 meters above ground level (agl) while the other two units were installed at 22 meters and 1.5 meters agl. Anabat detectors were programmed to record data from approximately one hour prior to sunset until approximately one hour after sunrise every night. The data call files that were recorded during the passive study were analyzed by ABR to remove files caused by wind, insect noise, and other static so that only bat calls remained. Once filtered, call files were then assigned to species groups based on comparisons with libraries of known bat reference calls. This comparison is possible only when clear, search phase calls greater than five pulses are recorded and only for certain species. Tree-roosting bats are typically easy to identify, while those of the genus *Myotis* are not. Nightly tallies of recorded calls were compiled for each detector and for each night. Rates of detection indicate the number of calls and do not necessarily reflect the number of individual bats in a given area**,** because a single individual can produce one or many call files recorded by the bat detector, and the bat detector cannot differentiate between individuals of the same species. Call rates by species, species group, as well as total detections and trends in species' presence in the data set were reported. Comparisons between call rates and species composition were also made among the detectors.

#### 2.3.4.2 Active Study

In addition to the passive sampling described above, active monitoring was conducted by E & E staff on six nights in late spring to early summer.to gather information on the resident bats occurring in the Project Area. Active monitoring surveys were conducted by using a hand-held AnaBat SD1 detector equipped with a personal digital assistant (PDA) running AnaPocket© software. Surveys consisted of an approximately 10 minute stationary survey, similar to a breeding bird point count, at 12 different survey points (see Figure 2-2). These surveys began at sunset and continued in a sequential order until all 12 sites were visited. On some instances, surveys lasted longer than 10 minutes if significant activity was present. With the travel time between sites, the surveys were typically completed within five hours of sunset. Survey points were selected to include various landscape features present in the Project Area where bats would be expected to forage, including field edges, hedgerows, roadsides, riparian corridors, and other wetland areas based on accessibility and proximity to the turbines proposed at the time. Each survey night, a different starting point was chosen at random so as to not bias the data due to sampling each point at approximately the same time.

Active monitoring data analysis was conducted by using AnaLook DOS version 4.9j (AnaLook; Titley Scientific, Ballina, New South Wales, Australia) to analyze the sound files recorded by the bat detectors. All sound files were scanned with a filter (adapted from Britzke and Murray 2000 [see Appendix H, Table H-9]) designed to remove files that contained noise (e.g., insects, wind, rain) so that only bat call files remained. A bat call file is synonymous with a bat pass and is defined as any file that contains two or more echolocation pulses (Baerwald et al. 2009).

Each echolocation pulse has characteristics such as slope and frequency that can be measured quantitatively and used to identify the call sequence to a species or species group. Although it is sometimes possible to distinguish species from specific characteristics in the echolocation calls, factors such as intraspecific variation and variation within a bat pass make reliable identification difficult (Murray et al. 2001).

Analysis of the data collected from the active bat detectors was completed in two phases. The first phase included identifying the total number of bat passes recorded at each site on each night regardless of species; this phase is referred to as total bat activity. The second phase involved using a subset of the bat passes recorded (call files that were of sufficient quality [those that included five or more echolocation pulses]) to be identified to a species group to determine the relative composition of species recorded at each detector.

Total bat activity (the number of bat passes containing two or more echolocation pulses) was tabulated for each detector at each survey point each night and is reported as the total number of bat passes per night. In order to assess bat species group diversity in the Project Area, call files with at least five echolocation pulses were identified to one of the three species groups using a combination of call characteristics (minimum frequency and slope) calculated in AnaLook (Baerwald et al. 2009). Five echolocation pulses were required for species group identification in order to reduce potential problems associated with misidentification, which can occur when fewer pulses are analyzed.

The species group consisting of the big brown bat, silver-haired bat, and hoary bat includes bat passes with minimum frequencies typically below 30 kilohertz (kHz). The eastern red bat and tri-colored bat species group include bat passes with minimum frequencies typically between 30 and 45 kHz and minimum slope values <40 octaves per second. Bats in the *Myotis* genus species group typically produce echolocation calls with minimum frequencies of 38 to 50 kHz and have minimum slope values of >40 octaves per second. Bat passes identified to the *Myotis* species group could possibly include eastern small-footed bats, Indiana bats, little brown bats, and northern bat. This analysis methodology did not attempt to identify any individual species.

### 2.3.5 Habitat Surveys

In addition to a desktop review of the habitats found in the Project Area, E & E conducted initial habitat-level surveys during various visits to the Project Area in spring, summer, and fall 2008 to determine if any habitat within the Project Area is suitable for bat species, particularly habitats required for endangered and threatened species. Habitats were documented based on composition of the vegetation and general landscape position with particular emphasis placed on forested riparian, floodplain, and wetland areas, which tend to be preferable roost and foraging locations for many species. Habitat surveys also assessed the potential for bat species to frequently utilize the Project Area. Rock outcroppings, potential dwellings, or other hibernacula where bats may roost were examined from field visits and desktop reviews of the surrounding region.

# 3 Habitat Assessment and Literature Review

## 3.1 Habitat and Topography Description

The Project is located within an area of approximately 9,500 acres in the towns of Cortlandville, Homer, Solon, and Truxton in Cortland County, New York. Land uses within the Project Area are predominantly a mixture of forested and agricultural land, with the remaining acreage consisting of wetlands, residential areas, roads, and other paved surfaces. Additionally, there are approximately 15.4 acres of NYSDEC mapped wetlands and 47.4 acres of National Wetland Inventory (NWI) mapped wetlands within the Project Area.

The Project Area is located in the Appalachian Uplands physiographic province, adjacent to the boundary with the Central (Erie/Ontario) Lowland Physiographic Province. The topography predominately consists of rolling hills and hummocky areas. Within the Project Area, elevations range from approximately 948 feet to 2,129 feet (298 meters to 649 meters) above mean sea level (amsl). The bedrock in the region mostly comprises shale layers, interspersed with limestone, sandstone and siltstone.

The Project Area is characterized by deciduous and some mixed forest and agricultural fields. Current agricultural use includes a mixture of row crops (e.g., corn), hay production, and pasture. Forested land within the Project Area varies from successional hardwood forest to more mature forested communities. Two climax communities (stable, mature communities) are represented: beech-maple mesic forest and hemlock-northern hardwood forest. Most of the stands representing these climax communities are impacted to some degree by human disturbance, specifically silviculture, and forest stands range from recently timbered to mature. The remaining communities are in various stages of succession (old field, shrubland, and young forest) following agricultural or silivcultural disturbance.

The general population pattern in the area is rural residential, consisting of scattered residences along roads. Residential development within and adjacent to the Project Area is typical of rural areas, with residences and farms clustered at crossroad hamlets, located on individual agricultural properties, or situated along state, county, and local roadways. Residential use in the Project Area is primarily active farmsteads.

The Cortland County landfill west side extension is located within the Project Area. This is an active landfill containing residential and commercial municipal solid waste; construction and demolition debris; and sewage treatment plant sludge.

The mosaic of uplands and wetlands within the Project Area offers a variety of habitats and ecozones beneficial to a broad wildlife assemblage. Numerous streams and ponds are also interspersed throughout the Project Area. Seven general ecological communities were identified in the Project Area: beech-maple mesic forest; hemlock northern hardwood forest; successional northern hardwood forest; successional shrubland; successional old field; spruce/fir plantations and agriculture (row crops, field crops, and pastureland) (see Figure 3-1). Six general wetland communities were identified in the Project Area: deep emergent marsh, shallow emergent marsh, shrub swamp, hemlock-hardwood swamp, red maple hardwood swamp, and artificial ponds. The community structure found within the Project Area is typical of other central New York areas with similar significant agricultural production, ranging from woodlots to old fields. Wildlife, including birds and bats, expected to be associated with the communities throughout the Project Area is typical of what would be found throughout much of central New York State.

## 3.2 Literature Review

### 3.2.1 Birds

#### 3.2.1.1 Regional Avian Overview

This section discusses migration, breeding birds, and wintering birds in New York State. The dynamics of migration differs among groups of birds. Therefore, this section contains discussions on the migration of raptors, passerines, and waterbirds. The majority of passerines migrate during the night while raptors migrate almost exclusively during the day. Waterbirds migrate during the day and night (Richardson 1998).

**Migrating Birds (Spring and Fall)**

The primary bird migration seasons in the Project Area are spring and fall. Typical of New York State and the northeast United States in general, the migrations of certain bird groups are as follows:

- Raptors (e.g., hawks, falcons, eagles, and vultures) migrate primarily from mid-March through mid-May and then from September through early November. Some species and individuals migrate in the months just outside of the durations indicated above, particularly Golden Eagles which will migrate south through December;

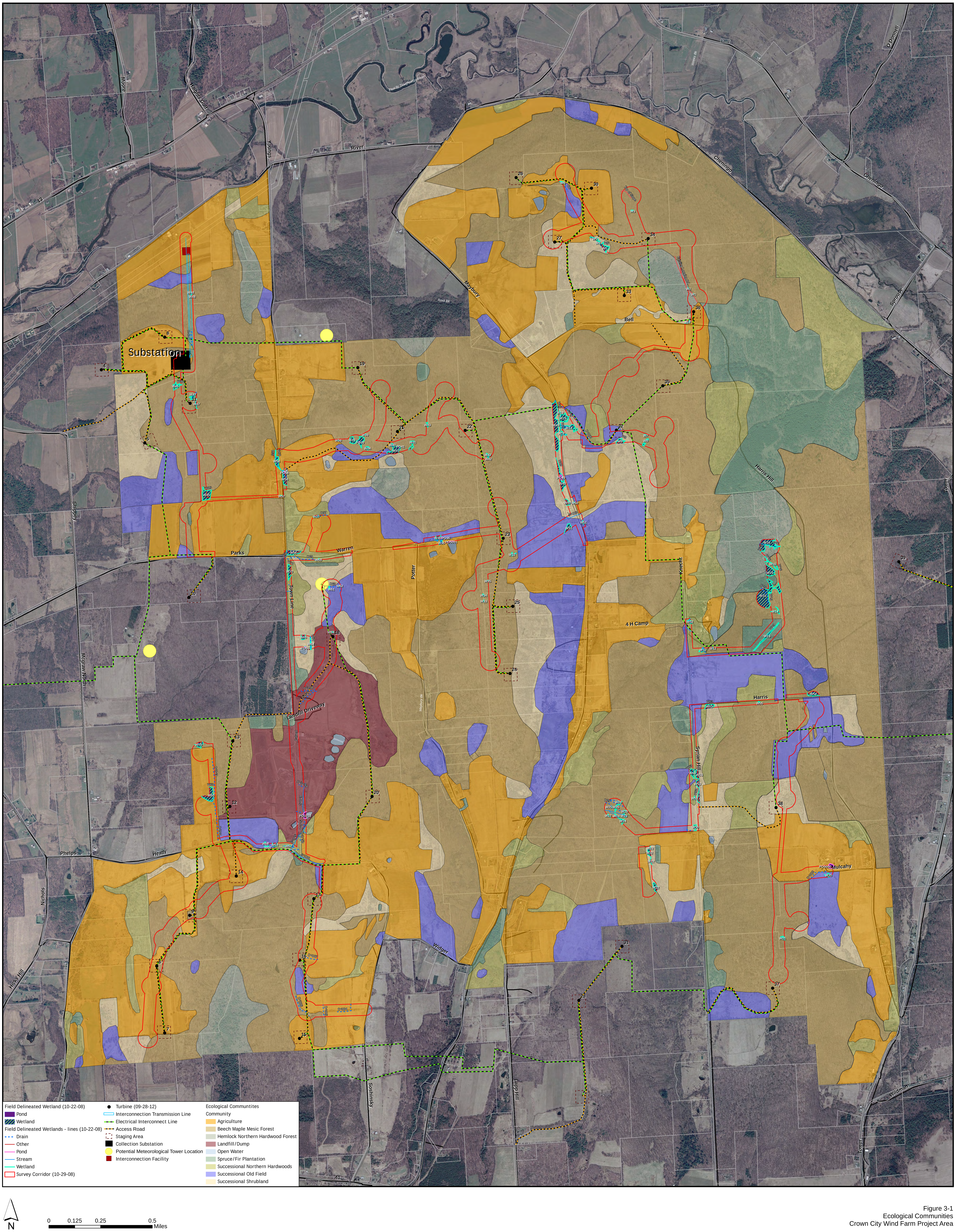


Figure 3-1
Ecological Communities
Crown City Wind Farm Project Area

- Passerines (i.e., songbirds) primarily migrate from mid-April through May and from late August through October. Some individuals migrate in the months just outside of the durations indicated above; and

- Waterbirds (e.g., waterfowl, herons, and shorebirds) migrate primarily between March and mid-May and then between September and mid-November. Some individuals migrate in the months just outside of the durations indicated above.

Raptor migration areas in New York State are well documented and locations where large numbers (thousands to tens of thousands) of migrating raptors occur are already known. There are 24 sites in New York State that regularly report results to the Hawk Migration Association of North America (HMANA) database (HawkCount 2012). Most of these prime raptor migration locations are along the Great Lakes (in spring) and in the lower Hudson Valley (in fall). In spring, raptor migration is concentrated along the southern shores of the Great Lakes as raptors avoid crossing large bodies of water. Migratory raptors are also found in concentrated numbers along prominent ridgelines and well-defined river valleys. There are no hawk monitoring locations ("hawk watch") in proximity to the Project Area. As the Project Area is not immediately proximate to the shorelines of the Great Lakes, large bodies of water, or lengthy ridgelines or valleys, raptor migration in the Project Area is diffuse and without regularly occurring concentration points. There are no geographical or topographical features within the Project Area that attract or concentrate large numbers of migrating raptors. The area does contain some relatively large forested tracts, however, and may provide stopover habitat for some species. The active landfill may also serve as a potential foraging area for migrating vultures and Bald Eagles.

Unlike most migrating raptors, migrating passerines (i.e., songbirds) do not generally avoid crossing large bodies of water or migrate in concentrated numbers along ridgelines. However, they do concentrate in stopover sites following nocturnal migration. These stopover sites are often along geographical or topographical features (i.e., shorelines of large lakes or oceans) or isolated patches of habitat. No features that would attract or concentrate migrating passerines in greater numbers than elsewhere in the region were identified in the vicinity of the Project Area. As such, passerine migration in the Project Area is typically diffuse over a broad front like most of New York State.

There are no large waterbodies or extensive wetlands with open water in the Project Area to attract substantial numbers of waterbirds (i.e., waterfowl, waders, or shorebirds) during migration. Inland waterbodies, including lakes, reservoirs, and rivers attract migrant waterfowl and other birds. Areas closest to the Project Area with habitat conducive for large concentrations of migrant waterbirds include Whitney Point and Deruyter reservoirs and the Finger Lakes. The Project Area is located approximately 15 miles north and 25 miles southwest of the Whitney Point and Deruyter reservoirs, respectively. The Project Area is southeast of the three closest Finger Lakes, with the southern tip of Skaneateles Lake being the closest at approximately 20 miles. The other two lakes (Otisco Lake and Owasco Lake) are each approximately 25 miles from the Project Area. Waterfowl are counted annually on Skaneateles Lake as part of the USFWS Mid-winter Waterfowl Survey. Numbers of waterfowl on Skaneateles Lake averaged 1,500 ducks, geese, and swans from 2001 to 2005. The majority of waterfowl on Skaneateles Lake have been Canada Geese.

#### Breeding Birds (Late Spring and Summer)

Late spring and summer is the primary season for avian breeding in the Project Area. Breeding activity in and/or near the Project Area has been documented by several sources (see Sections 3.2.1.2 and 3.2.1.3) and E & E conducted breeding bird surveys in the Project Area in June 2008. Typical for rural Cortland County, a moderate to good diversity of breeding species is associated with the area, especially in the forested areas.

#### Wintering Birds

Large concentrations of birds do not winter in the Project Area and diversity is low because of the harsh climate and lack of sufficient food sources. Most species present in other seasons (e.g., warblers, flycatchers, and thrushes) migrate south for the winter, leaving only year-round species that are not seasonally displaced (e.g., Great Horned Owl, Pileated Woodpecker) and some species (e.g., American Tree Sparrow, Rough-legged Hawk) that travel south from more northern climates to winter in New York. Regional CBC data provide an overview of species that would be anticipated to occur in the Project Area during the winter in appropriate habitat (see Section 3.2.1.4).

### 3.2.1.2 Breeding Bird Atlas Projects

The New York State BBA project was an extensive survey to determine the distribution of breeding bird species in New York State. Volunteer birders recorded evidence of breeding bird species throughout the state within 5-km by 5-km blocks. The data provide evidence of breeding composition and, in general, quality of breeding habitat. Depending on the breeding evidence observed, species were classified as possible, probable, or confirmed breeders. The first atlas was conducted between 1980 and 1986 (Andrle and Carroll 1988). Surveys for the Atlas 2000 project (2000 through 2005) allowing a comparison to the results of the first atlas to see how the distribution of breeding birds has changed (McGowan and Corwin 2008). Final data from the Atlas 2000 project and final data from the 1980 to 1986 Atlas project are available for review on NYSDEC's Atlas 2000 web site (http://www.dec.ny.gov/public/7312.html). A total of 76 species was considered the statewide goal for species diversity per block and then volunteers were encouraged to move on to other blocks. The statewide average was 71 species per block although it varied widely by region, as evidenced by the 83.1 species per block average for Region 4 which included Cortland County (McGowan and Corwin 2008).

The Project Area is located within six New York State BBA blocks (4071B, 4072B, 4072D, 4171A, 4072C, and 4172C; see Figure 3-2). Only very limited portions of the Project Area overlap with BBA block 4072B and 4071A. Final data for the species totals in all six blocks from the Atlas 2000 project are included in Table 3-1. Totals for all six of the atlas blocks are greater than or equal to the target goal for coverage of 76 species, which likely indicates good atlas survey coverage and good species diversity in the blocks.

**Table 3-1 Total Species Identified in New York State Breeding Bird Atlas Blocks in the Project Area**

| Block | Species Total | Possible Breeders | Probable Breeders | Confirmed Breeders |
|---|---|---|---|---|
| 4071B | 76 | 19 | 37 | 20 |
| 4072B | 81 | 28 | 23 | 30 |
| 4072D | 77 | 29 | 18 | 30 |
| 4171A | 84 | 26 | 37 | 21 |
| 4072C | 82 | 32 | 9 | 41 |
| 4172C | 80 | 31 | 21 | 28 |

Source: New York State Breeding Bird Atlas 2000-2005 (NYSDEC 2000). Website accessed at: http://www.dec.ny.gov/cfmx/extapps/bba/.

A combined total of 117species was identified in the six atlas blocks; see Appendix B, Table B-1, for the species identified in each block. The species identified in these six blocks are generally consistent with regularly occurring nesting species for the region.

Four state-listed species were included among the species documented in these blocks during the Atlas 2000 project. One state-threatened species, Northern Harrier, was documented. Northern Harrier was categorized as a possible breeder in blocks 4071B and 4072D. Species of special concern documented in the atlas blocks included Sharp-shinned Hawk (blocks 4072B and 4171A), Cooper's Hawk (blocks 4071B and 4171A), and Vesper Sparrow (block 4072C).

#### 3.2.1.3 Breeding Bird Surveys

BBSs are conducted annually by volunteers during the peak nesting season (June) as part of a long-running, widespread monitoring program implemented by the USGS. All birds heard or observed are documented using a specified protocol. Surveys are conducted for three minutes at 50 locations, one-half mile apart, starting 30 minutes before sunrise. The BBS data provide a valuable source of information on bird populations and trends over time in given areas, both locally and nationally.

There is one BBS route (Dryden) where at least a portion of the route is within 10 miles of the Project Area (see Figure 3-3). The species identified on this BBS (see Appendix B, Table B-2) are similar to those observed during the New York State BBA project and are generally consistent with regularly occurring nesting species for the region. Several state-listed species were included among the species documented on this BBS. Table 3-2 includes the New York State-listed species that were identified at least once during the BBS between 1966 and 2011, the number of birds per route, and the last year they were detected (Sauer et al. 2011). As indicated on Table 3-2, all listed species that have been documented have been in low numbers. No federally listed species were identified during these surveys.

**Table 3-2 State-Listed Species Identified during Dryden BBS**

| Common Name | Listed Species | Birds/Route (Last Year Recorded) |
|---|---|---|
| American Bittern | SC | 0.02 (1984) |
| Osprey | SC | 0.02 (1982) |
| Northern Harrier | T | 0.07 (1988) |
| Sharp-shinned Hawk | SC | 0.05 (1981) |
| Cooper's Hawk | SC | 0.02 (1994) |
| Red-shouldered Hawk | SC | 0.07 (1979) |
| Upland Sandpiper | T | 0.20 (2005) |
| Horned Lark | SC | 0.12 (1997) |
| Cerulean Warbler | SC | 0.02 (1983) |
| Vesper Sparrow | SC | 0.54 (2007) |
| Grasshopper Sparrow | SC | 0.24 (1998) |
| Henslow's Sparrow | T | 0.66 (1993) |

Source: Sauer et al. 2011

Key:
NR = Not recorded.
E = State-endangered.
T = State-threatened.
SC = State species of special concern.

The Dryden BBS (#61041) is a roughly west-to-east route from the town of Dryden to the town of McGraw 12 miles east in Cortland County; this route is approximately one mile south of the Project Area at its closest point. Numbers of species have ranged from 50 to 76 during the years when surveys have been conducted. A total of 126 species have been recorded over the duration of the Dryden BBS, which was conducted every year between 1966 and 2011 except 2003, 2004, and 2006 (USGS 2001).

### 3.2.1.4 Christmas Bird Counts

The primary objective of the National Audubon Society's CBC is to monitor the status and distribution of wintering bird populations across the Western Hemisphere. The CBC is an all-day census of early winter bird populations within 15-mile diameter survey areas. The results are compiled into the longest running database in ornithology, representing over a century of continuous data on trends of early winter bird populations across the Americas (National Audubon Society 2005). The CBCs are conducted mostly by volunteer birders. The CBC data

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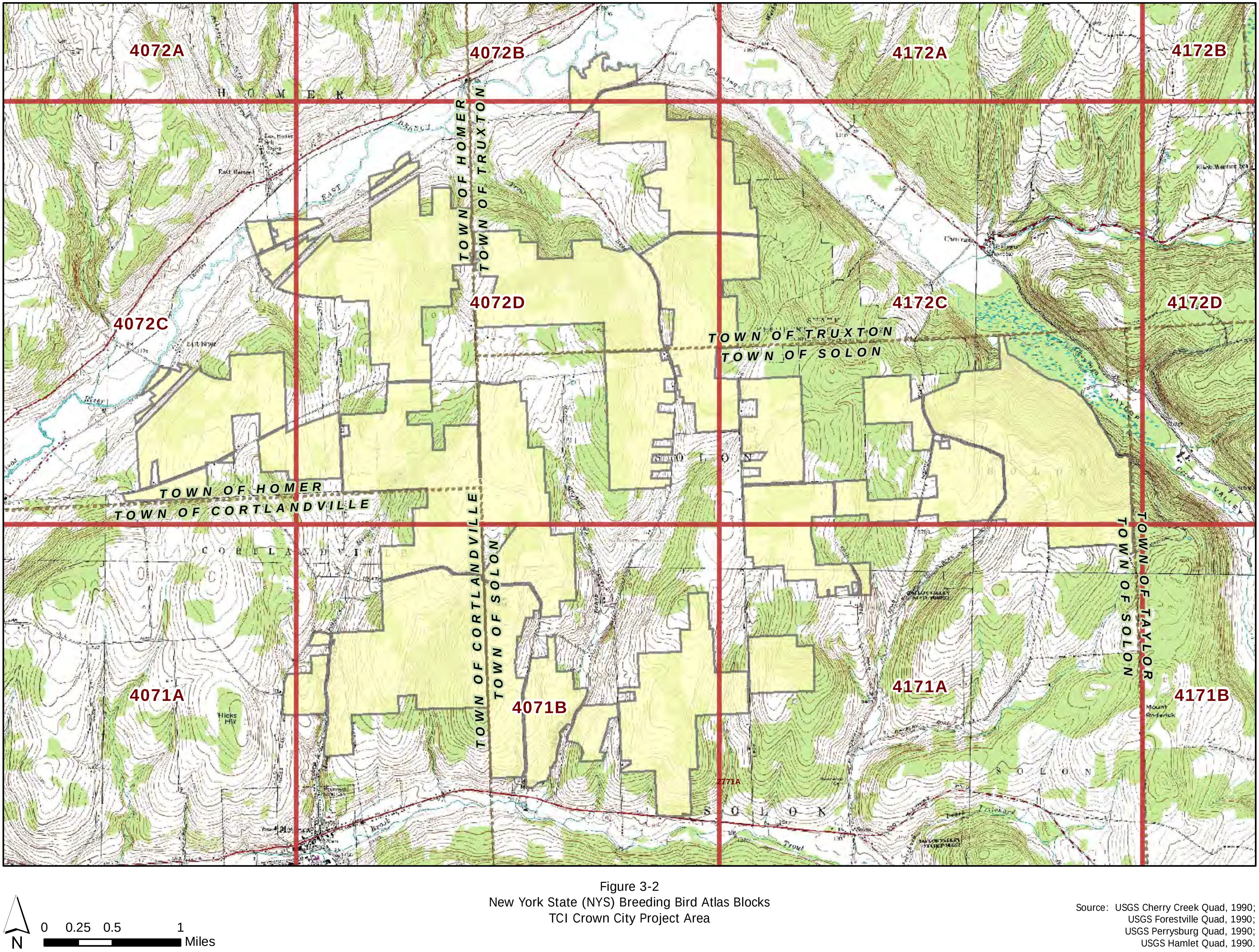


Figure 3-2
New York State (NYS) Breeding Bird Atlas Blocks
TCI Crown City Project Area

Source: USGS Cherry Creek Quad, 1990;
USGS Forestville Quad, 1990;
USGS Perrysburg Quad, 1990;
USGS Hamlet Quad, 1990.

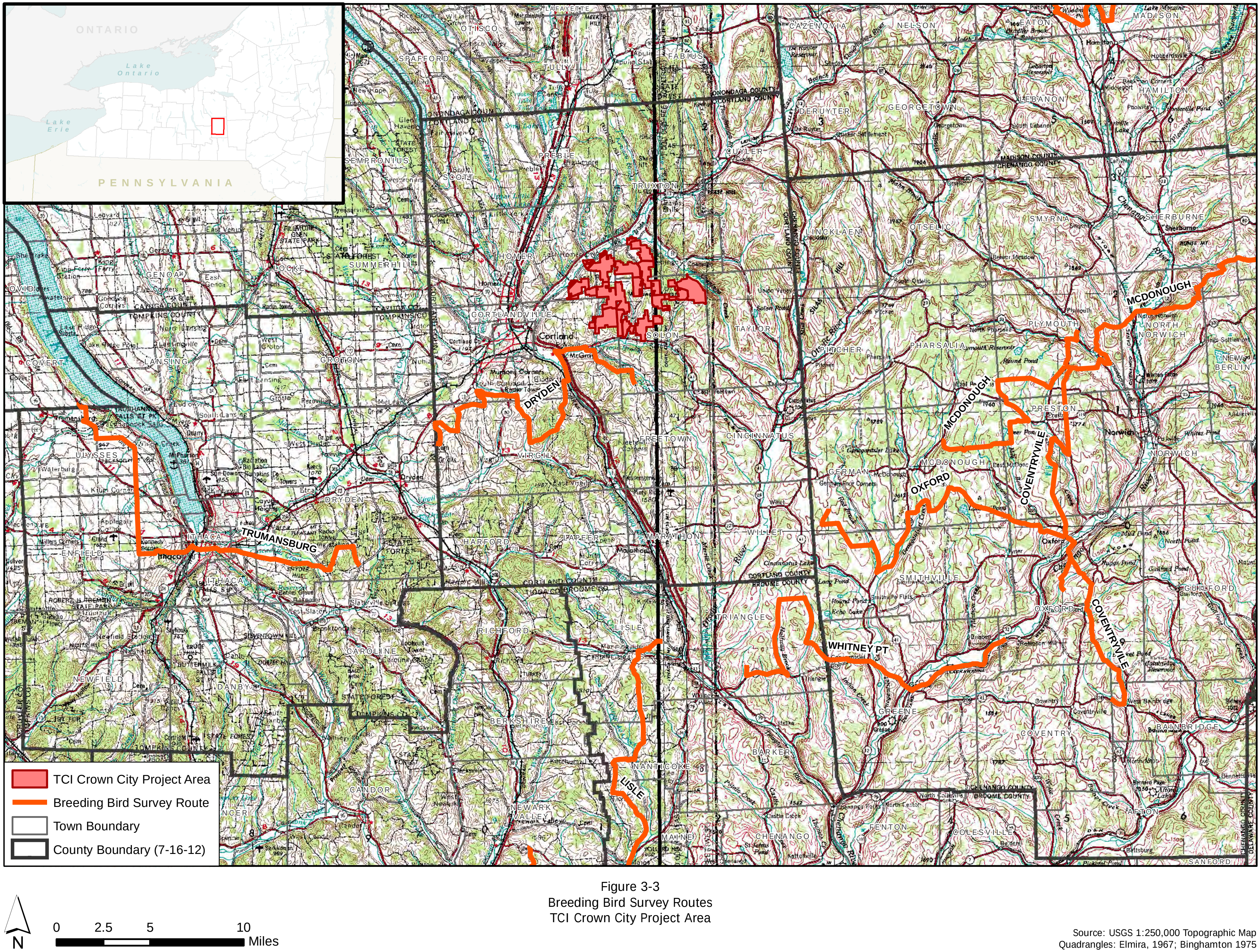


Figure 3-3
Breeding Bird Survey Routes
TCI Crown City Project Area

Source: USGS 1:250,000 Topographic Map
Quadrangles: Elmira, 1967; Binghamton 1975

provide a good overview of the species that occur regionally in early winter in similar habitat. CBC data are available from a National Audubon Society web site (http://audubon2.org/birds/cbc/hr/count_table.html). Birds observed during CBCs conducted near the Project Area provide information on birds likely occurring in the Project Area during the winter months in similar habitat. However, past observations of bird species during the CBC do not mean that such species are currently present on or near the Project Area.

The closest CBC is the Cortland count. The Cortland CBC is centered approximately 10 miles northwest of the McGraw, which is approximately 1 mile southwest of the southwestern edge of the Project Area. Given that a 15-mile diameter area is surveyed, the western half of the Project Area is included in this count.

The Cortland CBC was started in 1938. A total of 136 species have been identified on this CBC from December 1938 through December 2010 (72 years; a survey was not conducted in 1960) (National Audubon Society 2012). The number of species counted each year ranged from a minimum of 21 species in 1962 to 79 species in 2007 for an average species count during that time period of 44 species. See Appendix B, Table B-3, for the data from the last 10 years of the Cortland CBC. Table 3-3 includes the New York State-listed species that were identified at least once during the Cortland CBC between 1938 and 2010 and the maximum count during that period (National Audubon Society 2012). No federally listed species were identified during this period.

**Table 3-3 State-Listed Species Recorded during Cortland Christmas Bird Count (1938 through 2009)**

| Common Name | New York State Status | Number of Years Observed Out of 71 Years | Maximum Count (Year[1]) |
|---|---|---|---|
| Common Loon | Special Concern | 9 | 48 (2001) |
| Pied-billed Grebe | Threatened | 15 | 3 (1951, 1968, 1970) |
| Bald Eagle | Threatened | 4 | 1 (2000, 2002, 2007, 2008) |
| Northern Harrier | Threatened | 9 | 11 (2001) |
| Sharp-shinned Hawk | Special Concern | 22 | 4 (2003, 2004, 2005) |
| Cooper's Hawk | Special Concern | 34 | 10 (2007) |
| Northern Goshawk | Special Concern | 2 | 1 (2005, 2007) |
| Red-shouldered Hawk | Special Concern | 4 | 2 (1974) |
| Golden Eagle | Endangered | 1 | 1 (2004) |
| Short-eared Owl | Endangered | 4 | 3 (1980, 2001) |
| Red-headed Woodpecker | Special Concern | 2 | 2 (1939) |
| Horned Lark | Special Concern | 38 | 442 (1973) |

Source: National Audubon Society 2012.
[1] Year(s) that the maximum count was observed.

#### 3.2.1.5 Regional Reports

E & E reviewed the Region 4, Susquehanna quarterly reports in *The Kingbird*, a publication of the New York State Ornithological Association (NYSOA). NYSOA Region 4 includes Tioga, Cortland, Chenango, Otsego, Delaware, and Broome Counties. All reports since 2000 were reviewed for bird sightings in the Towns of Cortlandville, Homer, Solon, and Truxton, Cortland County, New York (NYSOA 2012).

Sightings of rare or threatened and endangered species were sparse across the four aforementioned towns that encompass the Project Area; however, there were several reports. Northern Harrier was documented in the township of Homer on December 1 2001, and December 14, 2008. Additionally, a Golden Eagle was observed feeding on road kill in the town of Cortlandville on November 14, 2005. Northern Harrier is listed as a threatened species in New York State and the Golden Eagle is listed as endangered in New York State.

#### 3.2.1.6 Important Bird Areas

The National Audubon Society has developed the Important Bird Area program to identify a network of sites that provide critical habitat for birds. There are no IBAs as identified by Audubon New York within the Project Area. There are three IBAs, Tioughnioga River/Whitney Point Reservoir located in Broome and Cortland Counties, Southern Skaneateles Lake Forest located in Cayuga and Onondaga Counties, and Pharsalia Woods located in Chenango County within 20 miles of the Project Area (see Figure 3-4).

The Tioughnioga River/Whitney Point reservoir IBA contains a 1,200-acre recreational lake, two 3-acre ponds, and the Otselic River backwaters. This IBA is located 20 miles south of the Project Area. Approximately 40% of the site is shrub habitat. This IBA is an important breeding location for shrub bird species, including American Woodcock, Gray Catbird, Brown Thrasher, Blue-winged Warbler, Prairie Warbler, Eastern Towhee, Field Sparrow, and Indigo Bunting. The reservoir serves as an important waterfowl stopover location and supports a high abundance and diversity of waterfowl. Raptors, including Osprey and Bald Eagles, are regularly present. The site also supports a variety of shorebirds in years when the water is drawn down and is an excellent songbird migration stopover location (Burger and Liner 2005).

The southern Skaneateles Lake Forest IBA, located at the southern end of Skaneateles Lake, is dominated by pine, spruce, hemlock, and hardwood forests. This IBA is located 16 miles northwest of the Project Area. There is also a wetland complex at the site that supports one state-listed threatened species, the northern harrier, as well as seven state-listed species of special concern, including the American Bittern, Sharp-shinned Hawk, Cooper's

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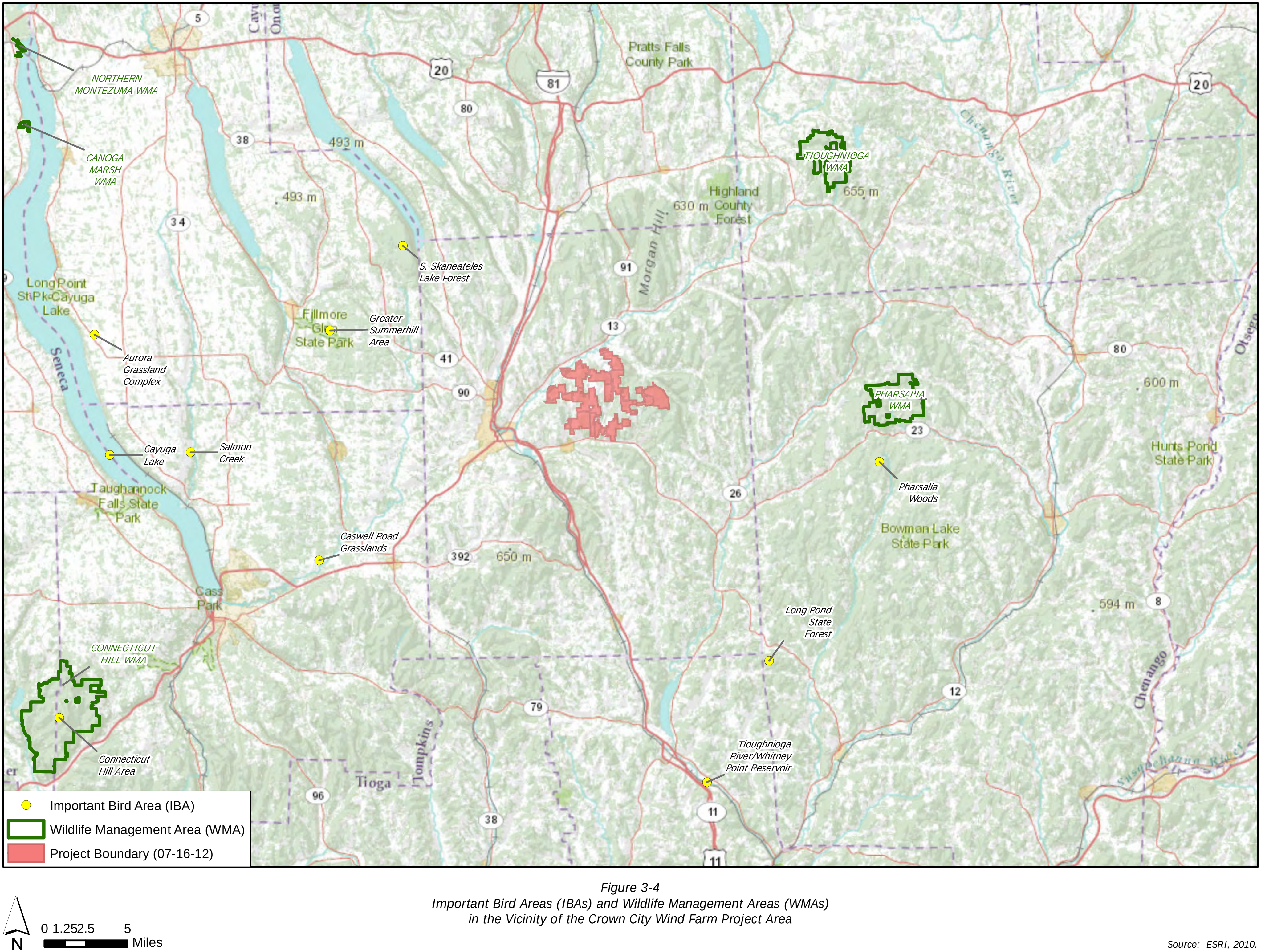


*Figure 3-4*
*Important Bird Areas (IBAs) and Wildlife Management Areas (WMAs)*
*in the Vicinity of the Crown City Wind Farm Project Area*

*Source: ESRI, 2010.*

Hawk, Northern Goshawk, Red-shouldered Hawk, Golden-winged Warbler, and Cerulean Warbler. More than 20 species of warblers also breed at this site.

The Pharsalia Woods IBA is a heavily forested area (approximately 85% cover) comprised primarily of hardwoods, including maple, beech, and hemlock. The site contains complex habitats including, deciduous wetland, evergreen northern hardwood, evergreen plantation, successional hardwood, and sugar maple mesic forests (Burger and Liner 2005). The IBA is approximately 16 miles east of the Project Area. This IBA is among the highest points in New York State and is one of the few areas with breeding Swainson's Thrushes. Other characteristic breeding birds of this IBA include Northern Harrier, Sharp-shinned Hawk, Cooper's Hawk, Northern Goshawk, Red-shouldered Hawk, Eastern Wood-Pewee, Red-eyed Vireo, Veery, Hermit Thrush, Magnolia Warbler, Black-throated Blue Warbler, Yellow-rumped Warbler, Black-throated Green Warbler, Blackburnian Warbler, Mourning Warbler, Canada Warbler, Scarlet Tanager, and Rose-breasted Grosbeak (Burger and Liner 2005). Additionally, this IBA contains significant red pine and Norway spruce plantations, which support Pine Grosbeak, Red Crossbill, White-winged Crossbill, Common Redpoll, and Pine Siskin (Burger and Liner 2005).

Although these IBAs contain habitats unique to the area and/or habitats that are not degraded or heavily impacted by humans (Burger and Liner 2005), none of these IBAs is proximate to the Project Area. Therefore, the IBAs are unlikely to be impacted by the Project.

#### 3.2.1.7 Other Protected Areas

New York State's bird conservation areas (BCAs) program is modeled after the Audubon New York IBA program except that only state-owned lands and waters can be designated as BCAs. The 3,316-acre Bear Swamp BCA, located 16 miles northwest of the Project Area, is primarily a mixed hardwood and coniferous forest and is part of the Southern Skaneateles Lake Forest IBA. Forest management at the site has created a diverse forest structure that supports a high diversity and abundance of breeding forest bird species (NYSDEC 2012a).

The Whitney Point Wildlife Management Area (WMA) is located near the Project Area. The Whitney Point WMA is a 4,645-acre upland and wetland area created by the construction of the Whitney Point flood control dam. The site offers hiking trails, boat access, scenic vistas, bird watching, cross-country skiing, snowshoeing, hunting, fishing, and trapping. The northern tip of the WMA is located approximately 10 miles south of the Project Area.

A number of state forests are also within 20 miles of the Project Area. Many of the state forests have contiguous tracts of forested lands. There are also several tracts of forestland that appear to be relatively unfragmented within the Project Area. Regulatory agencies have strongly discouraged development or fragmentation of unfragmented forests as they provide continuous protective habitat for a number of bird and bat species. These habitats have also been declining. Similarly, grassland habitat has been declining as have populations of grassland bird species.

Additionally, The Nature Conservancy (TNC) has a nature preserve, the von Engeln Preserve at Malloryville, which is located approximately 12.5 miles southwest of the Project Area (TNC 2012). The area contains more than one mile of ancient river beds in addition to forests, bogs, fens, and wooded swamps, which provide habitat to a variety of flora and fauna (TNC 2012)

#### 3.2.1.8 Recent Bird Studies in Proximity to the Project Area

Bird studies have been conducted in proximity to the Project Area as part of the permitting process for four other wind energy projects (Citizens Airtricity Central New York Wind Power Project, West Hill Wind Farm, Fenner Wind Power Project, and Madison Wind Power Project). A summary of the results from these bird studies are included in this section. The general locations of these four projects are identified on Figure 3-5.

##### Citizens Airtricity Central New York Wind Power Project

Curry and Kerlinger, LLC (C & K) conducted an avian risk assessment for the then-proposed Citizens Airtricity Central New York Wind Power Project Area in Madison and Oneida counties, New York, in 2004 (Kerlinger 2005). The site is located approximately 31 miles northeast of the Project Area (see Figure 3-5) and is dominated by grassland and agricultural fields, patch forests, and edge habitats. Through observations made on August 24 and 25, 2004, 74 bird species were recorded, including one species listed by New York State as threatened (Northern Harrier) and four New York State-listed species of special concern (Sharp-shinned Hawk, Horned Lark, Vesper Sparrow, and Grasshopper Sparrow).

Through literature review and a habitat assessment of the site, Kerlinger (2005) concluded that the site potentially provides sufficient nesting habitat for two state-listed threatened and three special concern species: Upland Sandpiper, Henslow's Sparrow, Horned Lark, Grasshopper Sparrow, and Vesper Sparrow. The study further concluded that risks for avian species included the potential to displace nesting species, which could have adverse impacts on local populations but would be unlikely to be regionally or globally significant. In addition, the authors concluded that the mortality from collisions with wind turbines would not be biologically significant and rates would be similar to those of other wind projects in the Northeast and Midwest.

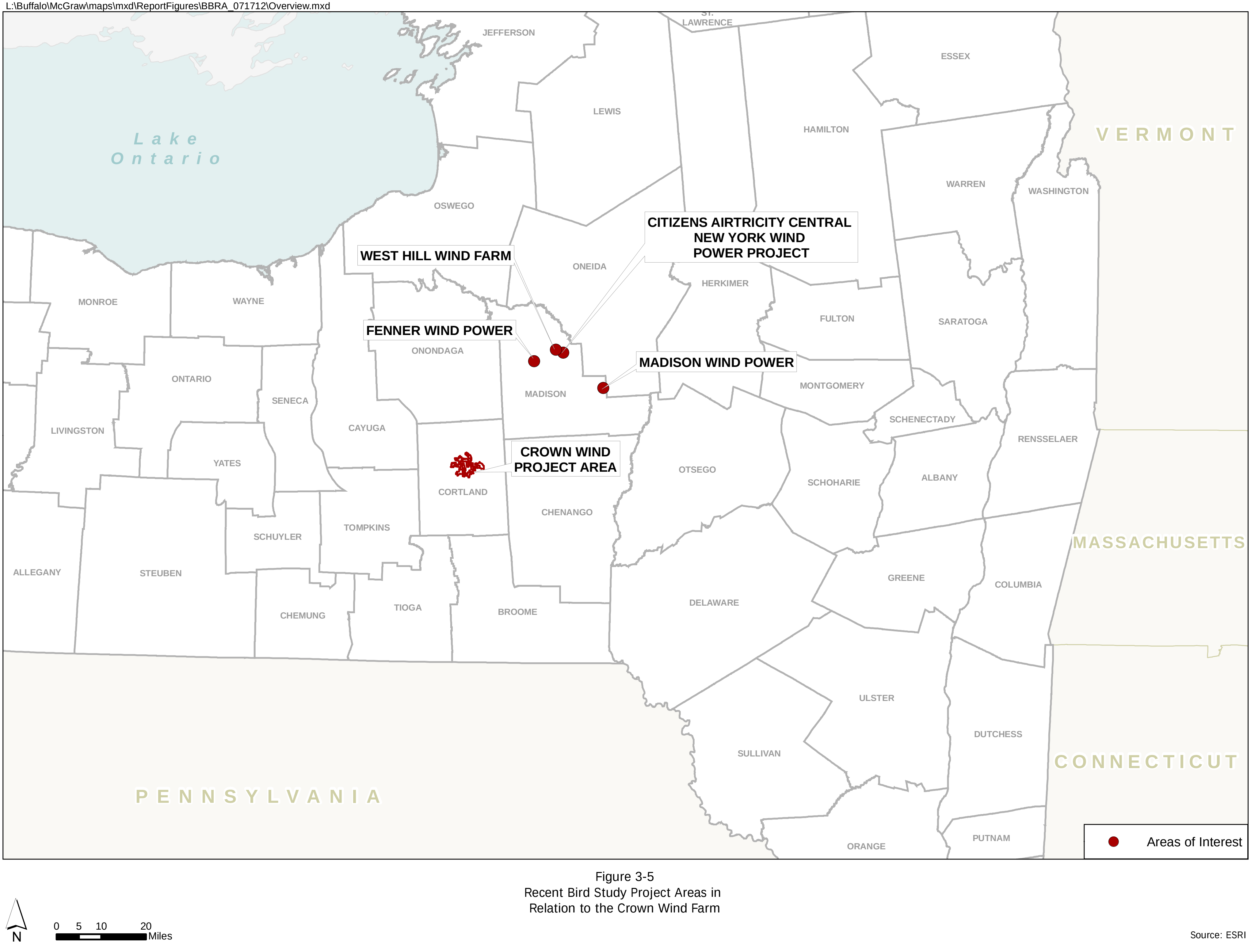


Figure 3-5
Recent Bird Study Project Areas in
Relation to the Crown Wind Farm

Source: ESRI

In 2008, post-construction mortality studies and breeding bird surveys were conducted weekly from April 15 to November 15 (Stantec Consulting 2008). Carcass searches yielded 10 bird fatalities in the vicinity of wind turbines. Species included Rock Pigeon, Ruby-crowned Kinglet, Red-eyed Vireo, Song Sparrow, Wild Turkey, and Red-tailed Hawk. With extrapolations based on searcher efficiency and carcass predation, the estimated number of fatalities was 51.1 birds per year or 2.2 birds per turbine per year. This fatality rate is on the low end of post-construction mortality study results in New York State.

Three post-construction breeding bird surveys were conducted in May 2008 (one survey) and June 2008 (two surveys). A total of 1,061 birds of 67 species were identified. Six other species were incidentally identified within the wind farm Project Area, for a total of 73 species (Stantec Consulting 2008). Of these, three state-listed species were identified—Northern Harrier (state-listed as threatened), Horned Lark (species of special concern), and Vesper Sparrow (species of special concern)—and all species had been observed during pre-construction surveys as well. Stantec (2008) noted that breeding bird displacement was observed at turbines located at forest edge habitats but it was not observed at turbines in agricultural settings. A second study is planned in 2013 to assess conditions five years after construction to compare with conditions one year after construction.

### West Hill Wind Farm

Woodlot, Inc. (Woodlot, now Stantec) conducted migratory and breeding bird surveys at the proposed West Hill Wind Farm in Madison County, New York, in 2005 (Woodlot 2005a, b). This site is located approximately 30 miles to the northeast of the Project Area (see Figure 3-5). Migratory raptor surveys were conducted in the spring and fall of 2005 (Woodlot 2005a, b). A total of 375 raptors of 12 species were recorded over 10 survey days in the spring. The spring raptor passage rate was 6.25 raptors/hour. The fall raptor count reached 369 with 14 species documented. The passage rate for raptors in the fall was 5.68 raptors/hour.

Overall, Woodlot reported that 78 percent of raptors recorded during the spring survey and 51 percent of raptors recorded during the fall survey were flying below the proposed turbine height of 118.5 meters (389 feet).

Nocturnal radar studies were also conducted by Woodlot in the spring and fall to document the nocturnal migration of songbirds (Woodlot 2005a). The spring nocturnal passage rate was 160 targets/km/hr while the fall passage rate was 732 targets/km/hr. Mean flight height in the spring time was 291 meters (955 feet), while mean flight height was 664 meters (2,178 feet) in the fall. Twenty-five percent and two percent of all targets were reported flying below the proposed turbine height during the spring and fall studies, respectively.

Breeding bird surveys were conducted by Woodlot spanning four days in June 2005 (Woodlot 2005b). A total of 588 individuals of 59 species were documented in the Project Area, with 64 individuals as fly-overs.

Woodlot (2005a, b) concluded that construction within the Project Area would not pose a significant negative impact on migratory birds. They expected that turbine collision related bird fatalities would be low due to lack of favorable landscape features for migrating birds (e.g. migratory corridors). They do however state that a minimal chance of bird fatalities via turbine collisions exists.

### Fenner Wind Power Project

C & K conducted an avian risk assessment in 1999 and 2000 for the then-proposed Fenner Wind Power project area in Madison County, New York (Kerlinger 2000a). This site is located approximately 25.4 miles to the northeast of the Project Area (see Figure 3-5). Observations made on March 24, 1999, and April 13-15 and May 22, 2000 recorded 32 bird species, including two New York State species of special concern (Horned Lark and Vesper Sparrow). The authors concluded that the risks for avian species, including the potential to displace nesting species and mortality from collisions, would not be biologically significant and rates would be similar to those of other wind projects in the Northeast and Midwest.

### Madison Wind Power Project

In June 2001 and May 2002, C & K conducted searches under seven erected wind turbines and a guyed meteorology tower (164 feet [50 meters] in height) located on farmland in Madison County, New York (Kerlinger 2002). The Madison Wind Power Project is located approximately 32.0 miles northeast of the Project Area (see Figure 3-5). The turbines were V66, 1.65 MW Vestas machines with a 216- foot (66-meter) diameter rotor and a 220-foot (67-meter) tower (a total height of 328 feet [100 meters] agl).

Six dead birds were located during the study (Kerlinger 2002). No other carcasses were reported by work crews, the landowners, or other visitors to the site. Four of the birds were found under turbines (Turkey Vulture, Great Horned Owl, Golden-crowned Kinglet, and Indigo Bunting) and their deaths were attributed to collisions with those turbines. The other two fatalities included one individual under a barbed-wire fence (Ruffed Grouse) and one individual under the meteorological tower (Yellow-bellied Sapsucker). This study indicated that the overall number of avian fatalities, the species involved, and the fatality rates (per turbine per year) were low. The authors concluded that this rate of fatality and the taxonomic variety do not suggest the possibility of ecologically significant impacts.

It should be noted that the number of bird carcasses located is likely an underestimation of the actual number of dead birds in the area. Detectability, decomposition, and opportunistic carnivorous animals play a role in carcass recovery; however, the relatively low number of carcasses recovered does suggest that mortality due to turbines is low at this project site.

### 3.2.2 Bats

#### 3.2.2.1 Regional Bat Overview

This section discusses general bat ecology and habitat preference for bat species found in New York State. Very limited information specific to the Project Area was identified during the literature review. Nine species of bats have been identified as potentially utilizing the various landscapes found in the State of New York (see Table 3-4). This section discusses general bat ecology and habitat preference for bat species found in New York State.

Habitats utilized by bats in New York include wetlands, agricultural and reverting fields, forests, and cities with a variety of micro-habitats used for foraging, roosting, and maternity roosting. Bats thrive in these various habitats as they are proficient predators of insect populations. Generally bats are solitary outside of mating, hibernation periods, and rearing of young, although some colonial roosting does occur. The most common species of bats found in New York prior to the onset of white-nose syndrome (WNS), which includes the timeframe when these surveys were conducted, were little brown bat, tri-colored bat, big brown bat, and eastern red bat. These species have adapted to a multitude of habitat types including human-altered landscapes, as such, these species are assumed to utilize the Project Area. The remaining bat species population levels are not as well known, therefore, their potential abundance in the Project Area is much more difficult to predict.

WNS was first documented on hibernating bats in a cave near Albany, New York, in winter 2006 and has since spread across the state and country. The syndrome is named for the presence of a white fungal growth around the affected bats' muzzle, ears, and wing membranes (Blehert et al. 2009). WNS is now believed to be present in all hibernacula in New York State (NYSDEC 2010). In April 2012, NYSDEC reported observed statewide declines of 98% for northern bat, 95% for tri-colored bats, 90% for little brown bats, 71% for Indiana bats, and 13% for eastern small-footed bat. Outside New York State, as of March 2012,WNS has been confirmed to occur in 19 states (Alabama, Connecticut, Delaware, Indiana, Kentucky, Maine, Maryland, Massachusetts, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Vermont, and West Virginia [the fungus that causes WNS has been confirmed in Oklahoma]) and four Canadian provinces (New Brunswick, Nova Scotia, Ontario, and Quebec), with the largest population impacts occurring in the northeastern United States (USFWS 2012a). Six species are known to be affected by WNS: big brown bat, eastern small-footed bat, Indiana bat, little brown bat, northern bat, and tri-colored bat. In 2010, three other bat species tested positive for the fungus associated with WNS (*Geomyces destructans*) but were not found to be infected.

**Table 3-4  Bat Species of New York, Preferred Habitats, and Abundance**

| Common Name | Scientific Name | Average Body Size (Inches) | Preferred Habitats | | Abundance[2] |
|---|---|---|---|---|---|
| | | | Summer | Winter | |
| Big Brown Bat | *Eptesicus fuscus* | 3.4-5.4 | Tree cavities, exfoliating bark, urban structures | Regional hibernacula, buildings, urban structure | Common |
| Silver-haired Bat | *Lasionycteris noctivagans* | 3.6-4.6 | Tree cavities, exfoliating bark in coniferous forested stands, and rock crevices | Migrates outside region? | Uncommon (abundance uncertain) |
| Eastern Red Bat | *Lasiurus borealis* | 3.6-4.6 | Dense riparian tree foliage | Migrates outside region? | Uncommon (abundance uncertain in New York); most common tree roosting bat |
| Hoary Bat | *Lasiurus cinereus* | 5.1-5.9 | Tree foliage | Migrates outside region? | Uncommon (abundance uncertain) |
| EasternSmall-footed Bat (SC) | *Myotis leibii* | 2.9-3.2 | Hemlock stands, rock crevices, tree bark, urban structures | Regional hibernacula, rock outcropping | Uncommon |
| Little Brown Bat | *Myotis lucifugus* | 2.4-4.0 | Tree cavities, urban structures | Regional hibernacula | Most common[2] prior to the onset of WNS, now uncommon |
| Indiana Bat (E) | *Myotis sodalis* | 2.9-3.9 | Exfoliating bark, cavities, dead trees in riparian corridors | Regional hibernacula | Uncommon[2]; federally endangered |
| Northern bat | *Myotis septentrionalis* | 3.2-3.8 | Tree cavities, exfoliating bark, barns, eves, shingles | Regional hibernacula | Uncommon to common[2] prior to the onset of WNS, now extremely rare |
| Tri-colored Bat | *Pipistrellus subflavus* | 3.0-3.6 | Tree foliage, leaf litter | Regional hibernacula | Uncommon to common[2] prior to the onset of WNS, now extremely rare |

Source:  Curtis and Sullivan 2001, Williams et al. 2002, NYSDEC 2012b, Bat Conservation International 2007.

Note:

[1] State-endangered (E) and threatened (T) species and species of special concern (SC) are noted with parenthesis after the common name.

[2] Pre-white nose syndrome abundance levels.  In April, 2012, NYSDEC reported observed statewide declines of 98% for northern bat, 95% for tri-colored bats, 90% for little brown bats, 71% for Indiana bats, and 13% for eastern small-footed bat.

These species included the cave myotis (*Myotis velifer*), gray myotis (*Myotis grisescens*), and southeastern myotis (*Myotis austroriparius*). It has been predicted that if the current infection and mortality trend continues the little brown bat is likely to be regionally extinct in the next 16 years in the northeastern United States and could be completely extinct in less than 100 years (Frick et al. 2010).

**Habitat Requirements**

Specialized habitats required for bats include winter hibernacula, where bat species congregate during hibernation periods (November through March). Identified hibernacula include limestone caves, old mines, and old well shafts. Most bats require a moderated constant temperature and humidity provided by the hibernacula to survive over the winter. Measures have been taken by state and federal agencies in recent decades to protect important bat hibernacula habitats, as any disturbances during critical hibernation periods can be detrimental to large populations of bats, as well as individual bat species. Bats return in fall to established hibernacula. Some New York bats migrate relatively short distances to these hibernacula. Some bats winter in small hibernacula near their summer roosting areas, while other bats migrate farther south to warmer climates with shorter periods of hibernation and available foraging sources.

Summer roosts are generally daytime or nighttime roosts, where bats will spend the entire day resting and/or portions of the night resting. Potential roost structures are present in the Project Area including buildings, rock piles, and trees with crevices and exfoliating bark, but none were identified as known or active roost locations within the Project Area based on the literature search

#### 3.2.2.2 NYSDEC Acoustic Transect Sampling in Proximity to the Project Area

The NYSDEC initiated acoustic bat monitoring in New York State in an effort to detect the species composition and relative abundance, as well as changes in relative abundance, of bats on a state-wide basis over time (Herzog 2012). The monitoring is conducted annually during the month of June with the use of acoustic transect sampling. A device that records bat echolocation calls is fixed to the roof of a vehicle, which then drives predetermined routes at a speed of 20 miles-per-hour. The recordings are then analyzed to determine how many of each bat species are recorded. The surveys document bats during the summer maternity season, and therefore indicate local residents and not migratory bats.

There are no NYSDEC acoustic sampling transects in Cortland County. The nearest transects are in Onondaga, Madison, Chenango, and Tompkins counties, which are located approximately 8 miles northwest, 13 miles northeast, 17 miles southeast, and 19 miles southwest of the Project Area, respectively. All of the species listed in Table 3-4, with the exception of the small-footed myotis have been detected on one or more of the routes sampled in the vicinity of the Project Area. Determining the species that created a recorded call is not 100% accurate and error rates vary by species, with *Myotis* species and big brown and silver-haired bats being especially difficult to distinguish. Although one Indiana bat call was detected in Chenango County, NYSDEC believes that it is extremely unlikely that Indiana bats occur there (Herzog 2012). Two other species with very few detections were the northern bat and tricolored bat.

#### 3.2.2.3 Recent Bat Studies in Proximity to the Project Area

Bat studies have been conducted in proximity to the Project Area as part of the permitting process for three other proposed wind energy projects (Citizens Airtricity Central New York Wind Power Project, West Hill Wind Farm, and Madison Wind Power Project. A summary of the results from these bat studies is included in this section. The general locations of the wind projects are identified on Figure 3-5.

**Citizens Airtricity Central New York Wind Power Project**

In 2008, post-construction mortality studies were conducted at the Citizens Airtricity Central New York Wind Power Project in Madison and Oneida counties, New York (Stantec Consulting 2008). The site is located approximately 31 miles northeast of the Project Area (see Figure 3-5) and is dominated by grassland and agricultural fields, patch forests, and edge habitats. Carcass searches were conducted weekly from April 15 to November 15 and yielded 10 bat fatalities in the vicinity of wind turbines. Species included hoary bat, little brown bat, big brown bat, and eastern red bat. With extrapolations based on searcher efficiency and carcass predation, the estimated number of fatalities was 15.0 bats per year or 0.7 bats per turbine per year. This fatality rate is among the lowest estimates of post-construction bat mortality study results in the region.

**West Hill Wind Farm**

**Spring 2005.** A spring radar and acoustic survey of bat migration was conducted at the then-proposed West Hill Wind Farm by Woodlot in 2005 (Woodlot 2005a). The West Hill Wind Farm is located approximately 30 miles to the northeast of the Project Area (see Figure 3-5) in Madison County, New York. The spring field survey included deployment of a single AnaBat II® detector (Titley Electronics Pty. Ltd.) on 22 separate nights. Sampling occurred from May 10 to May 31, 2005. The detector was placed on a meteorological tower at a height of approximately 98 feet (30 meters). The detector was programmed to collect data from 7:00 p.m. to 7:00 a.m. each evening (Woodlot 2005a).

A total of six bat call sequences were recorded during the spring survey period (Woodlot 2005a). Calls were detected only on the nights of May 10, 13, and 16, 2005. Due to the low numbers of calls detected, hourly passage rates were not calculated. Recorded calls were compared to reference libraries of known calls. Of the six calls recorded at the proposed Project Area, four were identified as *Myotis* sp. and two as hoary bats.

The low number of detected bats could indicate a small bat population in the region, avoidance of the area by bats, or poor conditions for bats (Woodlot 2005a).

No definitive determination of the presence or absence of any rare bats or impacts from development of a wind generation facility could be made.

**Summer 2005.** The summer 2005 field survey included documentation of summer bat activity through active and passive surveys with detectors (Woodlot 2005b). Sampling took place during three groups of three nights during June and July. Summer surveys took place on nine nights between June 29 and July 31, totaling approximately 121 hours of survey time. Passive surveys took place on the nights of June 29 to July 1, July 13 to 15, and July 29 to 31 and totaled 108 hours of sampling. Active surveys took place on all of the above dates with the exception of July 31, totaling approximately 13 hours. Fall surveys took place on 82 nights between August 1 and October 21, totaling 127 detector-nights of sampling.

A total of 140 bat call sequences were recorded during the summer sampling (Woodlot 2005b). Far more calls were recorded during active sampling (5.5 call sequences/hour) than during the passive sampling (0.6 call sequence/hour) despite the fact that the detector on the meteorological measurement tower was operating for twice as long as the hand-held detector (average of 10 to 12 hours a night versus 4 to 6 hours).

Habitat types sampled included open agricultural fields, pond and wetland edges, forests, and forest edges (Woodlot 2005b). The most productive habitat type sampled during active sampling was field edge habitat. Of the 140 calls recorded, 110 (78.6%) were *Myotis* sp. and 18 (16.4%) were identified as big brown bats.

Bat surveys conducted in the Project Area during spring, summer, and fall 2005 suggest that bat activity levels are highest in this area during the late summer and fall, especially between late August and early September (Woodlot 2005a, b). Identification of recorded call sequences suggest that myotids are the most common species in the Project Area during the spring and summer, but that numbers of other species, especially the big brown bat, increase during late summer and early fall. The detection rates found during the spring and fall were relatively low when compared to other sites in the northeast.

### Madison Wind Power Project

In June 2001 and May 2002, C & K conducted searches under seven erected wind turbines and a guyed meteorology tower (164 feet [50 meters] in height) located on farmland in Madison County, New York (Kerlinger 2002). The Madison Wind Power Project is located approximately 32 miles northeast of the Project Area (see Figure 3-5). The turbines were V66, 1.65 megawatt Vestas machines with a 216- foot (66-meter) diameter rotor and a 220-foot (67-meter) tower (a total height of 328 feet [100 meters] above ground level). No bat carcasses were located during any of the post-construction fatality surveys, and no bat carcasses have been reported by work crews, land owners, or other visitors to the site, suggesting that bat mortality resulting from the project is low (Kerlinger 2002).

### 3.2.3 Threatened and Endangered Species (Birds and Bats)

Federally listed threatened and endangered plant and animal species are protected by the Endangered Species Act of 1973, which is administered by the USFWS. State-listed threatened and endangered plant and animal species are protected by the New York State Environmental Conservation Law, Article 9 and Article 11, which is administered by NYSDEC.

The USFWS and the NYSDEC Natural Heritage Program (NHP) were consulted to determine the potential occurrence of federally and state-listed endangered and threatened species and significant natural communities and habitats within the Project Area.

The USFWS and NHP provided data detailing the known occurrences of threatened, endangered, and species of special concern within the Project Area. Species of special concern are wildlife species found by NYSDEC to be at risk of becoming either endangered or threatened in New York State. Species of special concern do not qualify as either endangered or threatened at this time, as defined in Part 182.2(g) and 182.2(h) and are not subject to the provisions of Part 182. Species of special concern are listed in Part 182.6(c) for informational purposes only.

#### 3.2.3.1 NYSDEC Natural Heritage Program

In addition to the standard analysis of project areas for potential occurrences of threatened or endangered plant and animal species, the NHP has developed specific criteria for wind power projects. NHP reports all records of avian species occurring within a 10-mile radius of identified project areas (Gradoni 2012). Records of bat colonies and bat species of concern occurring within a 40-mile radius are also reported.

Great Blue Heron, Northern Harrier, and Pied-billed Grebe were all identified as breeding species within 10 miles of the Project Area. The Northern Harrier and Pied-billed Grebe are state listed threatened species. The Great Blue Heron is protected by the federal Migratory Bird Treaty Act and does not have special status in New York State; however, it was listed because a rookery (nesting area) occurs within 10 miles of the Project Area.

Additionally, an Indiana bat hibernaculum and maternity colony were identified within 40 miles of the Project Area as well as an eastern small-footed myotis bachelor colony. The Indiana bat is a federally endangered species and the eastern small-footed myotis is a state-listed species of special concern. Both locations were reported in Onondaga County to the north of Cortland County. Information on the distribution of Indiana bats in New York State is identified on Figure 3-6.

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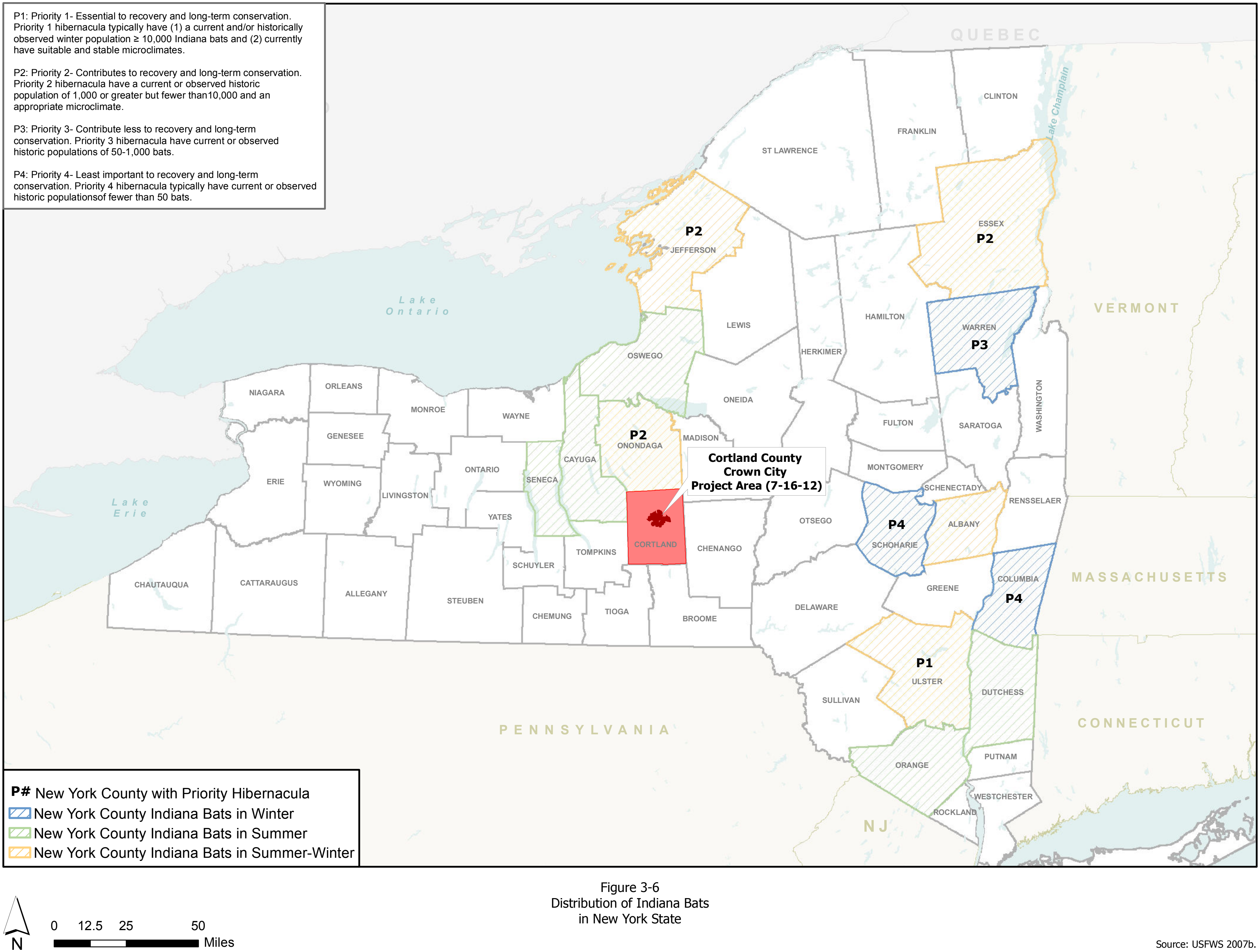


Figure 3-6
Distribution of Indiana Bats
in New York State

Source: USFWS 2007b.

#### 3.2.3.2 USFWS

The USFWS has expressed concern pertaining to the potential for wind projects, in general, to impact migratory birds and threatened or endangered bat species (such as the Indiana bat). Presently, two additional bat species, the eastern small-footed bat and the northern bat are under review by the USFWS for listing under the Endangered Species Act (CBD 2010). The USFWS maintains a database of federally listed endangered and threatened and candidate species regarding known or likely occurrences by county. The database is available online at http://www.fws.gov/northeast/nyfo/es/esdesc.htm. The county-level list of federally listed animal species was reviewed for this Project for updated threatened and endangered bird and bat species information. The only species identified is the Bald Eagle, which has been de-listed and is no longer protected by the Endangered Species Act (USFWS 2007). The Bald Eagle is still protected federally under the Bald and Golden Eagle Protection Act (USFWS 2008). No federally designated or proposed "critical habitat" exists within the Project Area.

# 4 Results

## 4.1 Migratory Raptor Surveys

### 4.1.1 Spring Raptor Surveys

Spring migratory raptor surveys were conducted within the Crown City Project Area on April 2, 3, 10, 17, 18, 19, and May 3, 4, 11, 14, 2008, for a total of 68 survey hours. Migrants were determined as those raptors with a northerly flight path. Locally foraging raptors were also documented but not included in the migrant totals.

Over the course of the ten raptor surveys conducted during the spring of 2008, a total of 435 raptors of 13 species were identified, 192 of which were considered to be migrants (see Table 4-1 and Table C-1). The migratory passage rate was 2.8 raptors per observer hour. For comparison, at the Braddock Bay Hawk Watch in Hilton, New York over the same ten survey days, 9,954 raptors were tallied over 64.25 hours for a passage rate of 154.9 raptors/hour (HawkCount 2008). At the Derby Hill Hawk Watch in Mexico, New York over the same ten survey days, 7,403 raptors were tallied over 88 hours for a passage rate of 84.1 raptors/hour (HawkCount 2008).

The flight direction results are included for all sightings (migrants and locals) in the Project Area by species in Appendix Table C-2 and distributed by date in Appendix Table C-3. Flight directions of migrating raptors were predominantly to the northeastern direction, which is expected for this season.

The flight height of each bird was estimated to be above or below 500 feet agl by the field observer. Overall (migrants and locals), approximately 65% of the raptors were observed below 500 feet. Migrant raptors were observed flying below 500 feet 51% of the time. A summary of sightings by species (including several non-raptor species) based on flight height category is included in Table C-4.

Weather conditions on the survey days were generally favorable for raptor migration with westerly or south-westerly winds, average to above average temperatures, and no precipitation (see Table C-5 for daily weather conditions).

**Table 4-1 Spring Migrant Raptor Totals in the Project Area by Date**

| Species | Year 2008 | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4/2 | 4/3 | 4/10 | 4/17 | 4/18 | 4/19 | 5/3 | 5/4 | 5/11 | 5/14 | |
| Black Vulture | - | 2 | - | - | - | - | - | - | - | - | **2** |
| Turkey Vulture | 3 | 36 | 12 | 27 | 4 | 11 | 9 | 8 | 3 | - | **113** |
| Osprey | - | - | - | - | - | 1 | 2 | 3 | - | 1 | **7** |
| Bald Eagle | - | - | - | - | - | - | - | - | 2 | - | **2** |
| Northern Harrier | - | 2 | - | - | - | - | - | - | 3 | - | **5** |
| Sharp-shinned Hawk | - | 2 | - | - | - | - | 4 | 4 | - | - | **10** |
| Cooper's Hawk | - | - | 1 | - | - | - | - | - | - | - | **1** |
| Red-shouldered Hawk | - | 3 | - | - | - | 1 | 1 | - | - | - | **5** |
| Broad-winged Hawk | - | - | - | - | - | - | 3 | 3 | 1 | - | **7** |
| Red-tailed Hawk | 2 | 9 | 3 | 3 | 7 | 1 | 2 | 2 | 2 | - | **31** |
| Golden Eagle | 1 | 1 | - | - | - | - | - | - | - | - | **2** |
| American Kestrel | - | 1 | - | - | - | - | - | - | - | - | **1** |
| Merlin | - | 1 | - | - | - | - | - | - | - | - | **1** |
| unidentified raptor | 1 | 4 | - | - | - | - | - | - | - | - | **5** |
| **Total Birds:** | **7** | **61** | **16** | **30** | **11** | **14** | **21** | **20** | **11** | **1** | ***192*** |
| **Species Count:** | **4** | **10** | **3** | **2** | **2** | **4** | **6** | **5** | **5** | **1** | ***13*** |
| **Daily Survey Hours** | **6** | **6.5** | **7** | **7** | **7** | **7** | **7** | **7** | **7** | **6.5** | ***68*** |

Key:

– Indicates 0 sightings.

The findings from the spring migratory raptor surveys are consistent with the knowledge of spring raptor migration in New York State away from the Great Lakes (see Table C-6). General flight paths observed from the raptor survey location are shown on Figure 4-1; the majority of raptor movement was predominantly to the north, northeast. While some local raptors were observed flying over the landfill adjacent to the survey location, results from the survey suggest that the landfill is not heavily utilized by local or migrating raptors during the spring season; there were however, large numbers of gulls and American Crows utilizing this area. There is no evidence of a pronounced spring migratory raptor corridor in the Project Area.

### 4.1.2 Fall Raptor Surveys

Fall migratory raptor surveys were conducted by E & E on September 2, 10, 18, and 25, October 7, 15, and 31, November 12, and 21, and December 3, 2008, for a total of 69 survey hours. Migrants were determined as those raptors with a southerly flight path. Locally foraging raptors were also counted but not included in the migrant totals. Weather conditions on the survey days were generally favorable for fall raptor migration exhibiting northerly, northeasterly or northwesterly winds with the exception of November 21, 2008, where moderate to heavy snowfall and below average temperatures were recorded for parts of the survey (see Table C-5 for daily weather conditions).

During Project surveys in fall 2008, E & E observed a total of 759 raptors including 687 migrants and 72 local raptors of 11 species (see Table 4-2 and Table D-1 for migratory raptor totals). The migratory passage rate was 10.0 raptors per observer hour. The Franklin Mountain Hawk Watch in Oneonta, New York was used for nine day to day comparisons with the Project Area (there was no Franklin Mountain survey on September 26, 2008). The Franklin Mountain Hawk Watch in Oneonta, New York (approximately 50 miles southeast of the Project Area) yielded 1,152 raptors over 65.25 hours for a passage rate of 17.7 raptors/hour (HawkCount 2008).

The flight direction results are included for all sightings (migrants and locals) in the Project Area by species in Appendix Table D-2 and distributed by date in Appendix Table D-3. The primary flight direction of migratory raptors was to the south and no concentrated flight paths were identified. General flight paths observed from the raptor survey location are shown on Figure 4-2.

The flight height of each bird was estimated to be above or below 500 feet agl by the field observer. Overall (migrants and locals), approximately 48% of the raptors were observed below 500 feet. Approximately 42% of the migratory raptors flew below 500 feet agl at some point during observation. A summary of sightings by species based on flight height category is included in Table D-4.

Table 4-2 Fall Migrant Raptor Totals in the Project Area by Date

| Species | Year 2008 | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9/2 | 9/10 | 9/18 | 9/25 | 10/7 | 10/15 | 10/31 | 11/12 | 11/21 | 12/3 | |
| Turkey Vulture | 74 | 163 | 78 | 109 | 29 | 32 | - | 1 | - | - | **486** |
| Osprey | - | 1 | - | - | - | - | - | - | - | - | **1** |
| Bald Eagle | - | 3 | 1 | 1 | - | - | - | - | - | - | **5** |
| Northern Harrier | - | - | - | 1 | - | - | - | - | - | - | **1** |
| Sharp-shinned Hawk | - | - | 2 | 1 | 1 | - | - | - | - | - | **4** |
| Cooper's Hawk | - | - | 1 | - | - | - | - | - | - | - | **1** |
| Red-shouldered Hawk | - | 1 | 1 | - | - | - | - | - | - | - | **2** |
| Broad-winged Hawk | - | 145 | 12 | - | - | - | - | - | - | - | **157** |
| Red-tailed Hawk | - | 6 | 3 | - | 3 | 4 | - | 5 | 1 | - | **22** |
| Rough-legged Hawk | - | - | - | - | - | - | - | 1 | - | - | **1** |
| American Kestrel | - | 3 | - | - | - | - | - | - | - | - | **3** |
| unidentified raptor | - | 3 | 1 | - | - | - | - | - | - | - | **4** |
| **Total Birds:** | **74** | **325** | **99** | **112** | **33** | **36** | **-** | **7** | **1** | **-** | **687** |
| **Species Count:** | **1** | **8** | **8** | **4** | **3** | **2** | **-** | **3** | **1** | **-** | **11** |
| **Daily Survey Hours** | **7** | **7** | **7** | **7** | **7** | **7** | **7** | **7** | **6** | **7** | **69.0** |

Key:

– Indicates 0 sightings.

Turkey Vultures were the most prevalent raptor species seen. Many of the Turkey Vultures identified were likely local birds exhibiting back and forth foraging flights and were observed over the landfill; however, all birds observing flying in a non-northerly direction were considered potential migrants. This likely resulted in classification of many non-migrant Turkey Vultures as migrants and also more total raptors flying less than 500 feet. Broad-winged Hawks were observed in greater numbers in the fall (157 sightings), which were tied to sightings of several kettles and good migration numbers in early September.

The findings are consistent with the knowledge of fall raptor migration in New York State (see Table D-5), as raptors do not concentrate in large numbers in this area and movements are relatively diffuse. The migratory raptor passage rate of 10.0 raptors per observer-hour was highest among other NYS studies; however, the likely overestimate of Turkey Vultures (as described above) influenced this passage rate. Many of the local raptor sightings during the fall season were concentrated over the landfill adjacent to the survey location (especially Turkey Vultures), suggesting that the landfill is an attractant to local raptor populations. There is no evidence of a pronounced fall migratory raptor corridor in the Project Area.

## 4.2 Migratory Surveys

### 4.2.1 Spring 2008

A total of 1,360 birds of 87 species were recorded during migratory bird surveys conducted at 20 points on May 10, 15, 20 and 28, 2008 (see Appendix E, Table E-1 for totals and Tables E-2 through E-5 for survey results by date).

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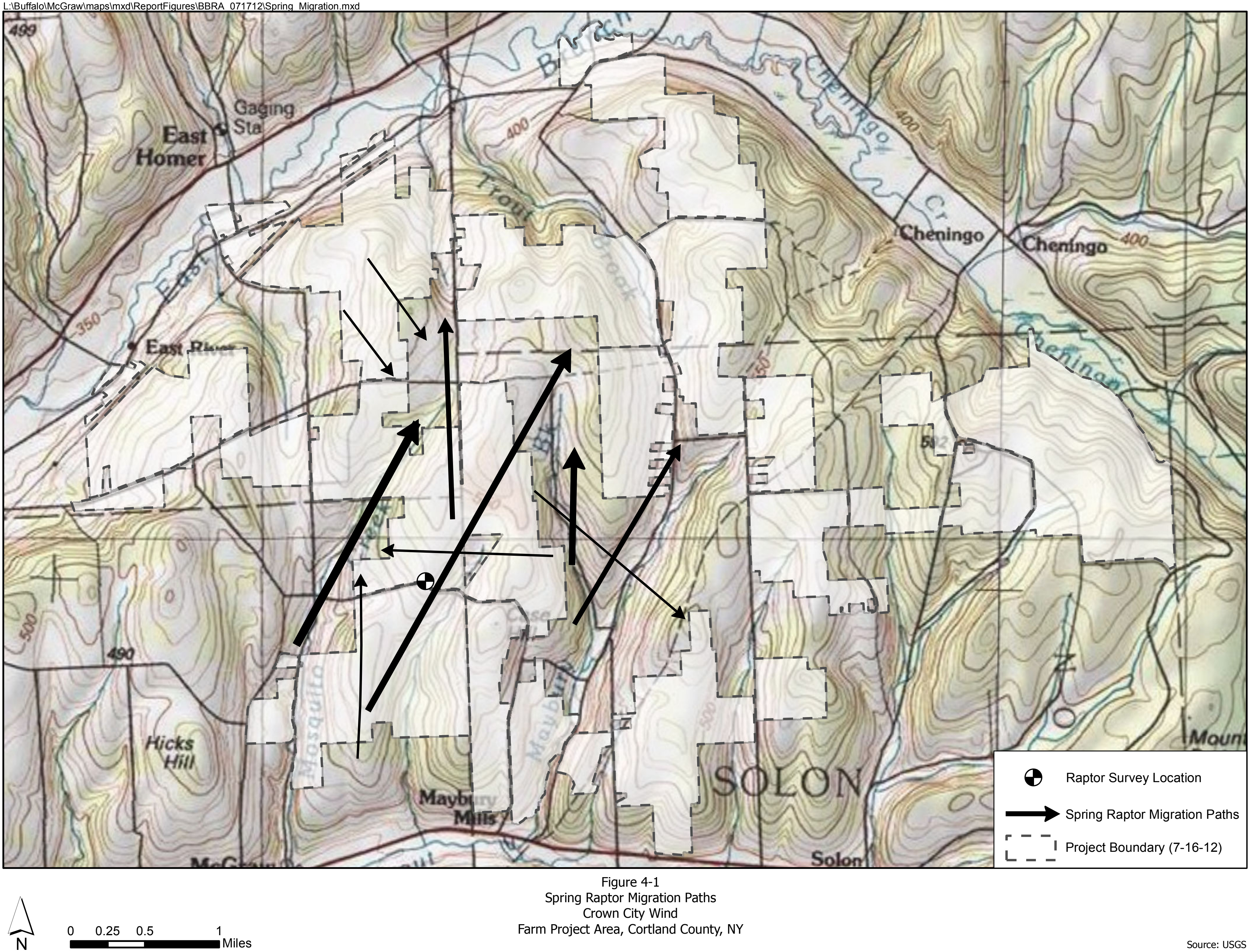


Figure 4-1
Spring Raptor Migration Paths
Crown City Wind
Farm Project Area, Cortland County, NY

Source: USGS

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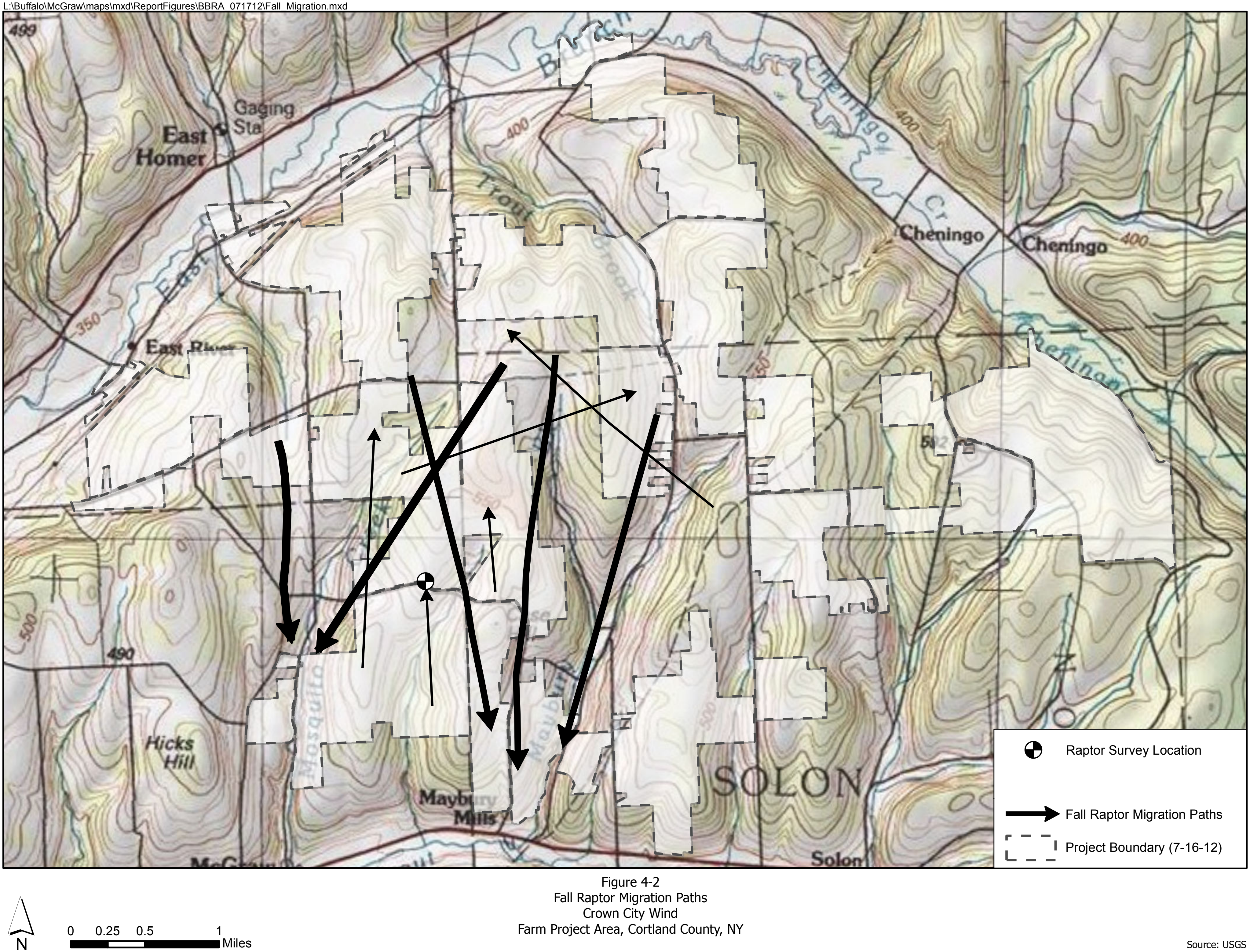


Figure 4-2
Fall Raptor Migration Paths
Crown City Wind
Farm Project Area, Cortland County, NY

Source: USGS

Flyovers made up 82 of the 1,360 birds and were observed at 17 of the 20 survey locations. Eighteen species were observed flying over the Project Area; they included Canada Goose (four birds), Great Blue Heron (1), Turkey Vulture (1), Killdeer (2), Ring-billed Gull (8), Mourning Dove (1), Blue Jay (4), American Crow (21), Barn Swallow (7), Eastern Bluebird (1), American Robin (2), Cedar Waxwing (2), Bobolink (1), Red-winged Blackbird (3), Eastern Meadowlark (1), Common Grackle (9), Brown-headed Cowbird (3), and American Goldfinch (11). All of these species are known to breed in or within proximity to the Project Area and the number of flyovers is relatively low in comparison to total birds identified. Thus, these birds were included in the results that follow.

The total number of birds per point across all surveys ranged between zero and 35 birds, with an overall average of 17.0 birds per point. Points E, H, and I had the highest number of birds with averages of more than 21 birds and points A, F, and P held the lowest number of total birds with averages under 13 birds. Species richness per point across both surveys ranged between zero and 21 species, with an overall average of 11.7 species per point. Survey points E, G, and S averaged more than 13 species, while survey points A, F, and R averaged nine species or less. See Table 4-3 for a summary of results by survey day.

**Table 4-3 Spring Migratory Survey Results**

| | 5/10/08 | 5/15/08 | 5/20/08 | 5/28/08 |
|---|---|---|---|---|
| Total Species on Survey | 51 | 51 | 64 | 70 |
| Average Number of Birds per Location | 14.5 | 14.3 | 20.8 | 18.5 |
| Average Number of Species per Location | 10.5 | 9.7 | 12.9 | 13.7 |

The survey points with the highest number of birds and species richness, generally, have a mix of habitats. The survey points with the lowest number of birds and species richness, generally, were without a mix of habitats and/or had poor lines-of-sight.

Most of the birds tallied during the spring migratory survey were likely local breeders rather than migrants, as most species identified were within their population breeding range. However, surveys were conducted during the migratory season, as evidenced by sightings of several species that do not breed in the area, including Wilson's Warbler and Blackpoll Warbler. There was no evidence from the surveys or other time spent in the Project Area during the spring season that the Project Area serves as an increased migratory corridor or stopover point for passerines or other bird species.

Table E-6 in Appendix E compares pre-construction spring migratory bird survey results at Crown City with results at other proposed and constructed wind farm sites in New York State. The Crown City spring migratory bird survey results are generally consistent with those at other New York wind energy facilities (see Table E-6). The number of birds identified during surveys was slightly lower within the Project Area compared to other sites across New York and the species richness fell within the middle of other sites in New York.

### 4.2.2 Fall

A total of 1,579 birds of 62 species were recorded during fall migratory bird surveys conducted at 20 points on September 3, 11, 19, and 26, 2008 (see Appendix F, Table F-1 for totals and Tables F-2 through F-5 for survey results by date). The most common species found within the Project Area included Blue Jay (223), American Crow (438), and Red-winged Blackbird (130). Overall, the species observed were generally expected based on the habitat, location, and time of year. The averages for total birds and species per survey location are indicated in Table 4-4.

Flyovers in the Project Area comprised 71 of the 1, 579 birds and were observed at 2 of the 20 survey locations. Species observed flying over the Project Area included Canada Goose (five birds), Red-shouldered Hawk (1), and American Crow (68). All of these species are known to breed in or within proximity to the Project Area and the number of flyovers is relatively low in comparison to total birds identified. Thus, these birds were included in the results that follow.

**Table 4-4 Fall Migratory Survey Results**

| | 9/3/08 | 9/11/08 | 9/19/08 | 9/26/08 |
|---|---|---|---|---|
| Total Species on Survey | 62 | 30 | 33 | 34 |
| Average Total Birds per Location | 18.0 | 17.8 | 18.7 | 24.5 |
| Average Number of Species per Location | 8.4 | 6.5 | 5.8 | 5.9 |

The total number of birds per point across fall migratory surveys ranged between two and 89 birds, with an overall average of 19.7 birds per point. Points E, F, and J had the highest number of birds with averages of 30 or more birds and points P,Q, and R held the lowest number of total birds with averages of ten birds per site or less. Species richness per point across both surveys ranged between one and 15, with an overall average of 6.6 species per point. Survey points I, J, and K averaged more than eight species, while survey points H, M, and R averaged fewer than six species. See Table 4-4 for a summary of results by survey day.

The survey points with the highest number of birds and species richness, generally, have a mix of habitats. The survey points with the lowest number of birds and species richness, generally, were without a mix of habitats and/or had poor lines-of-sight.

Most of the birds tallied during the fall migratory survey were likely local breeders rather than migrants, as most species identified were within their population breeding range. However, surveys were conducted during the migratory season, as evidenced by sightings of several species that do not breed in the area, including Wilson's Warbler. There was no evidence from the surveys or other time spent in the Project Area during the fall season that the Project Area serves as an increased migratory corridor or stopover point for passerines or other bird species.

## 4.3 Breeding Bird Surveys

A five-minute breeding bird survey was conducted at 24 points on June 9 and 10, 2008 and was repeated on June 24 and 25, 2008 (see Figure 2-1). A combined total of 996 birds of 70 species were identified during the two surveys (see Appendix G, Table G-1 for totals and Tables G-2 through G-5 for survey results by date). Sixty-two species were identified during the June 9 and 10, 2008, survey with a total of 408 birds. Sixty-four species and a total of 588 birds were identified during the June 24 and 25, 2008 survey. The most numerous species recorded were American Crow (95 birds), American Robin (88), Red-eyed Vireo (78), and Song Sparrow (50).

Total birds per point ranged from nine to 44 birds, with averages of 17 birds on June 9 and 10, and 24.5 birds on June 24 and 25. Total species per point ranged from seven to 17 species, with averages of 10.9 species on June 9 and 10, and 13.5 species on June 24 and 25. Survey points B, E, and N averaged more than 31 birds per location and relatively high species richness (greater than 12 species per location); whereas points G, R, and W averaged less than 15 birds per point and relatively low species richness (less than 11 species per point).

The species composition was generally consistent with what was anticipated for the habitat and location, and was generally consistent with those species regularly found in or near Cortland County during the New York State Breeding Bird Atlas (2000 through 2005) and USGS breeding bird surveys. No threatened or endangered species were identified during E & E breeding bird surveys; only one state species of special concern, Vesper Sparrow, was detected.

Table G-6 compares pre-construction breeding bird results at Crown City with results at other proposed and constructed wind farm sites in New York State. Breeding bird survey results from the Project Area were generally consistent with other sites across New York; however, the species richness and number of bird observations were higher than most sites in the state (see Table G-6), suggesting that breeding bird activity within the Project Area is greater than several other wind sites in New York.

## 4.4 Habitat Surveys

Habitat surveys of the Project Area were conducted during various field efforts in 2008. Surveys identified no major rock outcroppings, cave dwellings, or hibernacula where bats may roost within the Project Area; however, these can be difficult to detect and can also possibly occur on land parcels not searched due to access limitations. Based on the mosaic of habitat types found throughout the Project Area, suitable habitat was identified for the most common bird and bat species that would be expected to occur in the Project Area. E & E noted the potential for several grassland-related avian species to occur in the Project Area such as the Northern Harrier (state threatened), Vesper Sparrow (special concern), and Grasshopper Sparrow (special concern). Several riparian areas were noted for possible bat foraging areas and the Donahue Woods State Forest land along Harris Hill Road in the northeast portion of the Project Area was identified for the potential for increased bat activity. This information was used to help select appropriate migratory bird, breeding bird, and active bat acoustical survey locations.

## 4.5 Acoustical Monitoring for Bats

ABR conducted the passive acoustical monitoring study from the late spring through fall of 2008. The results of their study, including mean detection rate, species composition, and the relationship of the number of call sequences to weather variables, are summarized in this section. The report prepared by ABR is in Appendix A. E & E conducted an active acoustical monitoring study during the late spring and summer months of 2008. Data tables from the study are available in Appendix H.

### 4.5.1 Passive

Three detectors were deployed at different heights (60m, 22m, and 1.5m agl) on a met tower in the Project Area from the night of May 2 to the night of October 15, 2008, yielding a total of 167 nights for recordings, yielding a total of 426 successful detector-nights. Of the 426 successful detector nights, 148 nights were from the 1.5m detector, 138 nights were from the 22m detector, and 140 nights were from the 60m detector (some nights of data were lost as a result of detector malfunction and problems during CF card exchange, both of which are common during these types of remote studies). The met tower was located in a hay field near the center of the Project Area and was adjacent to forested stands to the south and east and two large farm ponds to the northwest (see Figure 2-2). A total of 3,682 bat passes were recorded during the total sampling period of May 28 through October 15, 2008. Because of equipment malfunctions between May 2 through 27 yielded only one week of data for the 1.5m detector, ABR only reported on the data between May 28 and October 15, 2008. The mean detection rate of all bats for all detectors was 8.9 +/- 0.6 call sequences per detector-night (10.5 +/- 1.0 for late spring and 8.4 +/- 0.7 for the fall). The highest detection rate was recorded at the lowest detector (14.5 +/- 1.5 at 1.5 meters) with the lowest detection rate at the highest detector (5.1 +/- 0.5 at 60 meters). The middle detector (22 meters) had a detection rate slightly higher than the highest detector (6.8 +/- 0.7 at 22 meters), but was slightly less than half of the lowest detector's detection rate. The peak activity occurred between July 14 and July 21 with 7 of the 8 highest detector nights for the entire study occurring in this timeframe. In general, the data show activity was relatively steady through late May and early June with a slight decrease in activity before the spike in activity in mid-July. Activity then declined through August with a slight spike in activity observed in early September.

A large proportion (72.2%) of the call sequences were identified to species or species group. The remaining unidentified calls (27.8%) were divided into high and low frequency groups. The tree bat group, consisting of big brown bat, silver-haired bat, eastern red bat, hoary bat, and unidentified low frequency calls, compromised 57.4% of all calls. The big brown/silver-haired group was the most recorded group in the fall survey (29% of fall calls). The *Myotis* group was the most recorded group in the springtime survey (49% of spring calls) as well as the overall most recorded group (31.9% of total calls). The only other bat to make up a significant portion of the call sequences was the hoary bat (10.3% of the total calls). The eastern red bat and tri-colored bat were recorded but did not make up a significant portion of the call sequences (2.2% and 0.1% respectively).

The survey results were generally consistent with other studies conducted in a mixed agricultural-forest habitat (see Appendix A). Comparison of results between sites has numerous caveats, especially for the mean detection rate (call sequences per night) because the detection rates can be easily skewed by one or several bats repeatedly circling the met tower and producing many calls on one or several nights during the study period. Site selection is also a key component for comparison, as most studies are conducted at met towers, which are often placed in wide open fields that are not near wooded areas where there is often more local bat activity. Therefore, sites located near wooded areas and/or wetlands may have higher detection rates compared to other sites because of the surrounding habitat. The survey location on this project falls into the latter category because it was located near a forested edge and there were wetlands/ponds in close proximity to the MET tower. Other factors include, but are not limited to, duration of season, number of detectors, type of detectors, setup, and amount of operational time for the detectors as malfunctions are common for remote-based acoustical monitoring equipment.

For more complete results and discussion on the AnaBat surveys conducted from the late spring into fall, see the ABR report in Appendix A.

### 4.5.2 Active

All 12 survey points were sampled on each of the six sample nights except Site L, which was not sampled on the first survey night. This yielded a total of 71 active survey counts. There were 1,008 call files recorded during the entire survey period and 865 (85.8%) of those files were able to be identified to species group. Overall, the *Myotis* group was the most frequently identified group with 688 of the 865 identifiable files (79.5%) classified to that group. The second most common species group was the big brown/silver-hair/hoary bat group which was identified for 125 of the 865 identifiable files (14.5%). Lastly, the eastern red/tricolored bat species group was the least identified with only 52 call files (6.0%) belonging to this group. Unidentified calls made up 14.1% (142 calls files) of the total recorded call sequences due to short call sequences, poor call signature formation, or static interference. Site B recorded the most total call files (220) while Site D recorded the lowest number of total call files (seven). Sites B, E, F, I, and K recorded at least one bat pass on every evening. All other sites had at least one evening with no recorded bat passes including Sites C, H, J, and L, which had one evening with no recorded bat passes; Sites A and D with two evenings without recording a bat pass; and Site G with three evenings without recording a bat pass. In general, the results of this study were consistent with the passive acoustic study conducted by ABR in that the *Myotis* group was the most frequently identified species group followed by the big brown/silver-haired/hoary and eastern red/tricolored bat species groups respectively.

### Myotis Species Group
Every survey point sampled identified at least two *Myotis* group call files during the duration of the study while Sites B, E, F, and I recorded a *Myotis* group call on every evening. The *Myotis* group was the overall dominant species group identified at all but three survey locations (Sites G, J, and K). Site B recorded the most *Myotis* species group calls identified (172) followed by Sites I, C, and F (140, 109, and 102) respectively. Lastly, as expected, there were some observed temporal shifts in *Myotis* species group within the sites. For example, at Site C, there were 72 identified *Myotis* species group files on the evening of July 28, 2008, while there were none on the evening of June 5, 2008, and only one on the evening of June 3, 2008.

### Big Brown/Silver-hair/Hoary Bat Group
The big brown/silver-hair/hoary bat group was the second most identified group and was identified at all but one of the survey points (Site D). Site B recorded the most big brown/silver-hair/hoary bat group calls identified (44) followed by Sites K and J (28 and 21) respectively. The remaining sites had only a small number of files identified to the group. Although Site K had the second most number files recorded to this group, it is noteworthy that all 28 identified files were recorded on a single night and that the other five nights did not contain call files identified to this group.

### Eastern Red/Tri-colored Bat Group
The eastern red/tri-colored bat group was the least observed group of all. This group was only identified at seven of the 12 survey locations (58.3%). Site K was the only site to record a total of more than three files identified to this group at 41, 78.8% of the group total. Additionally, all 41 files at Site K were recorded on the evening of July 1, 2008 and no other files from this group were identified on any other nights at this site. At Site L, the closest site to the met tower where the ABR passive survey was conducted, no eastern red/tricolored bat species group call files were identified during the active survey.

These data suggest that the *Myotis* species group was the most common species group present in the Project Area at the time of the survey followed by the big brown/silver-haired/hoary bat group and eastern red bat/tri-colored bat group, respectively. Since this survey was conducted at the beginning of the onset of WNS, and the nearest county (Onondaga) was not confirmed as testing positive for WNS until the following winter (BCI 2012), the bat population present in the Project Area are likely to have decreased in that time. The full results of the active survey can be found in Appendix H.

## 4.6 Bird Species List and Threatened/Endangered Species
During the bird surveys and other activities in the Project Area, E & E identified a total of 129 bird species in the Project Area (see Table 4-5).

**Table 4-5 Bird Species Identified during E & E Surveys and Site Work in the Crown City Project Area**

| Common Name[1] | | |
|---|---|---|
| Snow Goose | Red-bellied Woodpecker | Yellow-rumped Warbler |
| Canada Goose | Yellow-bellied Sapsucker | Black-throated Green Warbler |
| Tundra Swan | Downy Woodpecker | Blackburnian Warbler |
| Wood Duck | Hairy Woodpecker | Bay-breasted Warbler |
| American Black Duck | Northern Flicker | Blackpoll Warbler |
| Mallard | Pileated Woodpecker | Black-and-white Warbler |
| Northern Pintail | Eastern Wood-Pewee | American Redstart |
| Green-winged Teal | Alder Flycatcher | Ovenbird |
| Ring-necked Duck | Least Flycatcher | Northern Waterthrush |
| Hooded Merganser | Eastern Phoebe | Mourning Warbler |
| Common Merganser | Great Crested Flycatcher | Common Yellowthroat |
| Ring-necked Pheasant | Eastern Kingbird | Hooded Warbler |
| Ruffed Grouse | Blue-headed Vireo | Wilson’s Warbler |
| Wild Turkey | Warbling Vireo | Canada Warbler |
| Great Blue Heron | Red-eyed Vireo | Scarlet Tanager |
| Green Heron | Blue Jay | Eastern Towhee |
| Black Vulture | American Crow | American Tree Sparrow |
| Turkey Vulture | Common Raven | Chipping Sparrow |
| Osprey (SC) | Horned Lark (SC) | Field Sparrow |
| Bald Eagle (T) | Tree Swallow | Vesper Sparrow (SC) |
| Northern Harrier (T) | Bank Swallow | Savannah Sparrow |
| Sharp-shinned Hawk (SC) | Barn Swallow | Grasshopper Sparrow (SC) |
| Cooper's Hawk (SC) | Black-capped Chickadee | Song Sparrow |
| Red-shouldered Hawk (SC) | Tufted Titmouse | White-throated Sparrow |
| Broad-winged Hawk | Red-breasted Nuthatch | White-crowned Sparrow |
| Red-tailed Hawk | White-breasted Nuthatch | Dark-eyed Junco |
| Rough-legged Hawk | House Wren | Lapland Longspur |
| Golden Eagle (E) | Winter Wren | Northern Cardinal |
| American Kestrel | Ruby-crowned Kinglet | Rose-breasted Grosbeak |
| Merlin | Eastern Bluebird | Indigo Bunting |
| Killdeer | Veery | Bobolink |
| Spotted Sandpiper | Hermit Thrush | Red-winged Blackbird |
| American Woodcock | Wood Thrush | Eastern Meadowlark |
| Ring-billed Gull | American Robin | Common Grackle |
| Herring Gull | Gray Catbird | Brown-headed Cowbird |
| Great Black-backed Gull | Brown Thrasher | Baltimore Oriole |
| Rock Pigeon | European Starling | Purple Finch |
| Mourning Dove | Cedar Waxwing | House Finch |
| Black-billed Cuckoo | Blue-winged Warbler | Common Redpoll |
| Yellow-billed Cuckoo | Nashville Warbler | American Goldfinch |

**Table 4-5 Bird Species Identified during E & E Surveys and Site Work in the Crown City Project Area**

| Common Name[1] | | |
|---|---|---|
| Barred Owl | Yellow Warbler | House Sparrow |
| Chimney Swift | Chestnut-sided Warbler | |
| Ruby-throated Hummingbird | Magnolia Warbler | |
| Belted Kingfisher | Black-throated Blue Warbler | |

NYSDEC maintains a list of bird species that are considered endangered (9 species), threatened (10 species), or of special concern (19 species) within the state of New York, inclusive of several federally listed species. Information was obtained from various sources, including E & E field surveys, Breeding Bird Atlas projects, and the NHP letters to determine the potential occurrence of endangered, threatened, or special concern species in the Project Area. Table 4-6 lists those species listed as endangered, threatened, or of special concern in New York with confirmed occurrence or potential to occur within the Project Area.

**Table 4-6 Potential Occurrence of Avian Endangered, Threatened, or Species of Special Concern within New York State at the Crown City Project Area**

| Listed Species[1,2] | Notes |
|---|---|
| **Endangered Species** | |
| Golden Eagle | It is considered extirpated as a breeder in New York State. It is an uncommon to rare migrant over the Project Area. Two migrants were observed during E & E raptor surveys in Spring 2008. One was observed in 2004 during the Cortland CBC. Additionally, one Golden Eagle was observed in Cortland County feeding on road kill on December 14, 2008. |
| Peregrine Falcon | No nests are known to occur in or near the Project Area. It is likely an uncommon migrant over the Project Area. |
| Short-eared Owl | It is a rare breeder in New York. Three were observed in 2001 during the Cortland CBC. They can potentially winter in grassy fields throughout New York State including those in the Project Area. |
| **Threatened Species** | |
| Pied-billed Grebe | It is an uncommon breeder in Cortland County and may be present in open water throughout the year. CBC data indicates four sightings since 2005, two of which were most recently observed in 2008. |
| Bald Eagle | This increasing species occurs as a migrant and transient over the Project Area. Location/habitat within Project Area is not ideal for breeding. E & E observed seven individuals during spring and fall surveys in 2008. Furthermore, they have been documented on a number of occasions during the Cortland CBC. No nests are known to occur within ten miles of the Project Area. |

**Table 4-6 Potential Occurrence of Avian Endangered, Threatened, or Species of Special Concern within New York State at the Crown City Project Area**

| Listed Species[1,2] | Notes |
|---|---|
| Northern Harrier | It is a possible breeder within the Project Area. It was listed as a possible breeder in BBA blocks 4071B and 4072D in or near the Project Area. E & E staff observed this species on several occasions during E & E spring and fall raptor surveys within the Project Area, including migrant and local birds. |
| Upland Sandpiper | This species has decreased over the last few decades. They were not detected during any surveys within the Project Area. They were observed in 2005 during the USGS BBS surveys on the Dryden route. They prefer open grassland habitat, which is present within the Project Area, thus there is a chance that they could occur in the Project Area |
| Sedge Wren | There is some potentially suitable habitat in the Project Area in grassy areas and wet meadows; however, the likelihood of their occurrence within the Project Area is low. |
| Henslow's Sparrow | The NHP reported that this species was observed in the Town of Smithville, Chenango County (Seoane 2007). During the USGS BBS in 1993 they were detected along the Dryden route. There is some potentially suitable habitat in the Project Area in small pockets of old field and successional shrubland habitat throughout the site; however, given their declining status it is unlikely that they will occur within the Project Area |
| **Species of Special Concern** | |
| Common Loon | Location/habitat in the Project Area is not suitable for breeding. It is likely a regular migrant over the Project Area. They prefer forested lakes, which are not present in the Project Area. |
| Osprey | It is a migrant and transient over the Project Area. E & E observed this species during both the fall and spring raptor surveys. With the absence of large water bodies, the location/habitat within the Project Area is unlikely for breeding. |
| Sharp-shinned Hawk | It is considered fairly common in Cortland County. Location/habitat in the Project Area is suitable for breeding. It was considered a possible breeder in BBA blocks 4072B and 4171A. A total of four were observed during the fall raptor migration surveys and ten during the spring raptor migration surveys. |
| Cooper's Hawk | It is considered fairly common in Cortland County. Location/ habitat in the Project Area is suitable for breeding. It was considered a confirmed breeder in BBA blocks4071B and 4171A. One was observed in both the spring and fall 2008 raptor migration surveys. |
| Northern Goshawk | It is considered a rare breeder in central New York. Location/habitat in the Project Area is potentially suitable for breeding, as they prefer thick coniferous and mixed forests. It was not observed during E & E surveys or field work. The likelihood of their occurrence within the Project Area is low. |

**Table 4-6 Potential Occurrence of Avian Endangered, Threatened, or Species of Special Concern within New York State at the Crown City Project Area**

| Listed Species[1,2] | Notes |
|---|---|
| Red-shouldered Hawk | It is considered fairly common in Cortland County. E & E observed two during fall raptor surveys in the Project Area, and five during spring raptor surveys. |
| Common Nighthawk | It is a rare and declining breeder in New York. Site location/habitat is likely unsuitable for breeding. It is likely an occasional spring and late summer migrant over the Project Area. |
| Red-headed Woodpecker | It is an uncommon and breeder in Cortland County Location/habitat in the Project Area is possibly suitable for breeding, as they prefer open forests. Their likelihood of occurrence within the Project Area is considered low. |
| Horned Lark | It is a regular, often common, species in winter throughout New York State. It may breed in low numbers in plowed fields within and near the Project Area. They have been observed regularly during CBC surveys during the past ten years. During E & E surveys, one was observed during fall migratory bird surveys. |
| Golden-winged Warbler | Location/habitat in the Project Area is possibly suitable for breeding. |
| Cerulean Warbler | Location/habitat in the Project Area is possibly suitable for breeding. None were observed during E & E surveys or site work. The overall likelihood of occurrence within the Project Area is considered to be low. |
| Yellow-breasted Chat | It is an uncommon breeder in New York. Location/habitat in the Project Area is potentially suitable for breeding. None were observed during E & E surveys or site work. The overall likelihood of occurrence within the Project Area is considered to be low. |
| Vesper Sparrow | Location/habitat in the Project Area is suitable for breeding. One was observed during E & E breeding bird surveys. |
| Grasshopper Sparrow | Location/habitat in the Project Area is suitable for breeding. None were observed during E & E surveys; however the Project Area contains habitat that would support them, thus the likelihood of their occurrence within the Project Area is considered high. |

Notes:
1 All species are state-listed. Federally listed species are indicated in the notes column.
2 Special concern species are not afforded protection under state and/or federal endangered species acts.

## 4.7 Bat Species List and Threatened/Endangered Species

During the acoustical monitoring, a total of five bat species in the Project Area were conclusively identified as well as at least one species from the Myotid group of bats (see Table 4-7).

**Table 4-7 Bat Species Identified during Acoustical Monitoring in the Crown City Project Area**

| Common Name[1] | Scientific Name |
|---|---|
| Big Brown Bat | *Eptesicus fuscus* |
| Silver-haired Bat | *Lasionycteris noctivagans* |
| Eastern Red Bat | *Lasiurus borealis* |
| Hoary Bat | *Lasiurus cinereus* |
| Tricolored Bat | *Pipistrellus subflavus* |
| Myotid species[1] | |

Note:
[1] Myotid bat species call sequences were identified during acoustical monitoring; however, the call sequence identifications could not be distinguished to species. There are four Myotid bat species that occur in New York State including the little brown bat (most common), eastern small-footed bat (uncommon; State species of special concern); Indiana bat (uncommon; federally and state-endangered); and northern bat (uncommon to common).

There are two bat species that occur in New York State that are either state- and/or federally listed; the Indiana bat, which is state and federally protected, and the eastern small-footed bat, which is a state species of concern. See Section 3.2.3 for more information on the Indiana bat. Table 4-8 lists these species along with notes of possible occurrence within the Project Area.

**Table 4-8 Potential Occurrence of Bat Endangered, Threatened, or Species of Special Concern within New York State at the Crown City Project Area**

| Listed Species[1,] | Notes |
|---|---|
| **Endangered Species (State and Federal)** | |
| Indiana Bat | The NHP letter indicated a known hibernaculum within 40 miles of the Project Area, which is known to be to the north in Onondaga County. Location/habitat in the Project Area is suitable for occurrence. Based on the proximity of Indiana bat hibernacula and because the Project Area is within the range of the Indiana bat there is potential for this species to occur; however, NYSDEC does not consider this species likely to be present in the county. |
| **State Species of Special Concern** | |
| Eastern Small-footed Bat | The NHP letter indicated a known bachelor colony within 40 miles of the Project Area. Location/habitat in the Project Area is suitable for occurrence. |

Note:
[1] Special concern species are not afforded protection under state and/or federal endangered species acts.

# 5 Evaluation of Potential Impacts

## 5.1 Wind Energy and Bird and Bat Issues

### 5.1.1 Overview

There are a number of beneficial impacts on bird populations that would result from an increased use of renewable energy, including wind energy. Air emissions and global climate change have been cited as serious concerns for North American bird populations (see *A Birdwatcher's Guide to Global Warming by the National Wildlife Federation and American Bird Conservancy* [Price and Glick 2004]). Increased renewable energy use has been cited as one way to slow the rate of climate change and reduce air emissions associated with the increased demand for new energy generation. In addition to the positive impacts noted above, operation of wind energy facilities also has the potential to result in some adverse impacts by causing injury or death to birds through collisions with turbines and by causing habitat loss, degradation, or displacement. While studies have shown that these negative impacts have occurred at a few sites, the results from numerous studies and reviews of impacts on birds from wind energy facilities in North America and Europe indicate that mortality rates are low, especially compared to other sources of bird mortality (Erickson et al. 2001; USGAO 2005; NWCC 2010).

The National Wind Coordinating Collaborative (NWCC), a consortium of agricultural businesses, consumer groups, economic development organizations, utilities, environmental organizations, the federal government, regulatory agencies, state government, tribal governments, and the wind industry, issued an updated fact sheet, "Wind Turbine Interactions with Birds, Bats, and their Habitats: A Summary of Research Results and Priority Questions" (NWCC 2010). The following passage from the fact sheet is part of an overview on the status of bird and bat issues at wind energy facilities that aptly describes the current understanding of the issues:

> "Wind energy's ability to generate electricity without many of the environmental impacts associated with other energy sources (e.g., air pollution, water pollution, mercury emissions, and climate change) could benefit birds, bats, and many other plant and animal species. However, possible impacts of wind facilities on birds, bats, and their habitats have been documented and continue to be an issue. Populations of many bird and bat species are experienc-

> ing long-term declines, due in part to habitat loss and fragmentation, invasive species, and numerous anthropogenic impacts, increasing the concern over the potential effects of energy development."

The NWCC has compiled overall bird fatality rates (number of fatalities/MW/year) of 63 wind energy facilities across North America that have published post-construction fatality data (Strickland et al. 2011). Based on this compilation, overall bird fatality rates are relatively similar across North America (bird fatality was less than or equal to three fatalities/MW/year in 42 of the 63 studies), though passerine fatality rates may be higher in the mid-western and eastern U.S. (Strickland et al. 2011). Overall bird fatality rates were also found to be similar across land cover types (agricultural: 37 facilities, 2.80 birds/MW/study period; grassland: 20 facilities, 2.41birds/MW/study period; forested landscapes: nine facilities, 3.27birds/MW/study period) (Strickland et al. 2011). Similarly a 2005 report to congressional requesters, the United States Government Accountability Office (GAO) reviewed the impacts on wildlife from wind power. The GAO report concluded that outside of the Altamont site in northern California, the research to date has not shown bird kills in alarming numbers (USGAO 2005). The GAO review of post-construction mortality studies found that bird fatalities ranged from 0 to 7.28 birds per turbine per year.

The notable exceptions to the low avian fatality rates can occur on foggy nights where there is some steady lighting produced at the facility. At the Mountaineer facility in West Virginia, on one foggy May night there were lights on at a substation and 27 birds were found dead at the substation and nearby wind turbines. Similar events happened in the fall of 2011 at the Mount Laurel project in Pennsylvania, Mount Storm in West Virginia, and the Criterion site in Maryland where lights were left on in a wind turbine nacelle and nearby facilities and foggy nights produced high bird mortality (see Section 5.1.2).

For a review of bat fatality patterns observed at wind energy facilities the NWCC compiled the results of 63 studies that provide annual estimates of post-construction bat fatalities at wind energy facilities (Strickland et al. 2011). Most of these studies (54) found bat fatality rates of less than 10/MW/study period (Strickland et al. 2011). The highest bat fatality rates in the U.S. have been documented in mountainous areas of the east, particularly along forested ridges (NWCC 2010; Arnett et al. 2008). However, recent studies from the Northeast, Upper Midwest, Wisconsin, and Canada suggest that relatively high bat fatality rates may occur at wind energy facilities in agricultural areas as well (Strickland et al. 2011).

The research regarding impacts to bats from wind developments was more limited until recent years; therefore, there are fewer studies with bat fatality data than bird fatality data. For many bat species, an understanding of their natural history, especially migration and foraging movements, remains incomplete (Miller 2008). The effect of bat fatalities due to wind turbines on populations as a whole is largely not understood and current research is addressing this issue. The Bats and Wind Energy Cooperative (BWEC), an alliance of state and federal agencies, the wind industry, academic institutions, and non-governmental organizations, is currently researching the interactions of bats and wind turbines with the intent to develop solutions for wind farm siting and mitigation that will minimize or prevent bat mortality from wind turbines. To date, there has been no confirmed correlation between habitat availability and specific atmospheric or seasonal conditions that result in increased mortality, although preliminary data seem to indicate that mortalities occur during periods of lower wind speed and that temperature, precipitation, and humidity may also be contributors (see Section 5.1.3). As the breadth of knowledge regarding bat/turbine interactions increases, specific mitigation strategies can be developed to allow for the continued operation of wind energy facilities as a critical aspect of a global renewable energy approach, while reducing the potential impact on bats.

### 5.1.2 Bird Collisions

#### 5.1.2.1 Altitude and Avoidance Affects

Direct collisions with the wind turbine rotors or tower can result in injury or mortality to birds and bats. However, the data from numerous post-construction mortality studies at wind turbine projects demonstrate that avian fatality rates are low. The low fatality rates are primarily due to three factors:

- Most migrating birds fly at altitudes higher than the maximum turbine height;
- A very high percentage of birds flying toward wind turbines will detect and avoid them; and
- Of those birds that do not alter their flight path in time to avoid the rotor swept area of a turbine, a majority will still avoid a collision.

Some details on these factors are included in the sections that follow.

#### Migration Flight Altitude

Nocturnal avian radar studies have routinely demonstrated that most nocturnal migrants fly above 150 meters (492 feet) agl, the maximum height of most modern wind turbines.

Birds migrate at varying altitudes, with most in the following ranges (Smithsonian Migratory Bird Center 2012):

- Songbirds: 500 to 6,000 feet, with 75% of songbirds migrating between 500 and 2,000 feet;
- Shorebirds: 1,000 to 13,000 feet;
- Waterfowl: 200 to 4,000 feet; and

- Raptors: 700 to 4,000 feet.

Given the typical altitude ranges of bird migration, only a small percentage of migrating birds are expected to be regularly flying lower than the maximum turbine height and to be at risk of collision with turbine rotors. Weather conditions such as precipitation, low cloud ceilings, and strong opposing winds will usually lower the altitude of migrating birds, putting more birds at risk of a collision. The relationship of poor visibility due to weather conditions and avian collisions with communications towers and buildings has been well studied (Erickson et al. 2001). During nights with low cloud ceiling, fog, and/or precipitation, collision rates at communication towers are higher than during nights with other weather conditions (Avery et al. 1980; Kerlinger et al. 2010). However, fewer birds typically migrate under such unfavorable conditions.

### Turbine Avoidance

Various studies of birds approaching wind turbines have demonstrated that most birds detect the presence of wind turbines and react by altering their flight path to avoid them (Osborn et al. 1998; Sterner 2002; Langston and Pullan 2003; Desholm and Kahlert 2005; Garvin et al. 2011). In a comparison of flight behavior, one study in Spain found that migrating birds flew at higher average altitudes (>328 feet [100 meters] versus 197 feet [60 meters]) over wind turbines than over areas without wind turbines (Janss 2000). In a study in the Netherlands, Winkelman (1994) observed that at 984 feet (300 meters) from wind turbines, the change in flight behavior was five times more horizontal than vertical and that 75% of the reactions occurred 328 feet (100 meters) from the turbines. Kahlert et al. (2003) showed some avoidance of an offshore wind farm by birds but emphasized that not enough data had been collected to determine whether the wind farm had or did not have negative effects on migrating bird populations. Desholm and Kahlert (2005) indicated that the radar studies demonstrated a substantial avoidance by migrating waterbirds to a large offshore wind farm with less than 1% flying close enough to the turbines to be at risk of collision. In the Netherlands, Winkelman (1994) found that 1.2% of birds flying at the maximum turbine height were killed. In Belgium, Everaert et al. (2002) calculated the chance of a gull colliding with a turbine to be 0.05% and for a tern 0.2% (Langston and Pullan 2003). Garvin et al. (2011) compared the abundance and behavior of raptors at a wind energy facility in Wisconsin. The study found that the number of raptors declined by 47% when post-construction levels were compared to pre-construction levels. Garvin et al. (2011) also found that some raptors tend to exhibit avoidance behavior as the observed raptors tend to remain at least 100 meters from the turbines and above the height of the rotor zone. The study did conclude that the degree of behavioral response to the turbines was dependent on the species, but that Turkey Vultures and Red-tailed Hawks tended to exhibit high risk flight behaviors more than other species (Garvin et al. 2011).

Most of the studies described above were conducted primarily on daytime flying birds and/or from offshore wind farms. Very few visual studies have been conducted at existing wind farms at night; however, the results of nocturnal radar studies can be used to show a high percentage of turbine avoidance among nocturnal migrants. The empirical comparison of pre-construction radar results to post-construction mortality results does indicate that turbine avoidance is a key factor in the relatively low avian fatality rates exhibited at wind farms. Avoidance was observed at the Maple Ridge site in the Tug Hill region of New York State. The turbine passage rate (i.e., number of birds flying through the pre-construction rotor sweep area) from the ABR pre-construction study at Maple Ridge was 0.7-4.6 nocturnal migrants per turbine per day (Mabee et al. 2006). Assuming for the point of this exercise that all of those nocturnal migrants would collide with the turbine and be found dead during the mortality study would result in approximately 42-to-276 bird fatalities per turbine over the course of the fall migration season (assuming 60 days from August 15 through October 15). The estimates from this exercise are much higher than the post-construction mortality rates of approximately six to 10 birds/turbine/study season [6 to 8 months] obtained during post-construction studies at the site in 2006 and 2007 (Jain et al. 2007; Jain et al. 2009a). Granted there are many caveats with such an empirical comparison; however, it demonstrates that there is a high degree of turbine avoidance by nocturnally migrating birds.

Because of site-specific differences in turbines, wind farm layout, weather, bird species, effort, and seasonal duration, these results of the various studies mentioned here cannot be universally applied; however, they demonstrate strong turbine avoidance behavior by birds in general.

### Rotor Avoidance

For birds that do not alter their flight path when approaching a turbine, studies have documented low collision rates for birds flying through the rotor swept area (the area of the rotating turbine blades). In a direct visual study, Winkelman (1994) observed that 84% of the birds passing through a rotor swept area were not killed. Although there are no empirical data that predict a bird's ability to pass safely through the rotor swept area (but see Desholm et al. 2006 for methods to investigate this behavior), there are hypothetical models (Tucker 1996; Holmstrom et al. 2011). Predictive models based on physics and field observations indicate that an interaction between wind speed, cut-in speed, and the bird's angle of approach affect the probability of collision (Holmstrom et al. 2011).

## 5.1.2.2 Other Factors Affecting Bird Collisions

Several other factors besides altitude, weather, and avoidance have been identified from post-construction monitoring at wind facilities as potential causes for, or associated with, bird mortality.

### Species Groups

Songbirds (passerines) comprise the vast majority of the fatalities associated with on-shore wind turbine projects. In a review of post-construction studies at 31 wind facilities outside of California, Erickson et al. (2001) reported that 78% of the carcasses were songbirds (NWCC 2010). Much lesser numbers of species from other bird species groups (e.g., waterfowl, waterbirds, shorebirds, diurnal raptors, owls, and fowl-like birds) have been found during post-construction monitoring (NWCC 2010). This is consistent with the more-studied communications tower industry. Passerines are typically the most abundant group of birds migrating and residing in an on-shore wind energy project area. Most passerines migrate primarily at night, when collisions are most likely to occur.

### Behavior

The behavior of a bird species can affect the potential impacts of collision through increased exposure to the rotor swept area or by distractions. Although migrants have a brief exposure period to the wind turbines (i.e., generally one pass through the Project Area in migration, versus numerous passes per day or season for a resident bird), migrants are considered to be at somewhat higher risk than residents. Resident birds appear to become habituated to wind turbines and avoid flying in the immediate proximity of them (Winkelman 1985; Janss 2000; Percival 2001, Devereux et al. 2008). However, some resident bird species are reported as fatalities more often than other resident species, with the primary factor being behavior. Some species (i.e., Horned Lark, Vesper Sparrow, and Bobolink) that perform aerial courtship or territorial displays that put them at an altitude within the rotor swept area have been the most common fatalities at projects studied in the western and central United States (NRC 2007).

### Seasonal Timing

As migratory songbirds have made up the vast majority of documented bird fatalities at wind turbines, the seasonal timing of bird fatalities is closely connected to migratory periods. As indicated in Section 3.2.1.1, the primary periods in New York for most songbird migration are in spring, mid-April through May, and in fall, late August through October.

### Turbine Design

As turbine designs have evolved, the maximum height has increased. Currently, most turbines proposed or installed are in the range of approximately 425 to 500 feet agl, with the turbine nacelle located at approximate 300 feet agl. Bird fatalities associated with communication towers generally increase with height of the tower and lighting, with greater fatalities at structures greater than 500 feet (152 meters) agl (Kerlinger 2000b; Longcore et al. 2005; NRC 2007; Kerlinger et al. 2010). It must be noted that most tall communication towers have guy wires installed for support, while modern turbines do not have guy wires. The presence of guy wires greatly increases the potential risk of bird collisions.

### Speed of Rotor

Although faster rotor speed and tip speed appear to be associated with higher mortality, the effects of other design features in comparison have not been studied (Sterner 2002). A few studies have documented that birds react more to operating turbines than stationary turbines (Winkelman 1994; DeLucas et al. 2004).

### Turbine Position and Alignment.

There have been several studies regarding the behavioral effects and mortality from turbine position and alignment within a wind energy facility. However, results have varied and the differences are likely due to site-specific conditions such as topography and the flight behavior of local species. BirdLife International concluded that a string of turbines parallel to the flight line of flying birds, or turbines in a loose cluster, are the best arrangements for deterring migrating birds from a wind turbine development (Langston and Pullan 2003).

### Lighting

Studies at communication towers show that migrating birds are attracted to some of the lighting recommended by the Federal Aviation Administration, especially on nights of poor visibility. Continuous lighting and white lights seem to attract birds. The birds appear to become disoriented and continue to circle the lighted tower instead of continuing in a straight path for migration, greatly increasing their risk of collision. As a result, they end up colliding with the tower, guy wires, or other circling birds. Several studies have suggested that continuous (non-blinking), red lighting is involved with more bird collisions at tall communication towers than other lighting systems that employ an intermittent or slow blinking lighting pattern (Jain et al. 2007, Kerlinger et al. 2010). However, based on available data, there is little evidence to suggest a similar effect with wind turbines (NRC 2007; NWCC 2010).

There are a limited number of documented large fatality events of nocturnal migrants at wind energy facilities, three of which occurred in the fall of 2011 in the Appalachian Highlands. During the evening of September 24, 2011 there were 59 birds and two bats killed at the Mount Storm wind energy facility in West Virginia. The majority of the birds (39) were believed to be killed by a single turbine that was reported to have had internal lighting left on overnight (American Bird Conservancy 2011). At the Criterion wind energy facility in western Maryland in 2011 the highest season-long estimated avian fatality rates documented to date occurred (16 birds per turbine per study period) in part due to higher fatality rates at two turbines with nacelle lights left on in late summer and early fall. There was a noticeable decrease in the fatality rate when the lights were turned off (Young et al. 2012). There have also been two large bird kill events that have occurred at wind energy facilities resulting from the artificial lighting of axillary project facilities, and not the actual turbines. During October 2011, searchers found a total 484 bird carcasses at the battery storage area of the Laurel Mountain Wind Farm (Wald 2011). The bird fatalities were attributed to artificial lighting of the battery storage area, which researchers believed to cause birds to collide with the substation and apparent exhaustion as the migrating bird circled the substation's lights in confusion. Again, indications are that the high mortality night occurred during foggy weather (Wald 2011). In May 2002 at the Mountaineer wind energy facility, 27 songbirds were killed at a floodlit substation and nearby turbines on a night with heavy fog (NWCC 2004). After this event, the sodium vapor lights were turned off and no subsequent avian fatalities were documented at the facility.

Lighting at the turbines and facilities need to be carefully and consistently controlled to avoid these sources of bird mortality.

### 5.1.3 Bat Collisions

The research regarding impacts to bats from wind developments was more limited until recent years; therefore, there are fewer studies with bat fatality data than bird fatality data. Seasonal trends are showing that migrant tree-roosting bats (hoary bat, eastern red bat, and silver-haired bat) are the species impacted the most, with nearly 75% of all recovered bat carcasses belonging to these three species (Kunz 2007; Arnett et al. 2008). Impacts to resident bat populations have not been as evident as the impacts on migratory species. There are signs that populations of local bats are less vulnerable and can avoid turbines, even living within and foraging around the proximity of active turbines.

The causes for the large numbers of bat fatalities at some wind energy facilities are poorly understood as this is a relatively recent documented issue. Five factors have been identified from post-construction monitoring at wind facilities as potential causes for, or associated with, the increased bat mortality:

- **Site Characteristics and Location.** Wind turbines placed along forested ridge tops may create or coincide with favorable bat migration corridors. Linear clearings associated with the wind energy facility may be attractive to bats for foraging and put them at increased risk of collision. Several post-construction studies primarily in the mid-Atlantic Highlands of the eastern United States have found the highest reported bat fatality rates. There is uncertainty whether the high fatality rates at these sites in the eastern United States differ from other regions or whether they reflect higher risk, higher abundance of migratory bats, or more intensive search efforts than other regions (Arnett et al. 2008; Strickland et al. 2011). Bat kills have also occurred at sites not considered favorable for bat migration (e.g., Alberta prairie; Baerwald 2008).

- **Seasonal Timing.** Bat mortality from wind turbines occurs most frequently during late summer (mid-July through September), within the fall migration period for many bat species. The seasonal distribution and migratory movements of bats are poorly understood. For the three bat species (i.e., hoary bat, eastern red bat, and silver-haired bat) with the highest fatality rates, the spring migration period is generally between early April and mid-June and the fall migration period is from mid-July through November (Cryan 2003; Arnett et al. 2008). Migration is a high risk activity for bats because they become more concentrated as they move, making them vulnerable to storms, drought, contaminants, predation, and human disturbance.

- **Weather.** Bat collisions occur with increased frequency on nights with low wind velocity, possibly because flying insects are more active (Arnett et al. 2005). Recent studies have demonstrated that more bat fatalities occur when wind speeds are low (< 6 meters per second) and during the passage of weather fronts (Horn et al. 2008a, Arnett et al. 2011). A limited number of studies have shown that increased cut-in speeds have resulted in a decrease in the fatality rate of bats and thus been recommended to decrease bat mortalities (Arnett et al. 2011; Baerwald et al. 2009). Thermal inversions may also influence the altitude of foraging bats in mountainous areas and place them at greater risk of collision with wind turbines.

- **Attraction to Turbines.** There are various hypotheses that consider bats to be potentially attracted to wind turbines for foraging, roosting, or because of visual or auditory curiosity. The clearings provided by wind turbine construction may create favorable foraging areas for bats to feed on insects. Insects may be attracted to these open areas as well, and possibly, to the heat generated by the turbine nacelle (NRC 2007). Some research explains that bats may have some visual or auditory attraction to tall objects, increasing curiosity and/or the potential for turbines being used as diurnal roost habitat for migrants (Arnett et al. 2005). Some theories indicate that bats are attracted to ultrasonic sound emitted by turbines, or the motion of the blades. The "swishing" sound made by the rotation of blades may attract bats, or their prey, increasing the threat for collision (Arnett et al. 2005). Curiosity of the movement in the blades may attract bats to investigate, thus increasing collisions. Wind turbines above any landscape dwarf the surrounding habitats, leaving the suggestion of potential diurnal roost sites. Dead bats were discovered in the open plains of southern Alberta at the Summerview Wind Farm, leaving bat experts baffled as to why bats were impacted in an area not known for great numbers of bats in the first place (Barclay and Baerwald personal communication in NRC 2007). Two species recovered were tree-roosting, highly migrant species (hoary bats and silver-haired bats) and at the time the wind facility was constructed the area was not known as a migrant corridor for bats (Baerwald 2008).

- **Echolocation Limitations.** There are several factors that may limit the response time and avoidance behavior of bats around turbine rotors. Research currently suggests that bats may not use echolocation capabilities during migration, or that the short distance use for echolocation is ineffective to detect an obstruction in time to react. In other words, bats out fly the return echo. The most efficient range of echolocation differs from 3 to 5 meters, in most North American bats (Arnett et al. 2005). Turbine rotors and the nacelle produce complex electromagnetic fields that may interfere with echolocation activities. Researchers are attempting to deter bats from wind turbines using acoustic bat-deterrent devices. These techniques show some promise, but are not yet ready for utility-scale use (Szewczak and Arnett 2006; Nicholls and Racey 2009; Horn et al. 2008b).

### 5.1.4 Habitat Loss, Degradation, or Displacement

There is also a potential that habitat disturbance from wind turbines may result in habitat loss, habitat degradation through fragmentation (i.e., the loss of quality or quantity of habitat), or result in behavioral displacement from habitats. These impacts have occurred in certain instances at wind turbine facilities (e.g., Leddy et al. 1999, Spaans et al. 1998, and Winkelman 1992a in Langston and Pullan 2003). The magnitude of disturbance will depend on site differences in topography, type of vegetation, presence of existing roads, historic land use, and size and arrangement of turbines (NRC 2007). The disturbances can be temporary (i.e., during construction) or permanent.

Responses of birds to changes in habitat likely vary by species (NRC 2007). For example, edge species, such as the Indigo Bunting and Mourning Warbler may benefit from habitat disturbance; whereas, forest-interior species, such as the Ovenbird, may be displaced. Some studies have documented decreased breeding densities, primarily in grassland-nesting songbirds, in proximity to wind turbines (Leddy et al. 1999). However, other studies have documented little impact on nesting birds and that some birds or species groups habituate to the areas around the turbines (e.g., Winkelman 1992b in Langston and Pullan 2003, Brown and Shepherd 1993 in Langston and Pullan 2003; NWCC 2010). In general, the response of displacement of forest-dwelling birds by turbines has not been well studied by the agencies, wind industry, or academia. For this Project Area, most of the forested areas have already been fragmented and/or are destined for silviculture.

Changes in vegetation may influence the behavior of bats by changing microclimatic conditions and the quality of habitat for foraging or roosting bats through the removal of vegetation (NRC 2007).

## 5.2 Potential Impacts on Birds and Bats from Construction

Construction-related activities (e.g., clearing for road construction, infrastructure construction, equipment noise, and increased vehicle traffic) can potentially impact birds and bats through the loss of habitat as a result of habitat alteration or displacement (Strickland et al. 2011). The magnitude of disturbance will depend on site topography, type of vegetation, presence of existing roads, historic land use, and size and arrangement of turbines (NRC 2007). The responses of birds to these disturbances likely vary by species and time of year; therefore, this section discusses impacts to migratory birds and breeding birds separately. Potential impacts to bat species resulting from construction activities are not expected to differ temporally and are discussed without temporal influences. Because these impacts are generally only temporary in nature, construction-related impacts on bird and bat populations are not significant.

### 5.2.1 Potential Impacts on Migratory Birds

Substantial adverse impacts on migratory populations of raptors, passerines, and waterbirds are not expected as a result of construction of the Project. It is anticipated that construction activities (e.g., vegetation clearing, foundation construction, access road construction, erection of facilities and turbines) would have negligible to minor impacts on nocturnal and diurnal migratory birds.

Ground-disturbing construction activities would reduce the availability of stopover habitat within the landscape directly through the loss of habitat and indirectly by inducing avoidance of stopover habitat in response to visual and/or noise disturbance (Strickland et al. 2011). On a landscape scale there is abundant availability of habitats similar to those of the Project within the nearby landscape.

Large construction cranes used to erect the turbine components, including the tower, nacelle, and rotors, could potentially serve as an obstacle to a small number of migrant birds. If collisions are to occur, they would most likely occur during nighttime as the cranes would be visible during daylight hours and should be easily avoided by flying birds. Erected turbines would not be operational during the construction period but would still pose a collision risk to migratory birds. Similar to the potential impacts of the construction crane, nocturnal migrants would likely be most susceptible to collision with the inert turbines. This increased risk to nocturnal migrants would result in a greater risk to passerines, species which are primarily nocturnal migrants, followed by waterbirds, which will sometimes conduct nocturnal migrations. Raptors which tend to be diurnal migrants would likely be the least at risk.

### 5.2.2 Potential Impacts on Breeding Birds

If construction begins before the initiation of breeding activities then it is anticipated that most breeding birds would likely avoid initiating nesting in active construction areas; however, the degree of avoidance will be a species-specific response. Within New York State, peak breeding time for birds common to agricultural and grassland habitat occurs in late spring and early summer. If construction begins before the breeding season, it is anticipated that breeding birds will likely avoid areas during the active construction period. If construction begins during the breeding season, breeding birds that have been exposed to similar disturbance such as farming and logging, and are accustomed to disruption of this nature may remain in the area while others will likely relocate to other adjacent suitable habitat, if available. Incidental loss of some nests, eggs, and/or young is possible when construction (land clearing, etc.) is conducted during the breeding season. Indirect impacts on breeding birds will occur as a result of habitat alteration during construction of the Project; however, these impacts are not expected to be significant because other suitable habitat that will not be disturbed exists in the Project Area. Outside of localized construction disturbance and some temporary displacement in the immediate vicinity of turbines, access roads, etc., no significant adverse impacts on breeding birds are anticipated during construction.

Direct collisions with vehicles may increase temporarily due to the increased traffic during construction; as traffic decreases upon the completion of construction, so will bird-vehicle collisions.

### 5.2.3 Potential Impacts on Bats

There is a potential for impacts on bats as a result of habitat alteration or loss in association with construction of the Project, and from collisions due to increased vehicle traffic. However, these impacts are expected to be even less than those experienced by birds.

Potential construction impacts to habitat would be caused by ground disturbance and tree removal. However, these activities are also associated with farming, which is common in the area. At this stage of development it cannot be verified when tree clearing activities will be conducted. Tree clearing during the winter months would present the lowest potential risk to bats by avoiding potential removal of roosting trees.

Changes in vegetation may influence the behavior of bats by changing microclimatic conditions and the quality of habitat for foraging or roosting bats (NRC 2007). Bats may also become attracted to openings made in forested areas from tree clearing activities for access roads as they may find foraging opportunities in the openings. It is anticipated that any bats that are present in the Project Area would return to areas that were temporarily disturbed following the completion of construction activity. Significant adverse impacts on bat populations are not expected during construction of the Project, especially if tree clearing activity can be limited to the winter months.

## 5.3 Potential Impacts on Birds and Bats from Operation of the Project

Operation of the wind turbines can potentially impact birds and bats through collisions (and barotrauma) with the turbine blades and towers, overhead collection lines and transmission lines, displacement from habitat, or influence on migration, etc. Collisions are typically the primary concern with operation-related impacts. Potential impacts can vary among different bird and bat populations and groups.

### 5.3.1 Potential Impacts on Migratory Birds

The potential impacts to migratory birds from the operation of wind turbines differ among groups of birds due to differences in migratory behavior. Therefore, this section contains separate discussions of potential impacts on migratory raptors, passerines, and waterbirds (i.e., waterfowl, wading birds, and shorebirds). The majority of passerines migrate during the night while raptors migrate almost exclusively during the day. Waterbirds migrate during the day and night (Richardson 1998).

#### Raptors

Concerns about raptor impacts from wind turbines persist from the continued fatalities occurring at the Altamont Pass in California and other older wind farms in that state, plus cases from some wind farms in Europe. The high fatality rate for raptors observed at Altamont Pass has been attributed to the turbine technology used, specific siting locations of the turbines, and the site-specific behavior of the affected raptors (USGAO 2005, NWCC 2010, Smallwood and Thelander 2008). Based on comparative studies of avian mortality rates at wind farms in New York State and raptor passage rate through wind farm sites, the overall raptor fatality rate in the Project Area is expected to be low. Post-construction ground searches conducted at the Noble Bliss Windpark found only one raptor carcass, a Red-tailed Hawk (Jain et al. 2009c). Post-construction ground searches conducted at the Noble Wethersfield Windpark found two raptor carcasses, one Red-tailed Hawk and one Sharp-shinned Hawk (Jain et al. 2011a). At the Sheldon wind farm, mortality of only three raptors, a Sharp-shinned Hawk and two Turkey Vultures, has been documented (Tidhar et al. 2011b). These recent results are similar to other studies conducted in New York. Raptor migration is diffuse in the region away from the Great Lakes shorelines. There are no geographical or topographic features (e.g., mountain ridgelines, river valleys, or coastlines) within the Project Area to attract or concentrate migrant raptors in large numbers. No concentrated flight paths were identified in either spring or fall and the findings were consistent with the existing knowledge of the bird resources in the region. The results of the 2008 migratory raptor studies recorded a migratory passage rate of 2.8 (spring) and 10.0 (fall) raptors/ observer-hour. The studies found 52% (spring) and 42% (fall) of the migratory raptors recorded flying below 500 feet agl at some point during observation. A raptor's use of the rotor-swept area increases the individual's collision risk (Strickland et al. 2011); however, there is the potential for the avoidance of the Project Area once the wind farm is constructed, which could reduce the potential collision risk to migrant raptor species. The impacts to migrating raptors from the operation of the Project are anticipated to be low (i.e., approximately 0 to 3 per year), which is consistent with the post-construction mortality studies in New York State and elsewhere in the eastern U.S.

As raptor use in the Project Area is relatively low and the likelihood of turbine avoidance is high, the potential for impacts is low. There is a potential for slightly higher impacts at turbines located near the county landfill if vultures and other raptors have increased flights in this area. Increased numbers of local flights could be a result of additional food sources available at the landfill. No biologically significant adverse impacts on migrant raptors are anticipated from operation of the Project.

### Passerines

A potential risk exists for nocturnal migrant passerines to collide with any tall structure, including wind turbines. Nocturnal migrant passerines accounted for the greatest number of bird fatalities in a review of post-construction fatality studies in the eastern U.S. (Erickson et al. 2001; NWCC 2010). The majority of post-construction surveys have found that bird fatalities typically accumulate in small numbers over the course of a season (Strickland et al. 2011). However, there appears to be a recent trend of large fatality rates at a wind energy facilities resulting from the use artificial lighting at nighttime at the facilities (Young et al. 2012; Wald 2011; American Bird Conservancy 2011; NWCC 2004); see the discussion of lighting effect in Section 5.1.2.2, Other Factors Affecting Bird Collisions.

There are no geographical or topographical features in the Project Area that attract or concentrate nocturnal migrant passerines. The Project Area is not immediately proximate to any large water bodies where nocturnal migrants tend to concentrate at stopover areas. Outside of such concentration areas, passerine migration is typically diffuse over a broad front.

There are conditions when nocturnal migrants will be more susceptible to collision. There is an increase for potential impacts when adverse weather conditions cause birds to fly at lower altitudes. Studies have shown that bird collisions with communication and television towers (much taller than wind turbines) are increased during low cloud ceilings, heavy fog, and precipitation.

It is likely that nocturnal migrant passerines will make up the majority of bird kills from the Project. Based on the literature review, pre-construction field studies, the Project's habitat types, and its topographical and geological location, the Project is anticipated to have an avian fatality rate that will be within the range of fatality rates observed in New York; see Table 5-1 for a summary of the calculated bird fatality rates for New York wind energy facilities. There are no indicators of potential elevated risk to passerines that would be expected to be above the normal range of avian fatalities. No biologically significant adverse impacts are anticipated for any species from operation of the Project.

**Waterbirds**

The Project Area is not located in an area where there are large numbers of migratory waterfowl or local movements. Post-construction studies at existing wind energy facilities have shown that waterfowl are less susceptible to collision than other species groups (Erickson et al. 2002; Langston and Pullan 2003; NWCC 2010). Due to the lack of open water habitats in the Project Area, the Project is a not anticipated to support a large number of water birds. Erickson et al. (2002) found that there is the potential for agricultural landscapes to support a higher numbers of waterbirds than native landscapes, particularly in the winter. However, even though agricultural land can provide suitable habitat for supporting waterbirds, Erickson et al.(2002) found that fatality rates at wind energy facilities in agricultural landscapes were lower than waterbirds fatality rates to turbines that were located near open water (Erickson et al. 2002).

The landfill located on the western edge of the Project Area (see Figure 3-1) has the potential to congregate a large number of gulls, and could result in a greater use of the Project Area by gulls than would be typically expected in the general landscape of Cortland County. The gulls would likely be using the landfill for foraging and loafing and use the airspace within the Project Area on their transit to and from the landfill. Though there is the potential for collision by the gulls during transit because these species often occupy the rotor swept area during flight, their daytime flight behavior should increase the gull's ability to avoid the turbines through visual detection of the turbines and there have not been large numbers of collisions by gulls documented at wind farms. Thus, there are no indicators of potential elevated risk to waterbirds that would be expected to contribute to above the normal range of avian fatalities.

### 5.3.2 Potential Impacts on Breeding Birds

The constructed wind farm may result in loss of breeding habitat, habitat degradation through fragmentation (e.g., the division of contiguous habitat by roads, power lines, or habitat alteration), the introduction of invasive species, or behavioral displacement from habitats (e.g., Leddy et al. 1999, Osborn et al. 1998, Garvin et al. 2011). Displacement can be caused by turbines or associated structures such as power lines. For example, prairie grouse have been shown to perceive power lines as barriers to movement, effectively dividing patches of habitat (Pruett et al. 2008). However, for some species, behavioral displacement can be temporary (The Ornithological Council 2007) and some species are more sensitive than others. Surveys at the Noble Bliss Windpark (Kerlinger and Guarnaccia 2009) concluded that bird diversity and abundance around turbines decreased in the year following construction. In the next following year, bird diversity rebounded while abundance did not. Surveys at the Noble Wethersfield Windpark (Kerlinger and Guarnaccia 2010) concluded that one species of bird, the Bobolink, showed an effect of turbine displacement following construction, with significantly fewer Bobolinks within 246 feet (75 m) of turbines situated in hayfields. However, another species of bird, the Savannah Sparrow, did not show a significant difference in abundance with distance from turbines. These examples are similar to other studies in New York. Indirect habitat effects can be more detrimental in sensitive or rare habitats (e.g., wetlands).

Given the various habitats in the Project Area and site geography, there is a good diversity of breeding species. There is a moderate degree of habitat fragmentation already in the Project Area. For portions of the Project that will be constructed in agricultural and forested blocks (see Figure 3-1), breeding birds may demonstrate temporary displacement. Most breeding bird species are anticipated to habituate to the turbines over the long-term, though some displacement may result. Grassland-nesting species may not habituate to the turbines as much as species in other habitats, although displacement may be limited to the immediate area (e.g., surrounding field) of each turbine depending on a site-specific basis as per turbine location, habitat, size of field, hay mowing, and pesticide practices. Any potential impacts to grassland-nesting species are anticipated to be much less than the impacts from existing hay mowing and pesticide practices in the same area, as well as the conversion of previously inactive fields for agricultural production.

Project facility construction in wooded areas could result in some forest fragmentation and negatively impact some forest-dwelling species (i.e., Wood Thrush, Ovenbird); however, the Project Area's forested habitats are fragmented to a degree by agricultural lands (see Figure 3-1). Some avian species that are considered early successional specialists (i.e., Indigo Bunting, Mourning Warbler, Eastern Towhee) may benefit from fragmentation. Minimal level of long-term displacement in wooded areas may occur as Kerlinger and Guarnaccia (2009) found that the bird diversity rebounded after the construction of the wind energy facility, but that diversity decline compared to preconstruction levels.

Many of the proposed turbines are sited in active agriculture fields that are already subject to periodic disturbance and have limited habitat value. Therefore, there is a low risk of substantial negative impact on habitat through loss, degradation, or displacement of breeding birds.

#### Nesting Raptors

Large numbers of raptor fatalities have not been documented at wind facilities in the United States as raptor fatalities have been estimated to be from 0 to 0.07 raptors/turbine/year for developments located outside of California (USGAO 2005). The 2011 NWCC report compiled 63 post-construction fatality studies across North America and concluded that there is no clear pattern between observed raptor fatality rates and land cover type (Strickland et al. 2011). Raptor fatalities have been limited at eastern sites where post-construction mortality monitoring has been conducted.

Raptors may be more susceptible to collisions with turbines because of the hunting behavior of some species; for example, raptors have keen eyesight and will often focus on prey at a distance, effectively ignoring spinning rotor blades directly in their line of flight (Garvin et al. 2011). Furthermore, raptors may experience displacement due to the loss and fragmentation of habitat from the construction of the facility (Garvin et al. 2011). Based on studies from the Midwest, local breeding raptors may decrease in density within the Project after construction, but will most likely acclimate to the turbines with time. Raptors will still be under the risk of collision, especially American Kestrels, Red-tailed Hawks, and Turkey Vultures (Garvin et al. 2011). There is the potential for an increased risk to raptors from any turbine that is closely located near an active raptor nest.

### 5.3.3 Potential Impacts on Bats

Based on the habitat within the Project Area, acoustical monitoring studies performed in and near the Project Area, and the limited post-construction data associated with other similar projects, the potential for significant adverse impacts on bats from operation of the Project is considered moderate. A primary reason for uncertainty is that pre-construction bat studies have not been effective at indicating post-construction impacts at many sites across North America (Kunz et al. 2007; Wind Turbine Guidelines Advisory Committee 2010),

The greatest concern for potential adverse impacts would be to transient individuals, especially migratory tree-roosting bat species (hoary bat, eastern red bat, and silver-haired bat) colliding with wind turbines. Results of fatality studies at wind energy facilities in the eastern United States as well as several western sites (U.S. and Canada) seem to indicate that these species are susceptible to collisions with wind turbines (NWCC 2010). It is anticipated that there would be much lower risk to the resident/summering populations occurring in the Project Area than to migrants because collisions with tree-roosting migrating species have exceeded those of other bat species (Kunz et al. 2007; Arnett et al. 2008). For example, during the post-construction surveys are Maple Ridge; 151 of 203 total dead bats found during the 2007 surveys and 106 of 140 total dead bats found during 2008 surveys were of the three tree-roosting bat species mentioned above Jain et al. 2009a; Jain et al. 2009b).

As the population sizes and trends and migratory patterns of most bats in New York State are unknown, it is uncertain what level of impact is made from wind projects, especially in light of the even greater mortality risk from WNS, as WNS is likely to occur in all New York caves (NYSDEC 2010).

## 5.4 Potential Impacts on Threatened and Endangered Bird and Bat Species from All Phases of Project Development

### 5.4.1 Birds

Because limited use of the Project Area is anticipated by endangered, threatened, and special concern species, no significant adverse impact on these species is expected during construction or operations. The potential impacts on listed species identified on site and those additional species listed by USFWS and NYSDEC on the NHP reports within 10 miles of the Project Area are discussed in detail below.

Two migrant Golden Eagles were observed in the Project Area by E & E staff during the spring raptor surveys on April 2 and April 3, 2008. There is no suitable habitat for breeding in the Project Area and there are no active nests in New York State (NYSDEC 2012c). There are no activities pertinent to the life cycle of the Golden Eagle that would regularly bring it to the Project Area except as a migrant or an occasional transient. With such low utilization of the Project Area, the potential direct mortality or injury of eagles colliding with wind turbines is considered remote. Similarly, as there is not suitable breeding habitat in the Project Area, the potential for harassment, displacement, or habitat impacts are also remote. Therefore, potential adverse impacts to Golden Eagle are considered low.

Bald Eagles were observed by E & E staff in the Project Area during spring and fall raptor surveys in 2008. All of the observed Bald Eagles were classified as migratory individuals passing through the Project Area. Habitat within the Project Area is not suitable for breeding. Foraging potential for Bald Eagles within the Project Area is considered low given the absence of any large bodies of water in the Project Area; however, there is potential that they could forage at the landfill, with a greater likelihood of occurring in winter. There are no activities pertinent to the life cycle of the Bald Eagle that would regularly bring it to the Project Area except as a migrant or a transient. As such, the potential for direct mortality or injury to Bald Eagles from colliding with wind turbines is low. Similarly, the potential for harassment, displacement, or habitat impacts are also low. Therefore, any potential adverse impacts to Bald Eagle are considered low.

A total of 8 Northern Harriers were observed in the Project Area during spring and fall raptor surveys, with both locals and migrants observed. According to the NHP, the Northern Harrier is known to breed in Cortland County, including the potential occurrence of this species within 10 miles of the Project Area. The BBA indicated it is a confirmed or suspected breeder in or near the Project Area. Various wetland and upland habitats, including cattail marshes, wet meadows, and hayfields, are used for nesting. Unlike most raptors, it is a ground nester. It is highly visible in all seasons and has a large hunting range (McGowan and Corwin 2008). Very low Northern Harrier mortality has been documented from wind turbines, even at sites that have relatively high use by this species (Erickson et al. 2002). The collision risk is considered low-to-moderate because of the species' frequency of occurrence in the Project Area.

The Pied-billed Grebe was identified by the NHP as having the potential to occur within 10 miles of the Project Area. The Pied-billed Grebe was not recorded during any of the E & E field surveys, and was absent from the Dryden BBS (Sauer et al. 2008). The Pied-billed Grebe was recorded by the Cortland CBC, but was an uncommon sighting as it was only observed 15 out of the 71 years of bird counts for this CBC site, with four sightings since 2005 (National Audubon Society 2012). The species is an uncommon breeder in Cortland County. The Project Area lacks the preferred breeding habitat of the Pied-billed (i.e, freshwater ponds, marshes, lakes), and therefore no activities pertinent to the life cycle of this species would regularly bring it to the Project Area except as a migrant or a transient. As such, the potential for direct mortality or injury to Pied-billed Grebe from colliding with wind turbines is low. Similarly, the potential for harassment, displacement, or habitat impacts are also low. Therefore, any potential adverse impacts to Pied-billed Grebe are considered low.

Great Blue Heron has been identified by NHP because a rookery near the Town of Scott, Cortland County. However, Scott, New York is approximately 15 miles away from the Project Area. While not a federal or state listed endangered or threatened species the Great Blue Heron is protected by the federal Migratory Bird Treaty Act. The Great Blue Heron typically nests in colonies, usually near water; and is primarily a fish eater, wading along the shorelines of marshes, lakes, and rivers (Butler 1992). The Project Area lacks suitable habitat to support a rookery or a large number of foraging Great Blue Herons at one time. There is the potential for the occurrence of individuals using the Project Area for foraging or for transient individuals to pass through the Project Area. Herons have not been prone to collisions with wind turbines and given their size, they would be easier to find than smaller birds such as passerines during post-construction mortality studies. In a review of bird collisions at wind facilities (Erickson et al. 2001) based on 31 studies, 78% of the carcasses found (outside of California) were passerines and only 3.3% were waterbirds (National Research Council 2007). The potential risks of collision and displacement is considered low, as there is little suitable breeding or foraging habitat in the Project Area.

Species of special concern are those that warrant attention and consideration because they are extremely uncommon in New York or have highly specific habitat requirements and deserve careful monitoring. Bird species of special concern with the potential to occur in the Project Area are listed in Table 4-6. Although rare, current information does not justify listing these species are either endangered or threatened. They are not warranted the same legal protection as those species which are listed as endangered or threatened. All of these species were detected in very low numbers, therefore the potential risks of collision and displacement are considered remote.

Only limited use of the Project Area is anticipated by endangered, threatened, and special concern bird species; therefore, the overall risk to threatened and endangered bird species from operation of the Project is considered low. Impacts to listed bird species will be identified during the post-construction study for bird and bat mortality monitoring. Implementing environmental monitoring prior to and during construction would help identify potential presence and risks to listed species during construction.

### 5.4.2 Bats

The federally- and state-listed endangered Indiana bat and the state species of special concern eastern small-footed bat are the only two protected bat species that were identified as having the potential to occur in Cortland County during the initial desktop review of the Project. The Project Area supports suitable roosting and foraging habitat for the species. It must be noted that the results of the acoustical monitoring did not distinguish to the species level for the genus *Myotis*; therefore, there is the potential that these species were present, but this is considered to be a low potential because of the rarity of the species in New York State.

The known occurrence and distribution of Indiana bats in New York State are described in Section 3.2.3. Within New York State, the Indiana bat is known to winter only in isolated hibernacula mostly within the eastern portion of the state. WNS has likely largely decreased populations of these species in New York. With decreases to already small populations there is less likelihood of bat collisions involving these species.

## 5.5 Bird and Bat Fatality Approximations

The results of site-specific pre-construction and post-construction studies from other wind energy sites are useful to attempt to predict bird and bat fatalities for the proposed Project. Available data from other sites are limited, however, there is considerable variability in the quality of data available, and the range of fatalities reported at other projects is large. Therefore, a prediction of fatality (or "fatality approximations") is a relative indicator that can be used as part of the more comprehensive evaluation of the potential impacts within this BBRA. The NWCC warns that caution must be used when comparing fatality rates across studies due to the use of different estimators and varying search intensities, study lengths, timing, size of search areas, and biases from unaccounted crippling losses (Strickland et al. 2011).

### 5.5.1 Birds

Operation of turbines poses the risk of bird fatalities from collisions. Bird fatality rates have varied between 0.66 and 9.59 birds/turbine/study period and between 0.44 and 5.81 birds/MW/study period at New York sites where recent, rigorous post-construction mortality monitoring has been conducted (see Table 5-1). Avian fatality rates at the Project are anticipated to be similar to those recorded within New York State. This prediction is based on the results of the bird studies, literature review, and because there are no features in the Project Area that attract or concentrate large numbers of migrating birds.

It is anticipated that the bird fatality rates for the Project will be within the wide range of bird fatality rates of these benchmark studies provided in Table 5-1.

For this approximation, the lower bound estimate for the fatality rate for the Project was based on the results of the 2008 three-day survey results from the Noble Bliss Wind Project (Jain et al. 2009e) and the upper bound was based on the results of 2006 daily surveys conducted at the Maple Ridge Wind Project (Jain et al. 2007; see Table 5-1). An average fatality rate was also calculated based on the weekly bird/MW/study period rates (see Table 5-2). These estimations represent the lower and upper end of estimated mortality, which may be biased high or low depending on survey methods. However, such comparisons can be misleading as to the actual fatality rates due to differences in the attention paid to avoidance measures during project design, the differences in habitat and avian abundance at the different projects, and other factors that would influence bird impacts. Additionally the size (capacity) of the wind energy facility is a major factor when comparing fatality estimates. The number of bird fatalities can only be determined with post-construction mortality studies; however, this estimate allows an evaluation of the potential impacts.

**Table 5-1 Bird Fatality Rates from Post-Construction Studies at New York State Wind Energy Facilities**

| Wind Project and Location | Monitoring Start/End Date | Year | Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal | | Reference |
|---|---|---|---|---|---|
| | | | Number of Bird Fatalities/ Turbine | Number of Bird Fatalities/ MW/Period | |
| **Maple Ridge, Lewis County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 6/17 – 11/15 | 2006 | 9.59 | 5.81 | Jain et al. 2007 |
| 3-day surveys | 6/29 – 11/15 | 2006 | 4.47 | 2.71 | Jain et al. 2007 |
| Weekly surveys | 7/11 – 11/13 | 2006 | 3.13 | 1.90 | Jain et al. 2007 |
| Weekly surveys | 4/30 – 11/14 | 2007 | 3.87 | 2.34 | Jain et al. 2009a |
| Weekly surveys | 4/15 – 11/9 | 2008 | 3.42 | 2.07 | Jain et al. 2009b |
| **Noble Bliss, Wyoming County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 4/21 – 11/14 | 2008 | 4.30 | 2.86 | Jain et al. 2009e |
| 3-day surveys | 5/9 – 11/14 | 2008 | 0.66 | 0.44 | Jain et al. 2009e |
| Weekly surveys | 5/9 – 11/14 | 2008 | 0.74 | 0.50 | Jain et al. 2009e |
| Daily surveys | 4/15 – 11/15 | 2009 | 4.45 | 2.97 | Jain et al. 2009c |
| Weekly surveys | 4/15 – 11/15 | 2009 | 2.87 | 1.91 | Jain et al. 2009c |
| **Noble Clinton, Clinton County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 4/26 – 10/13 | 2008 | 1.43 | 0.96 | Jain et al. 2009d |
| 3-day surveys | 4/26 – 10/13 | 2008 | 3.26 | 2.17 | Jain et al. 2009d |
| Weekly surveys | 5/8 – 10/13 | 2008 | 2.48 | 1.65 | Jain et al. 2009d |

**Table 5-1 Bird Fatality Rates from Post-Construction Studies at New York State Wind Energy Facilities**

| Wind Project and Location | Monitoring Start/End Date | Year | Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal: Number of Bird Fatalities/ Turbine | Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal: Number of Bird Fatalities/ MW/Period | Reference |
|---|---|---|---|---|---|
| Daily surveys | 4/15 – 11/15 | 2009 | 1.50 | 1.00 | Jain et al. 2010b |
| Weekly surveys | 4/15 – 11/15 | 2009 | 1.76 | 1.17 | Jain et al. 2010b |
| **Noble Ellenburg, Clinton County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 4/29 – 10/13 | 2008 | 2.09 | 1.40 | Jain et al. 2009c |
| 3-day surveys | 4/28 – 10/13 | 2008 | 1.37 | 0.91 | Jain et al. 2009c |
| Weekly surveys | 4/28 – 10/13 | 2008 | 1.18 | 0.78 | Jain et al. 2009c |
| Daily surveys | 4/15 – 11/15 | 2009 | 5.69 | 3.79 | Jain et al. 2010a |
| Weekly surveys | 4/15 – 11/15 | 2009 | 2.29 | 1.53 | Jain et al. 2010a |
| **Cohocton and Dutch Hill, Steuben County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 4/15 – 11/15 | 2009 | 4.7 | 1.88 | Stantec 2010 |
| Weekly surveys | 4/15 – 11/15 | 2009 | 2.9 | 1.18 | Stantec 2010 |
| Daily surveys | 7/15 – 9/17 | 2010 | 2.06 | 1.37 | Stantec 2011 |
| Weekly surveys | 7/15 – 9/17 | 2010 | 1.16 | 0.77 | Stantec 2011 |
| **Munnsville, Madison and Oneida Counties, New York – Mixed (agriculture and forest)** | | | | | |
| Dog searches (recurrence unknown) | 4/15 – 11/15 | 2008 | 1.71 | 1.14 | Stantec 2008 |
| Weekly surveys | 4/15 – 11/15 | 2008 | 2.22 | 1.48 | Stantec 2008 |
| **Noble Wethersfield, Wyoming County, New York – Mixed (agriculture and forest)** | | | | | |
| Weekly surveys | 4/26 – 10/15 | 2010 | 2.55 | 1.70 | Jain et al. 2011a |
| **Noble Altona, Clinton County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 4/26 – 10/15 | 2010 | 2.76 | 1.84 | Jain et al. 2011b |
| Weekly surveys | 4/26 – 10/15 | 2010 | 1.55 | 1.04 | Jain et al. 2011b |
| **Noble Chateaugay, Franklin County, New York – Mixed (agriculture and forest)** | | | | | |
| Weekly surveys | 4/26 – 10/15 | 2010 | 2.48 | 1.65 | Jain et al. 2011c |
| **High Sheldon, Wyoming County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily and weekly surveys | 4/15 – 11/15 | 2010 | 2.64 | 1.76 | Tidhar et al. 2011a |
| Daily and weekly surveys | 5/15 – 11/15 | 2011 | 2.36 | 1.57 | Tidhar et al. 2011b |

**Table 5-2 Approximate Number of Bird Fatalities for Project Based on New York Benchmark Studies**

| Project | Total MW (no. of Turbines) | Lower Bound: Approximate Bird Fatalities Per Study Period[1] | Upper Bound: Approximate Bird Fatalities Per Study Period[2] | Average: Approximate Bird Fatalities Per Study Period Based on Average of Weekly Rates[3] |
|---|---|---|---|---|
| Crown City | 70.4 (44) | 31 | 410 | 106 |

Notes:
[1] 0.44 birds/MW/Survey Season: May 9 – November 14 2008; Based on 3-day survey results (Jain et al. 2009e)
[2] 5.81 birds/MWturbine/survey season; Survey Season: June 17 – November 15 2006; Based on daily survey results (Jain et al. 2007).
[3] Average rate of 1.5 birds/MW/study period based on the weekly search estimates from Jain et al. 2007; Jain et al. 2009e; Jain et al. 2009d; Jain et al. 2009c; Stantec 2010; Stantec 2011; Stantec 2009; Jain et al. 2011a; Jain et al. 2011b; Jain et al. 2011c; Tidhar et al. 2011a; Tidhar et al. 2011b

### 5.5.2 Bats

Bat fatality rates have varied between 0.7 and 24.45 bats/turbine/study period and between 0.46 and 16.3 bats/MW/study period at New York sites where recent, rigorous post-construction mortality monitoring has been conducted (see Table 5-3). Bat fatality rates at the Project are anticipated to be similar to those recorded within New York State. This prediction is based on the results of the habitat surveys, acoustical monitoring studies, literature review, and because there are no features in the Project Area suggesting evidence of large roosts or hibernacula in the Project Area that would concentrate foraging bats.

It is anticipated that the bat fatality rates for the Project will be within the wide range of bat fatality rates of these benchmark studies provided in Table 5-3. For this approximation, the lower bound estimate for the fatality rate for the Project was based on the results of the 2008 weekly survey results from the Munnsville, Madison, and Oneida counties Wind Project (Stantec 2010) and the upper bound was based on the results of 2010 weekly surveys conducted at the Noble Wethersfield Wind Project (Jain et al. 20011a; see Table 5-3), An average fatality rate was also calculated based on the weekly bat/MW/study period rates provided in Table 5-4. However, such comparisons can be misleading (see Sections 5.5 and 5.5.1).

**Table 5-3 Bat Fatality Rates from Post-Construction Studies at New York State Wind Energy Facilities**

| Wind Project and Location | Monitoring Start/End Date | Year | Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal | | Reference |
|---|---|---|---|---|---|
| | | | Number of Bat Fatalities/ Turbine | Number of Bat Fatalities/ MW/Period | |
| **Maple Ridge, Lewis County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 6/17 – 11/15 | 2006 | 24.53 | 14.87 | Jain et al. 2007 |
| 3-day surveys | 6/29 – 11/15 | 2006 | 22.34 | 13.54 | Jain et al. 2007 |
| Weekly surveys | 7/11 – 11/13 | 2006 | 15.2 | 9.21 | Jain et al. 2007 |
| Weekly surveys | 4/30 – 11/14 | 2007 | 15.24 | 9.42 | Jain et al. 2009a |
| Weekly surveys | 4/15 – 11/9 | 2008 | 8.18 | 4.96 | Jain et al. 2009b |
| **Noble Bliss, Wyoming County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 4/21 – 11/14 | 2008 | 7.58 | 5.05 | Jain et al. 2009e |
| 3-day surveys | 5/9 – 11/14 | 2008 | 14.66 | 9.78 | Jain et al. 2009e |
| Weekly surveys | 5/9 – 11/14 | 2008 | 13.01 | 8.67 | Jain et al. 2009e |
| Daily surveys | 4/15 – 11/15 | 2009 | 8.24 | 5.5 | Jain et al. 2009c |
| Weekly surveys | 4/15 – 11/15 | 2009 | 4.46 | 2.97 | Jain et al. 2009c |
| **Noble Clinton, Clinton County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 4/26 – 10/13 | 2008 | 5.45 | 3.63 | Jain et al. 2009d |
| 3-day surveys | 4/26 – 10/13 | 2008 | 4.81 | 3.21 | Jain et al. 2009d |
| Weekly surveys | 5/8 – 10/13 | 2008 | 3.76 | 2.5 | Jain et al. 2009d |
| Daily surveys | 4/15 – 11/15 | 2009 | 9.72 | 6.48 | Jain et al. 2010b |
| Weekly surveys | 4/15 – 11/15 | 2009 | 5.16 | 3.44 | Jain et al. 2010b |
| **Noble Ellenburg, Clinton County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 4/29 – 10/13 | 2008 | 8.17 | 5.45 | Jain et al. 2009c |
| 3-day surveys | 4/28 – 10/13 | 2008 | 6.94 | 4.63 | Jain et al. 2009c |
| Weekly surveys | 4/28 – 10/13 | 2008 | 4.19 | 2.79 | Jain et al. 2009c |
| Daily surveys | 4/15 – 11/15 | 2009 | 8.01 | 5.34 | Jain et al. 2010a |
| Weekly surveys | 4/15 – 11/15 | 2009 | 3.7 | 2.47 | Jain et al. 2010a |
| **Cohocton and Dutch Hill, Steuben County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 4/15 – 11/15 | 2009 | 40 | 16 | Stantec 2010 |
| Weekly surveys | 4/15 – 11/15 | 2009 | 13.8 | 5.53 | Stantec 2010 |
| **Munnsville, Madison and Oneida Counties, New York – Mixed (agriculture and forest)** | | | | | |
| Dog searches (recurrence unknown) | 4/15 – 11/15 | 2008 | 2.9 | 1.93 | Stantec 2009 |
| Weekly surveys | 4/15 – 11/15 | 2008 | 0.7 | 0.46 | Stantec 2009 |
| **Noble Wethersfield, Wyoming County, New York – Mixed (agriculture and forest)** | | | | | |
| Weekly surveys | 4/26 – 10/15 | 2010 | 24.45 | 16.3 | Jain et al. 2011a |
| **Noble Altona, Clinton County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily surveys | 4/26 – 10/15 | 2010 | 6.51 | 4.34 | Jain et al. 2011b |
| Weekly surveys | 4/26 – 10/15 | 2010 | 3.87 | 2.58 | Jain et al. 2011b |
| **Noble Chateaugay, Franklin County, New York – Mixed (agriculture and forest)** | | | | | |
| Weekly surveys | 4/26 – 10/15 | 2010 | 3.66 | 2.44 | Jain et al. 2011c |

**Table 5-3 Bat Fatality Rates from Post-Construction Studies at New York State Wind Energy Facilities**

| Wind Project and Location | Monitoring Start/End Date | Year | Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal: Number of Bat Fatalities/ Turbine | Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal: Number of Bat Fatalities/ MW/Period | Reference |
|---|---|---|---|---|---|
| **High Sheldon, Wyoming County, New York – Mixed (agriculture and forest)** | | | | | |
| Daily and weekly surveys | 4/15 – 11/15 | 2010 | 3.50 | 2.33 | Tidhar et al. 2011a |
| Daily and weekly surveys | 5/15 – 11/15 | 2011 | 2.67 | 1.78 | Tidhar et al. 2011b |

**Table 5-4 Approximate Number of Bat Fatalities for Project Based on New York Benchmark Studies**

| Project | Total MW (no. of Turbines) | Lower Bound: Approximate Bat Fatalities Per Study Period[1] | Upper Bound: Approximate Bat Fatalities Per Study Period[2] | Average: Approximate Bat Fatalities Per Study Period Based on Average of Weekly Rates[3] |
|---|---|---|---|---|
| Crown City | 70.4 (44) | 33 | 1148 | 282 |

Notes:

[1] 0.46 bats/MW/Survey Season: April 15 – November 15 2008; Based on weekly survey results (Stantec 2009)

[2] 16.3 bats/MWturbine/survey season; Survey Season: April 26 – October 15 2010; Based on weekly survey results (Jain et al. 201a).

[3] Average rate of 4.0 bats/MW/study period based on the weekly search estimates from Jain et al. 2007; Jain et al. 2009e; Jain et al. 2009d; Jain et al. 2009c; Stantec 2010;; Stantec 2009; Jain et al. 2011a; Jain et al. 2011b; Jain et al. 2011c; Tidhar et al. 2011a; Tidhar et al. 2011b

# 6 Summary

TCI coordinated with NYSDEC and the USFWS at the early stages of development regarding bird and bat studies to conduct at the Project Area. TCI contracted with E & E and ABR to conduct the various bird and bat surveys in 2008. The bird and bat surveys were generally consistent with the draft NYSDEC guidelines in place in spring 2008. Slowdowns in the development process for the Project ensued. TCI contracted with E & E in July 2012 to prepare this BBRA based on the 2008 field survey results and other currently available public information.

The avian survey results are now four years old and the Project Area and layout have changed. However, the results of the migratory raptor, migratory bird, and breeding bird surveys were consistent with the results of other pre-construction studies at proposed wind projects in New York as well as with relevant local data. As such, the evaluation of potential impacts is unlikely to change much if additional surveys are conducted. As local breeding populations can change, it would be useful to revisit the breeding bird survey and conduct a search for listed bird species in the Project Area prior to and/or during construction. This could help minimize or avoid impacts to listed species during construction.

The results of the bat acoustical studies were consistent with the results of other pre-construction studies at proposed wind projects in New York as well as with existing knowledge of bat activity. Unlike for birds, bat populations have changed in the time elapsed since the 2008 studies. WNS has had devastating effects on the cave-dwelling bat populations and the 2008 results very likely represent conditions with far more bats from those species than currently would be expected in the Project Area. As little is known about bat populations in general, it is unknown what fluctuation may have occurred in the tree-dwelling bat populations since 2008; however, changes would not be expected to be as dramatic as those for the cave-dwelling bats affected by WNS. It would be useful to establish a new baseline for bat use at the Project Area because of the likely changed conditions; however, there is no evidence to suggest that impacts to bats would be outside the normal range of bat fatalities exhibited elsewhere in New York State.

For both birds and bats, it is expected that impacts from construction and operation of the Project including displacement and mortality to be within range of other NYS sites as there are no indicators of potential elevated risk. The Project facilities are largely sited in agricultural areas and other locations with fragmented habitat. The County landfill is an area of increased avian abundance (gulls, crows, vultures); however, the species involved are active during the day and elevated mortality is not anticipated as there are no turbines in the actual foraging areas at the landfill.

While bird and bat fatality impacts are anticipated to be within the range documented at other New York sites, it is also expected that scientific and technological advances will continue throughout the operating life of the Project which may enable bird and bat fatality rates to decrease from those currently experienced at other wind farms in NYS.

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# A Passive Bat Acoustical Monitoring Study (ABR, Inc.)

# AN ACOUSTIC STUDY OF BAT ACTIVITY AT THE PROPOSED CROWN CITY WIND ENERGY SITE, NEW YORK, SPRING–FALL 2008

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December 2008

*Printed on recycled paper.*

**EXECUTIVE SUMMARY**

- This report presents the results of a bat acoustic monitoring study conducted during a 167-day period (2 May–15 October 2008) at the proposed Crown City Wind Energy Site, Cortland County, New York. Each night we conducted bat acoustic monitoring for ~11–13 h/night (~1 h < sunset to ~1 h > sunrise).
- The primary goal of the study was to collect acoustic information on activity levels of bats during nocturnal hours, particularly during spring and fall migration. Specifically, our objectives were to: (1) collect baseline information on levels of bat activity (i.e., # bat passes/h, night, or tower) for migratory tree-roosting bats (e.g., hoary, Eastern red, and big brown/silver-haired bats) and other bat species (mainly *Myotis* spp.); and (2) examine temporal (e.g., nightly and seasonal) and altitudinal variations in bat activity.
- Peak mean activity (mean passes/tower) for all bats occurred in mid-July. Peak mean activity for migratory tree-roosting bats also occurred in mid-July and varied among species with higher activity levels of big brown/silver-haired bats preceding hoary and red bats.
- Mean bat acoustic activity (passes/detector-night) for all bats was 8.9 ± 0.6 across the entire study, and was relatively consistent between late spring (10.5 ± 1.0) and fall (8.4 ± 0.7).
- Mean activity rate for TREEBATS was 5.1 ± 0.3 passes/detector-night (late spring = 4.6 ± 0.4; fall = 5.2 ± 0.4)
- Peak activity for all species occurred 1–2 hours after sunset in both seasons and for the entire study.
- Mean activity (passes/detector-night) for all bats across the entire study was higher at 1.5 m (14.5 ± 1.5) than at 22 m (6.8 ± 0.7) and 60 m (5.1 ± 0.5) with most species showing similar trends except hoary bats which were detected more frequently at higher altitudes.

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## ACKNOWLEDGMENTS

We thank TCI for funding this study. We thank Mike Morgante (Ecology and Environment, Inc.) for helping with project coordination and logistics, and David Schultz (Ecology and Environment, Inc.) for field assistance. At ABR, we thank Delee Spiesschaert and Susan Cooper for logistical support, Leslie Rodman and Matt Apling for help with data analysis and table preparation, Pam Odom for report preparation, and Rich Blaha for figure preparation.

## INTRODUCTION

As energy demands increase worldwide, many countries are seeking ways to reduce fossil fuel consumption and generate alternative energy sources. Wind has been produced commercially in North America for nearly 4 decades and is one of the fastest growing forms of renewable energy (Arnett et al. 2007a). In recent years, the United States has led the world in wind capacity additions, growing by 27% and 46% in 2006 and 2007, respectively (Wiser and Bolinger 2008). In 2007, New York ranked 13th in the United States in newly installed wind-generating capacity at 55 MW and 11th overall for cumulative capacity at 425 MW (Wiser and Bolinger 2008). Although wind-generated energy reduces carbon and other greenhouse gas emissions associated with global warming, it is not entirely environmentally neutral because wildlife and habitats can be directly and/or indirectly impacted by wind development (Arnett et al. 2007a).

Bat fatalities at wind-energy facilities have been documented since the early 1970s (Hall and Richards 1972). Previous studies have documented high fatality rates along forested ridges in the eastern United States (e.g., Mountaineer, WV, Kerns et al. 2005; Buffalo Mountain, TN, Fiedler 2004, Fiedler et al. 2007). However, recent data suggests high fatality events occur across a variety of landscapes across North America, including agricultural, grassland prairies, and deciduous or coniferous forests (see Arnett et al. 2008, Barclay et al. 2007, Kunz et al. 2007a). Most bat fatalities documented at wind farms involve migratory tree-roosting species [i.e., hoary (*Lasiurus cinereus*), Eastern red (*Lasiurus borealis*), big brown (*Eptesicus fuscus*), and silver-haired (*Lasionycteris noctivagans*)] bats during seasonal periods of migration in late summer and fall. Several hypotheses explaining possible bat/turbine interactions exist (i.e., roost, landscape, acoustic or visual attraction), however, none have been tested (Arnett et al. 2005, Barclay et al. 2007, Cryan and Brown 2007, Kunz et al. 2007a). The lack of data on population estimates, migratory pathways, and flight behaviors around wind turbines of North American bats highlights the need for additional information to resolve these different hypotheses.

Nine species of bats are known to occur in New York. Of these, 1 (Indiana bat, *Myotis sodalis*) is listed as federally endangered by the U.S. Fish and Wildlife Service (USFWS 2008). The New York State Department of Environmental Conservation (NYSDEC) also lists the Indiana bat as state endangered and the Eastern small-footed myotis (*M. lebeii*) as a species of concern (NYSDEC 2008). The remaining 7 species of bats (big brown; hoary; tri-colored- formerly Eastern pipistrelle, *Perimyotis subflavus*; Eastern red; little brown, *M. lucifugus*; Northern long-eared, *M. septentrionalis*; and silver-haired) are not granted special conservation status in New York. However, several species (i.e., hoary bat, Eastern red bat, and silver-haired bat) are of increasing concern, particularly with respect to wind development, because of high fatalities at most wind-energy facilities in the U.S. (Arnett et al. 2008). Because wind-energy development may negatively impact resident and migrating bat species (Arnett et al. 2008, Kunz et al. 2007a), it is important to study the nightly and seasonal variations in bat activity.

## OBJECTIVES

TCI proposes to build the Crown City Wind Energy Site (Crown City), a 45–50 turbine facility capable of generating up to 90 MW of wind energy. The height of each 1.8 MW turbine tower will be up to 100 m with a rotor diameter of up to 100 m for a total maximum turbine height of 150 m (with the blade in the vertical position). In 2008, we conducted bat acoustic monitoring at the proposed project. The primary goal of the study was to collect acoustic information on activity levels of bats during nocturnal hours, particularly during spring and fall migration. Specifically, our objectives were to: (1) collect baseline information on levels of bat activity (i.e., # bat passes/h, night, or tower) for migratory tree-roosting bats (e.g., hoary, Eastern red, and big brown/silver-haired bats) and other bat species (mainly *Myotis* spp.); and (2) examine temporal (e.g., nightly and seasonal) and altitudinal variations in bat activity.

## STUDY AREA

The proposed Crown City Wind Energy Site is located in Cortland County, New York, ~8.9 km (5.5 mi) northeast of the City of Cortland and ~4.8 km (3.0 mi) south of the Village of Truxton (Fig. 1). The area is characterized by rolling hills ranging from 345 to 607 m above sea level (asl). The landscape consists primarily of agricultural fields but also includes large areas of forested stands and a few small wetlands. This project area comprises ~3,491 hectares of privately owned (~3,297 hectares) and County owned (~194 hectares-County landfill site) land.

Our acoustic monitoring stations (3) were positioned on 1 meteorological tower ([NAD83] UTM Zone 18 0413557 4721747N). The tower was located in a pasture near the center of the project area adjacent to forested stands to the south and 2 small ponds to the north. A narrow corridor of trees (1 to 2 trees wide) began near the eastern side of the meteorological tower and continued north for ~200 m.

## METHODS

### EQUIPMENT

We used 3 Anabat SD1 broadband acoustic detectors (Titley Electronics, Ballina, New South Wales, Australia) positioned at 1 meteorological tower to record echolocation call sequences, or bat passes, onto 1 GB compact flash (CF) cards. Prior to sampling, we calibrated each Anabat (sensitivity set at ~6) to minimize reception variability among detectors (Larson and Hayes 2000). We housed microphones in waterproof “bat-hats” (EME Systems, Berkley, California, USA). The bat-hat system consists of a protective shroud, reflector plate, and mounting bracket (version 1c –www.emesystems.com). We positioned microphones on each tower at 1.5 m, 22 m, and 60 m above ground level (agl), respectively. We employed pulley systems secured to meteorological towers to raise microphones to 22 m and 60 m sampling heights. We enclosed all electronic equipment in waterproof Pelican cases (Pelican Products, Inc., Torrance, California, USA) located at the base of each tower. We used a photovoltaic system (Online Solar, Inc., Hunt Valley, Maryland, USA) to provide continuous solar power to all detectors.

### DATA COLLECTION

For our study, we followed recommendations for conducting wildlife studies at wind-energy facilities described by Kunz et al. (2007b) and outlined in New York’s draft guidance document (NYSDEC 2007). We monitored acoustic activity during crepuscular and nocturnal hours (~1 h before sunset to ~1 h after sunrise), between 1657 and 0838, with hours sampled ranging between 11 and 13 h/night. This sampling schedule provided coverage during times when bats are most active in the region (Reynolds 2006) and exceeds that of similar studies in the Eastern United States (Arnett et al. 2006, 2007b, Reynolds 2006, Young et al. 2006). On 28 May, we repositioned the orientation of all 3 microphones from south to north following NYSDEC guidelines (NYSDEC 2007). Ecology and Environment, Inc., staff visited the meteorological tower every other week during spring and summer, and weekly during fall to exchange CF cards and shipped them to ABR for analysis. We downloaded and analyzed data using Anabat CFC Read (version 4.2a) and AnalookW software (version 3.5p), respectively. We removed extraneous noise from our data prior to analysis using customized filters derived from Britzke and Murray (2000).

### DATA ANALYSIS

Interpretation of bat acoustic data is subject to several important caveats. The metric “bat pass” is an index of relative activity, but may not correlate to individual numbers of bats (e.g., 100 bat passes may be a single bat recorded 100 different times or 100 bats each recording a single pass; Kunz et al. 2007b). Activity also may not be proportional to abundance because of variation attributed to: (1) detectability (loud vs. quiet species); (2) species call rates; (3) migratory vs. foraging call rates; and (4) attraction or avoidance of bats to the sampling area (Kunz et al. 2007b). However, interpreted properly, the index of relative activity may provide critical information of bat use at a proposed wind facility by characterizing temporal (hourly, nightly and seasonal) and spatial (height and location) patterns.

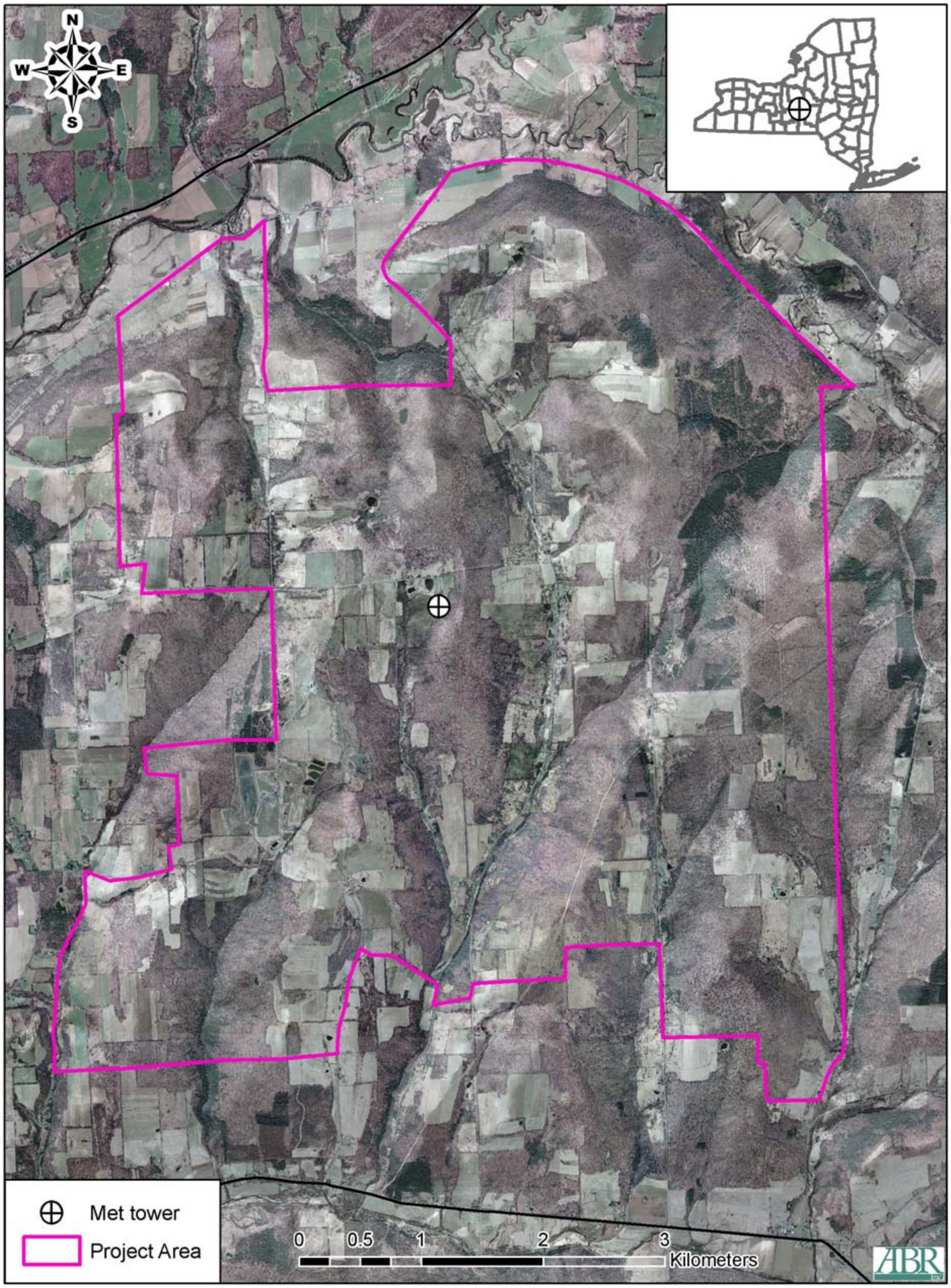


Figure 1. Map of the proposed Crown City Wind Energy Site in Cortland County, New York, 2008.

We defined a bat pass as a "search phase" echolocation sequence of ≥2 echolocation pulses with a minimum pulse duration of 10 ms within each sequence separated by >1 second (Fenton 1970, Thomas 1988, Gannon et al. 2003). Search phase passes are used by bats to detect objects at long ranges and are generally consistent within a species. In contrast, "approach" and "terminal" phase passes typically are used to target and capture insect prey and can vary widely within species. A bat pass is a standard term used to identify bat activity (Kunz et al. 2007b), although other terms also have been used synonymously, including "calls" (Ecology and Environment 2006, Woodlot 2006b, Young et al. 2006), and "call sequences" (Woodlot 2006b).

We compared echolocation call characteristics of each unknown bat pass (e.g., minimum frequency, duration) to a reference library containing bat passes of known species. Qualitative species identification can be relatively accurate when comparing unknown passes to known reference libraries (O'Farrell and Gannon 1999; O'Farrell et al. 1999). We assigned each unknown pass to a "phonic group"—a species or a group of species whose echolocation "search phase" calls possess similar characteristics. For this study, we placed passes into 7 phonic groups: (1) big brown/silver-haired bat (EPFU/LANO), (2) Eastern red bat (LABO), (3) hoary bat (LACI), (4) little brown bat/northern long-eared bat/ Eastern small-footed bat/Indiana bat (MYOTIS), 5) tri-colored bat-formerly Eastern pipistrelles (PESU), (6) unidentified high frequency (>35 kHz; i.e., *Myotis* spp., Eastern red, tri-colored) bats (UNHI), and (7) unidentified low frequency (≤35 kHz; i.e., big brown/silver-haired, hoary) bats (UNLO), following criteria similar to other studies within the region (Betts 1998, Gannon et al. 2003, Reynolds 2006, Mabee and Schwab 2008). We classified bat passes as unidentified if they did not contain sufficient information to determine the species identification (i.e., highly fragmented calls, approach or terminal phase calls). Migratory tree bats consistently have higher fatality rates than other species, therefore, we created an additional category, TREEBATS, which includes several phonic groups (EPFU/LANO, LABO, LACI, and UNLO) that are most impacted at wind-energy facilities. We include UNLO in this category because the phonic group is comprised exclusively of big brown/silver-haired and hoary bats. We created a single category, ALLBATS, comprised of all phonic groups combined.

We divided our study into 2 seasons (spring and fall). The spring season includes both the period of migration and reproductive period (pregnancy and lactation-when mothers nurse their young). The fall season encompasses the periods of juvenile volancy (ability to fly), swarming (pre-migration activity), and migration. Currently, a paucity of information exists regarding seasonal patterns of bat activity and fatality during spring and summer, making it difficult to define these seasons. Therefore, we grouped these seasons together for our spring (2 May–30 June, n = 60 days) season. We based our fall season (1 July–15 October, n = 107 days) on recent data from the region (Jain et al. 2007, Mabee and Schwab 2008) showing high levels of activity and fatality beginning in July and continuing through September and because nearly 90% of bat fatalities occur in late summer/early fall (Erickson et al. 2002).

Because our data were not normally distributed, we used non-parametric statistical tests for all analyses. We tested for differences among detector heights using the Kruskall-Wallis (K-W) analysis of variance. We used repeated-measures ANOVAs with Greenhouse-Geisser epsilon adjustment for degrees of freedom (SPSS 2007) to compare mean activity among hours of the night. We define mean activity as mean passes/ detector-night unless stated otherwise. We report all mean bat passes as mean ± standard error (SE). We used SPSS v.16.0 for all statistical comparisons using a level of statistical significance (α) = 0.05.

## RESULTS

We conducted bat acoustic monitoring at 3 detector heights positioned on 1 meteorological tower for 167 nights between 2 May and 15 October 2008. In spring, we were unable to collect data from 15 April to 1 May because of delays in tower installation, resulting in delays in our acoustic gear installation (i.e., acoustic detectors installed 2 May instead of 15 April). In addition, we were unable to collect data from the 60 m detector between 2 May and 27 May (n = 26 nights), and from both 1.5 m and 22 m detectors between 10 May and 27 May (n = 18 nights) because of equipment malfunctions and problems during the exchange of CF cards. In fall, we were unable to collect data from the 22 m detector between 21 July and 28 July (n = 8 nights) because of equipment malfunctions. We re-oriented all microphones from south to north on 28 May. Because our equipment was functional for only 1 week in May with microphones oriented south, we removed this data from all analyses to eliminate potential confounding factors associated with multiple microphone orientations. Therefore, our dataset only includes data collected for late spring (28 May–30 June, n = 34 days) and fall (1 July–15 October, n = 107 days) seasons for a total of 141 nights, unless otherwise stated.

## GENERAL BAT ACTIVITY

We recorded 3,682 total bat passes from all 3 detectors during late spring and fall (28 May–15 October; Table 1). Overall, most passes (72.2%) were identified to species or species group represented in descending order by MYOTIS, EPFU/LANO, LACI, LABO, and PESU, with remaining passes (27.8%) identified as UNHI and UNLO, respectively. The group TREEBATS represented 57.4% (n = 2,113) of passes recorded. In late spring, identifiable bats comprised 82% of all passes recorded with species percentages similar to the entire study. In fall, identifiable passes comprised 68.1% of all passes recorded. The most frequently recorded phonic group in fall was EPFU/LANO. The group TREEBATS represented 44.2% (n = 472) and 62.8% (n = 1,641) in late spring and fall, respectively. Because only 2 PESU calls were recorded during this study, this phonic group was excluded from our analyses.

## TEMPORAL DIFFERENCES IN ACTIVITY

### SEASONAL

Mean activity (mean passes/tower) for ALLBATS across the entire study (2 May–15 October) varied among nights with low activity levels recorded in mid-June and late fall (Fig. 2). Activity in late spring peaked in late May/early June with highs on 29 May (mean = 47), 9 June (mean = 19), and 29 May (mean = 12) for 1.5 m, 22 m, and 60 m detectors, respectively. In fall, activity peaked in mid-July with high levels recorded at 1.5 m peaked (mean = 128) on 16 July. Peak activity at 22 m (mean = 52) and 60 m (mean = 39) occurred on 19 July with smaller, less dramatic peaks of 22 and 34 mean passes/tower on 6 September for 22 m and 60 m, respectively.

We observed variations in mean activity (mean passes/tower) for migratory tree-roosting bats during times when these species appear to be most vulnerable to wind development (i.e., fall; Figs. 3, 4). The EPFU/LANO group showed high levels of activity in mid-July across all heights and on 6 September at higher altitudes. Activity of LACI was highest in mid to late July, particularly at higher altitudes. Overall, LABO was detected infrequently, but the majority (83%, n = 67) of calls occurred in fall at 22 m and 60 m heights.

Mean activity (passes/detector-night) of ALLBATS for late spring and fall across all heights was 8.9 ± 0.6 (n = 415 detector-nights; Fig. 5). Mean activity for ALLBATS was 10.5 ± 1.0 and 8.4 ± 0.7 for late spring and fall, respectively. Activity for most phonic groups remained relatively consistent between late spring and fall, except for MYOTIS which was detected less frequently in fall. Mean activity of TREEBATS was 5.1 ± 0.3 overall, and remained relatively constant between late spring (4.6 ± 0.4) and fall (5.2 ± 0.4).

### NIGHTLY

In fall, mean activity (passes/h) for ALLBATS across all altitudes varied among nocturnal hours for nights with 10 hours sampled/night ($F_{5.8, 612.7} = 19.1$, $P < 0.001$, n = 107; Fig. 6) and for different phonic groups (Fig. 7). Peak activity occurred 2 hr past sunset for 1.5m, 1–2 hr past sunset at 22 m, and 1 hr past sunset at 60 m. Although activity generally decreased at 1.5 m, fluctuations occurred throughout the night. At higher altitudes activity decreased during the night, but slightly increased ~7–9 hrs past sunset. Similar trends were observed for all phonic groups.

## ALTITUDINAL DIFFERENCES IN ACTIVITY

Variability in mean activity (passes/ detector-night) for the entire study differed among phonic groups among the 3 detector heights (Table 2). Activity for ALLBATS was higher (H = 41.3,

Table 1. Number of bat passes (N) identified as big brown/silver-haired (EPFU/LANO), Eastern red (LABO), hoary (LACI), *Myotis* spp. (MYOTIS), tri-colored (PESU), unidentified high frequency (UNHI), and unidentified low frequency (UNLO) bats at the proposed Crown City Wind Energy Site, New York, 2008. Percentages represent proportion of bat passes during late spring (28 May–30 June) and fall (1 July–15 October) across all altitudes.

| | 1.5 m | | 22 m | | 60 m | | Total | |
|---|---|---|---|---|---|---|---|---|
| Season/phonic group | N | % | N | % | N | % | N | % |
| **Late spring (n = 34 nights)** | | | | | | | | |
| EPFU/LANO | 117 | 3.2 | 78 | 2.1 | 47 | 1.3 | 242 | 6.6 |
| LABO | 4 | 0.1 | 3 | 0.1 | 7 | 0.2 | 14 | 0.4 |
| LACI | 12 | 0.3 | 40 | 1.1 | 38 | 1.0 | 90 | 2.4 |
| MYOTIS | 484 | 13.1 | 28 | 0.8 | 16 | 0.4 | 528 | 14.3 |
| PESU | 1 | >0.1 | 0 | 0.0 | 0 | 0.0 | 1 | >0.1 |
| UNHI | 45 | 1.2 | 13 | 0.4 | 8 | 0.2 | 66 | 1.8 |
| UNLO | 41 | 1.1 | 60 | 1.6 | 25 | 0.7 | 126 | 3.4 |
| *TOTAL* | *704* | *19.1* | *222* | *6.1* | *141* | *3.8* | *1067* | *29.0* |
| **Fall (n = 107 nights)** | | | | | | | | |
| EPFU/LANO | 289 | 7.8 | 229 | 6.2 | 237 | 6.4 | 755 | 20.5 |
| LABO | 15 | 0.4 | 21 | 0.6 | 31 | 0.8 | 67 | 1.8 |
| LACI | 15 | 0.4 | 125 | 3.4 | 149 | 4.0 | 289 | 7.8 |
| MYOTIS | 596 | 16.2 | 56 | 1.5 | 18 | 0.5 | 670 | 18.2 |
| PESU | 1 | >0.1 | 0 | 0.0 | 0 | 0.0 | 1 | >0.1 |
| UNHI | 257 | 7.0 | 33 | 0.9 | 13 | 0.4 | 303 | 8.2 |
| UNLO | 168 | 4.6 | 225 | 6.1 | 137 | 3.7 | 530 | 14.4 |
| *TOTAL* | *1341* | *36.4* | *689* | *18.7* | *585* | *15.9* | *2615* | *71.0* |
| **All seasons (n = 141 nights)** | | | | | | | | |
| EPFU/LANO | 406 | 11.0 | 307 | 8.3 | 284 | 7.7 | 997 | 27.1 |
| LABO | 19 | 0.5 | 24 | 0.7 | 38 | 1.0 | 81 | 2.2 |
| LACI | 27 | 0.7 | 165 | 4.5 | 187 | 5.1 | 379 | 10.3 |
| MYOTIS | 1080 | 29.3 | 84 | 2.3 | 34 | 0.9 | 1198 | 31.9 |
| PESU | 2 | 0.1 | 0 | 0.0 | 0 | 0.0 | 2 | 0.1 |
| UNHI | 302 | 8.2 | 46 | 1.3 | 21 | 0.6 | 369 | 10.0 |
| UNLO | 209 | 5.7 | 285 | 7.7 | 162 | 4.4 | 656 | 17.8 |
| *TOTAL* | *2045* | *55.5* | *911* | *24.8* | *726* | *19.7* | *3682* | *100.0* |

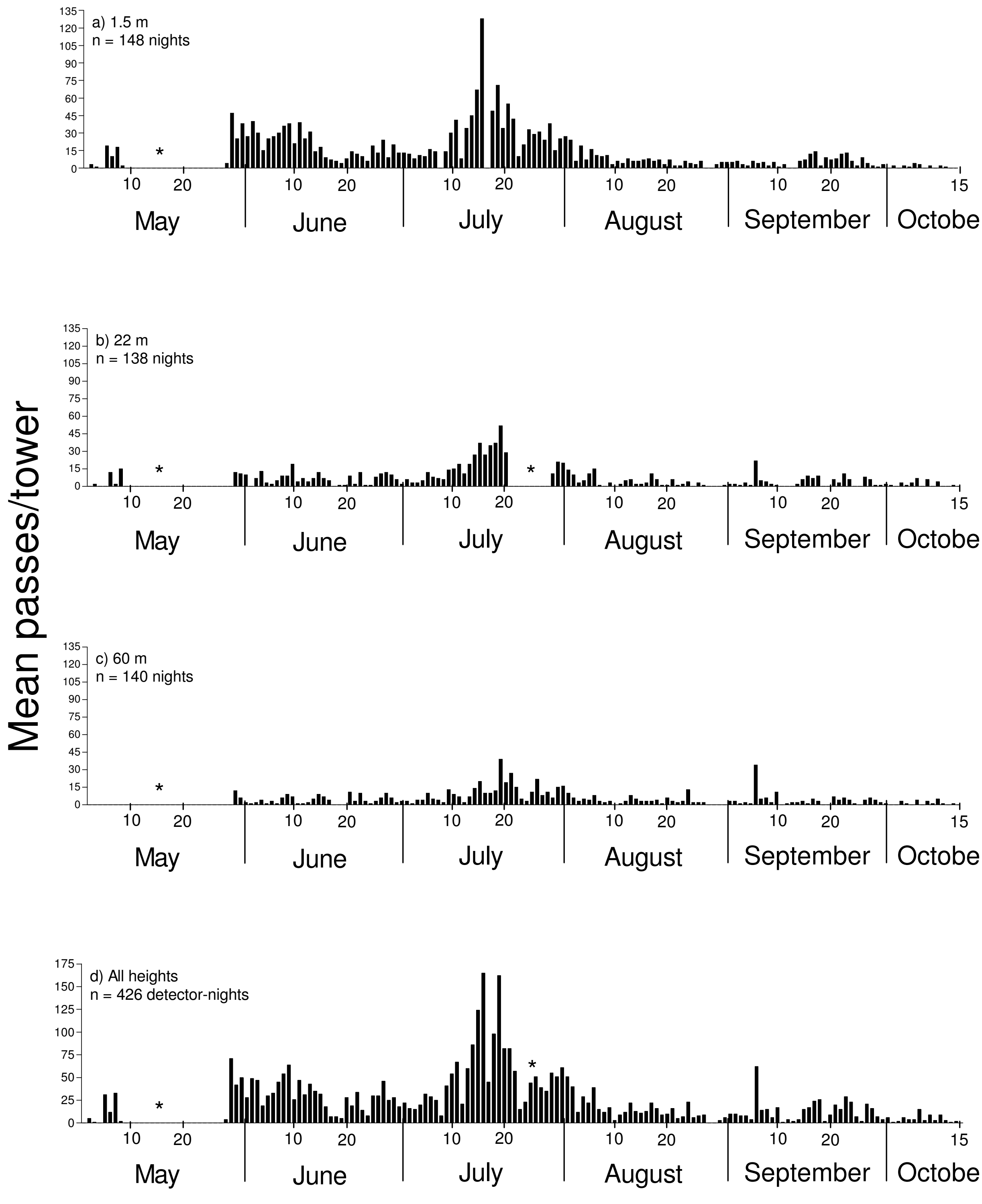


Figure 2. Mean bat passes/tower across all phonic groups by date for a) 1.5 m agl, b) 22 m agl, c) 60 m agl, and d) all heights at the proposed Crown City Wind Energy Site, New York, 2008. Asterisks indicated dates (2 May–27 May; 21 July–28 July) when ≥1 detectors non-operational. Note scale change on y-axis for the bottom graph.

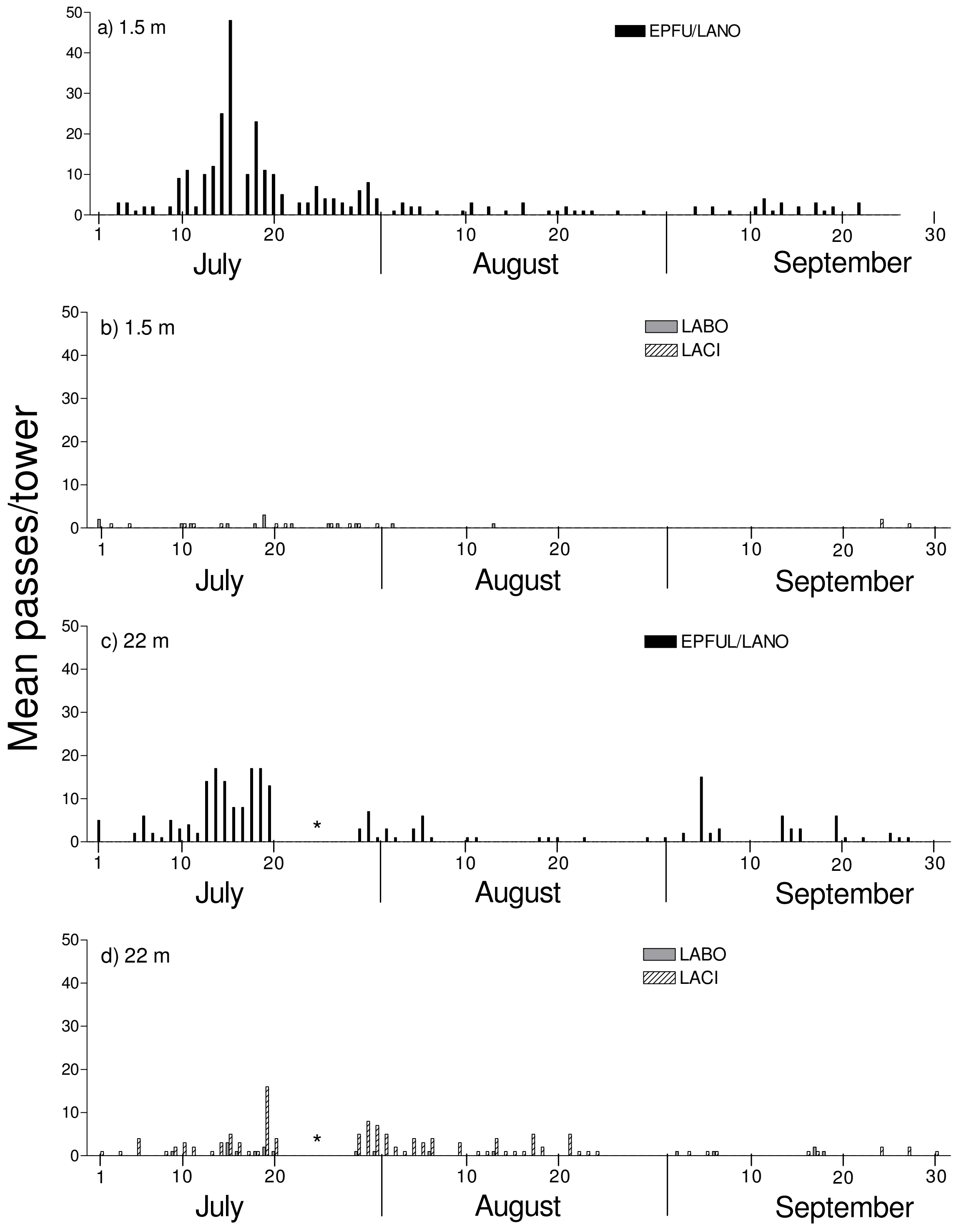


Figure 3. Mean bat passes/tower for big brown/silver-haired (EPFU/LANO), Eastern red (LABO), and hoary (LACI) bats by date for 1.5 m agl (a, b), and 22 m agl (c, d) at the proposed Crown City Wind Energy Site, New York, 2008. Asterisks indicated dates (2 May–27 May; 21 July–28 July) when ≥1 detectors non-operational.

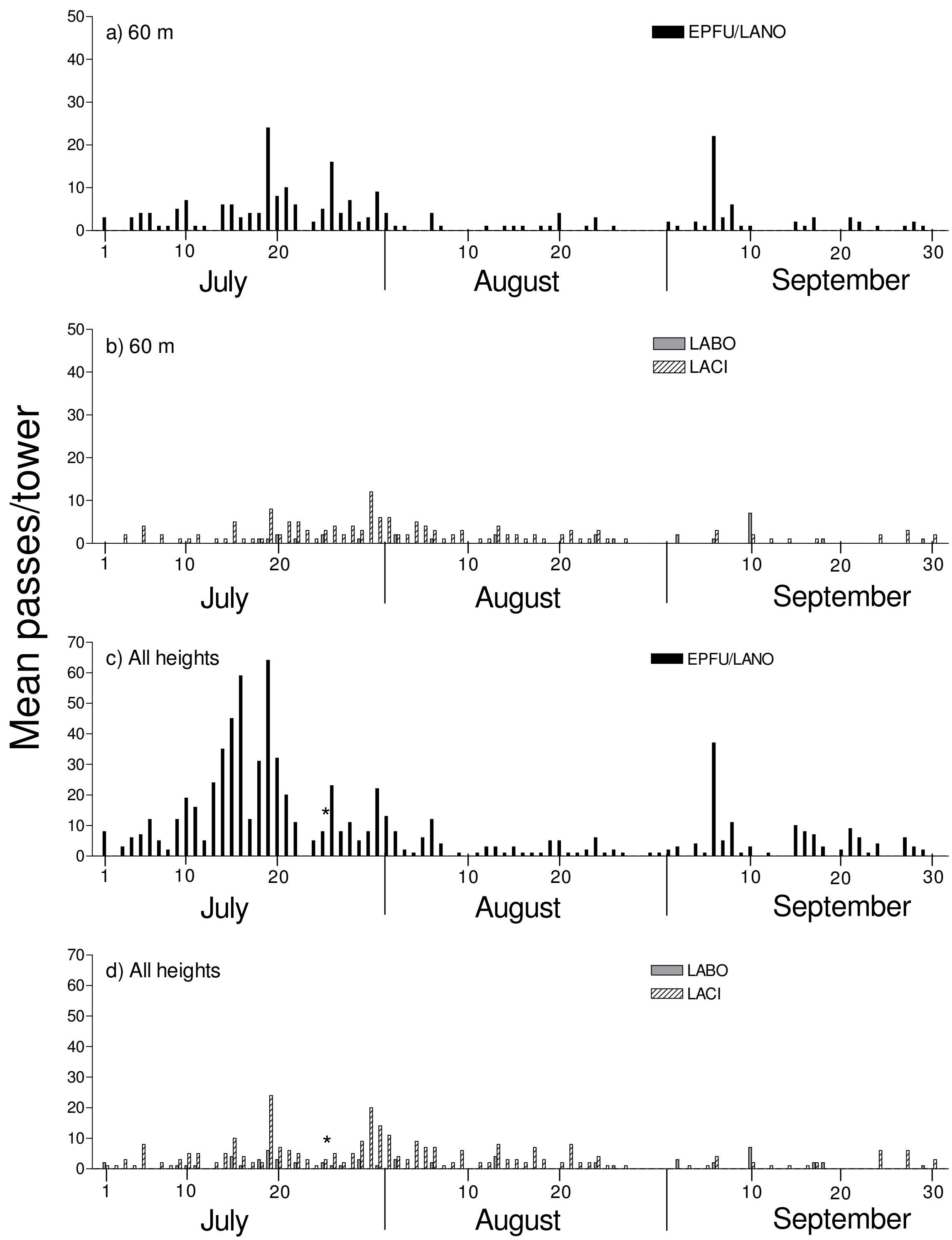


Figure 4. Mean bat passes/tower for big brown/silver-haired (EPFU/LANO), Eastern red (LABO), and hoary (LACI) bats by date for 60 m agl (a, b), and all heights (c, d) at the proposed Crown City Wind Energy Site, New York, 2008. Asterisks indicated dates (2 May–27 May; 21 July–28 July) when ≥1 detectors non-operational. Note scale change on y-axis for the bottom graph.

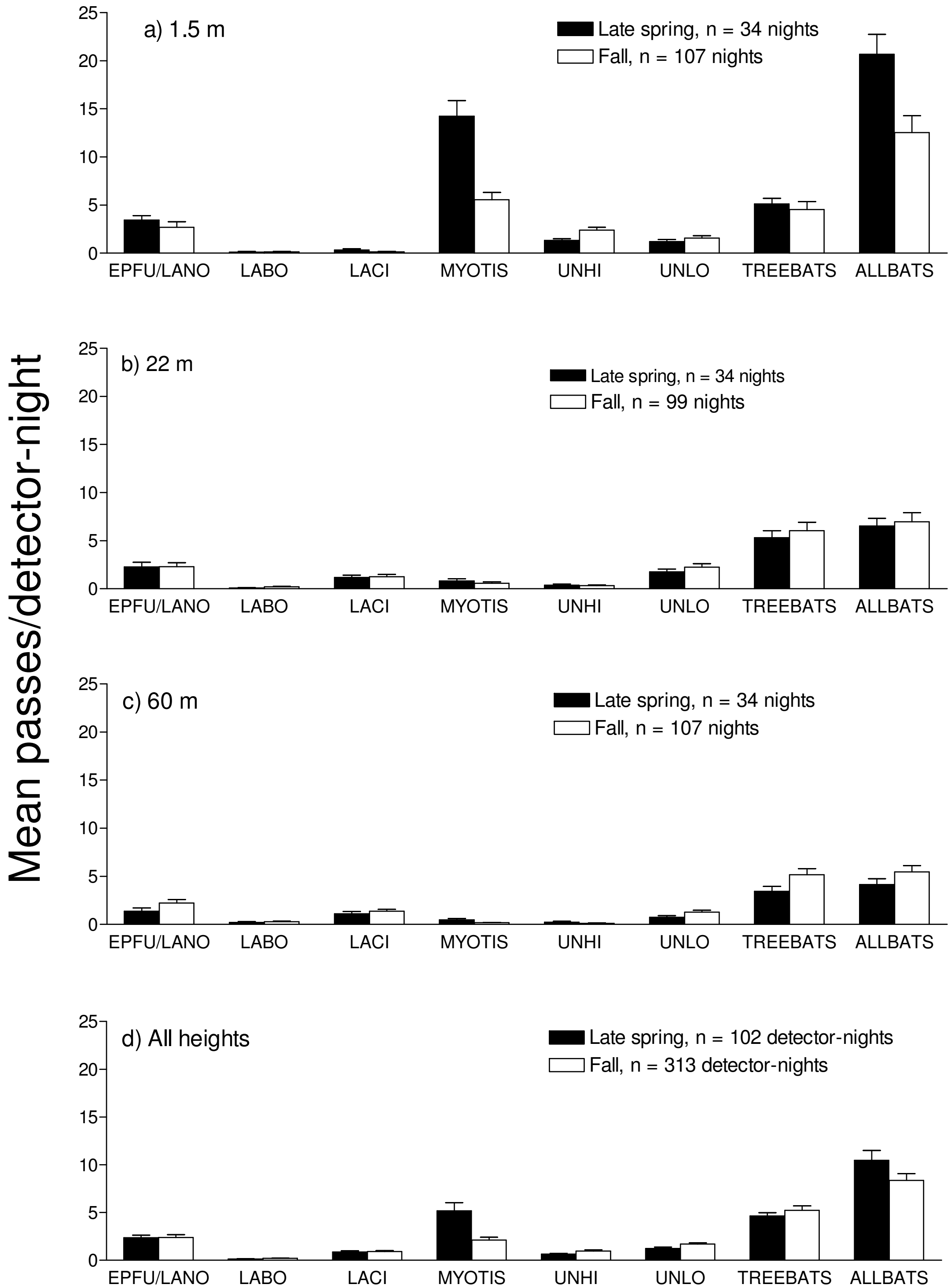


Figure 5. Mean bat passes/detector-night across late spring and fall seasons for big brown/silver-haired (EPFU/LANO), Eastern red (LABO), hoary (LACI), *Myotis* spp. (MYOTIS), unidentified high frequency (UNHI) bats, unidentified low frequency (UNLO) bats, migratory tree-roosting (TREEBATS) bats, and all phonic groups combined (ALLBATS) at a) 1.5 m agl, b) 22 m agl, c) 60 m agl, and d) all heights at the proposed Crown City Wind Energy Site, New York, 2008.

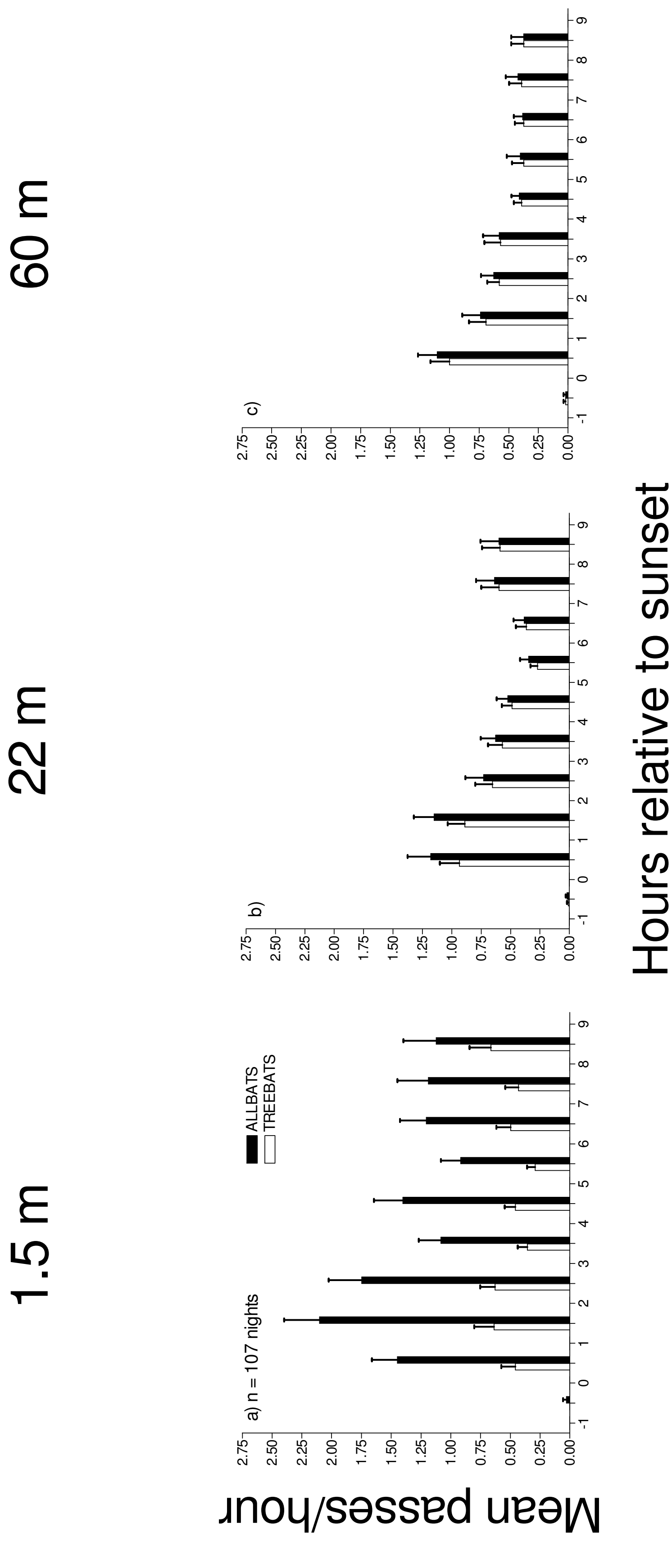


Figure 6. Mean bat passes/hour relative to sunset for ALLBATS and TREEBATS by height for fall at the proposed Crown City Wind Energy Site, New York 2008.

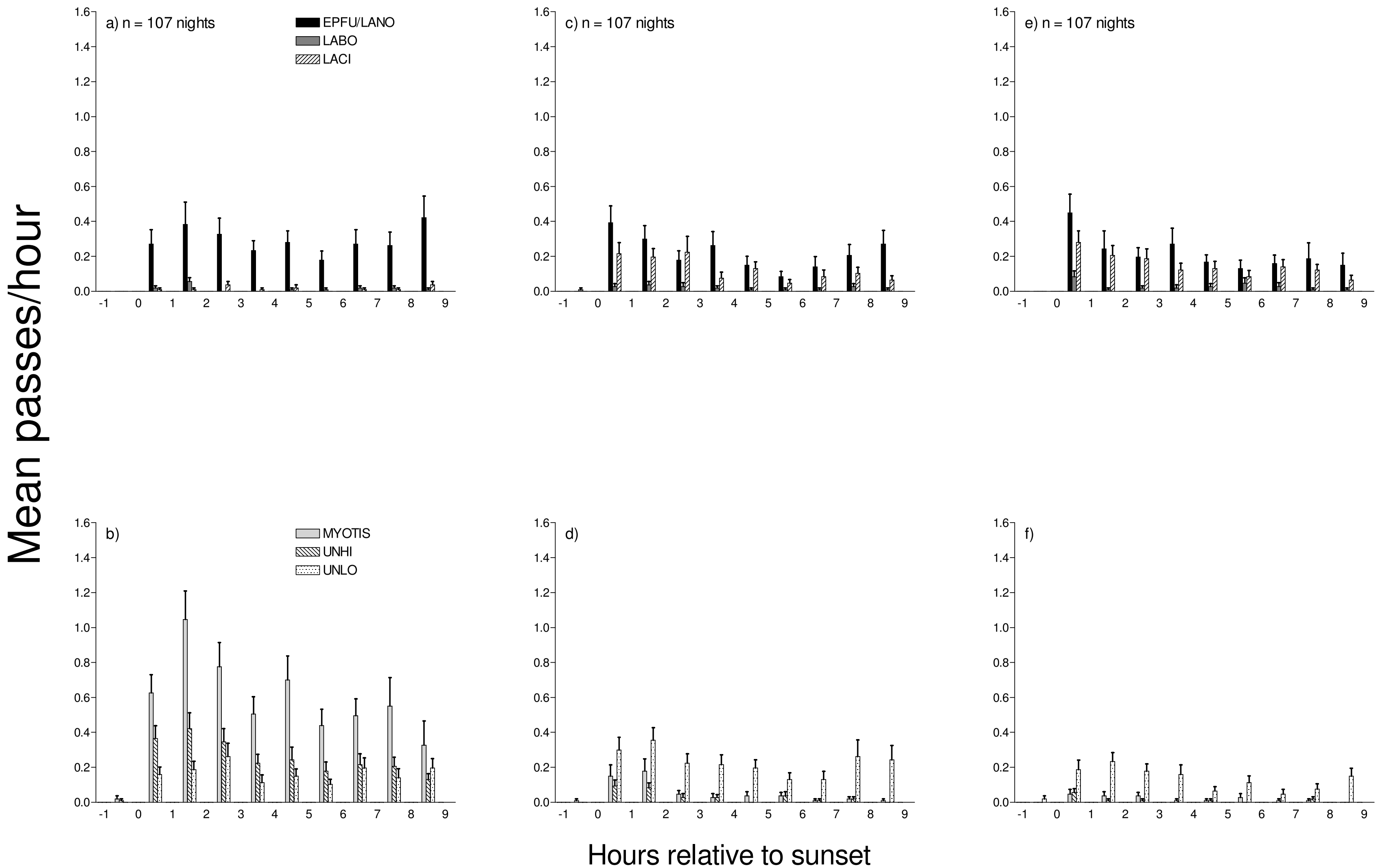


Figure 7. Mean bat passes/hour relative to sunset during fall by species and height for big brown/silver-haired (EPFU/LANO), Eastern red (LABO), and hoary (LACI) bats (a, c, e), and *Myotis* spp. (MYOTIS), unidentified high frequency (UNHI), and unidentified low frequency (UNLO) bats (b, d, f) at the proposed Crown City Wind Energy Site, New York 2008.

Table 2. Mean (passes/detector-night) and standard error (SE) of bat passes identified as big brown/silver-haired (EPFU/LANO), Eastern red (LABO), hoary (LACI), *Myotis* spp. (MYOTIS), tri-colored (PESU), unidentified high frequency (UNHI), unidentified low frequency (UNLO) bats, and all phonic groups combined (ALLBATS) at the proposed Crown City Wind Energy Site, New York, 2008. Comparisons are among altitudes by season (late spring = 28 May–30 June; fall = 1 July–15 October).

| | 1.5 m | | 22 m | | 60 m | | Kruskal-Wallis | | All Altitudes | |
|---|---|---|---|---|---|---|---|---|---|---|
| Season/phonic group | Mean | SE | Mean | SE | Mean | SE | H | *P* | Mean | SE |
| **Late spring** | | | | | | | | | | |
| EPFU/LANO | 3.4 | 0.5 | 2.3 | 0.5 | 1.4 | 0.3 | 12.9 | 0.002 | 2.4 | 0.3 |
| LABO | 0.1 | 0.1 | 0.1 | 0.0 | 0.2 | 0.1 | 1.3 | 0.520 | 0.1 | 0.0 |
| LACI | 0.4 | 0.1 | 1.2 | 0.2 | 1.1 | 0.2 | 9.5 | 0.009 | 0.9 | 0.1 |
| MYOTIS | 14.2 | 1.6 | 0.8 | 0.2 | 0.5 | 0.2 | 66.6 | <0.001 | 5.2 | 0.8 |
| UNHI | 1.3 | 0.2 | 0.4 | 0.1 | 0.2 | 0.1 | 29.6 | <0.001 | 0.7 | 0.1 |
| UNLO | 1.2 | 0.2 | 1.8 | 0.3 | 0.7 | 0.2 | 8.2 | 0.016 | 1.2 | 0.1 |
| ALLBATS | 20.7 | 2.0 | 6.5 | 0.8 | 4.1 | 0.6 | 46.4 | <0.001 | 10.5 | 1.0 |
| **Fall** | | | | | | | | | | |
| EPFU/LANO | 2.7 | 0.6 | 2.3 | 0.4 | 2.2 | 0.4 | 0.5 | 0.781 | 2.4 | 0.3 |
| LABO | 0.1 | 0.0 | 0.2 | 0.1 | 0.3 | 0.1 | 1.8 | 0.407 | 0.2 | 0.0 |
| LACI | 0.1 | 0.0 | 1.3 | 0.2 | 1.4 | 0.2 | 47.5 | <0.001 | 0.9 | 0.1 |
| MYOTIS | 5.6 | 0.8 | 0.6 | 0.1 | 0.2 | 0.0 | 144.3 | <0.001 | 2.1 | 0.3 |
| UNHI | 2.4 | 0.3 | 0.3 | 0.1 | 0.1 | 0.0 | 109.7 | <0.001 | 1.0 | 0.1 |
| UNLO | 1.6 | 0.2 | 2.3 | 0.4 | 1.3 | 0.2 | 3.0 | 0.221 | 1.7 | 0.2 |
| ALLBATS | 12.5 | 1.8 | 7.0 | 1.0 | 5.5 | 0.6 | 15.1 | 0.001 | 8.4 | 0.7 |
| **All seasons** | | | | | | | | | | |
| EPFU/LANO | 2.9 | 0.5 | 2.3 | 0.3 | 2.0 | 0.3 | 2.6 | 0.277 | 2.4 | 0.2 |
| LABO | 0.1 | 0.0 | 0.2 | 0.0 | 0.3 | 0.1 | 2.2 | 0.338 | 0.2 | 0.0 |
| LACI | 0.2 | 0.0 | 1.2 | 0.2 | 1.3 | 0.2 | 55.5 | <0.001 | 0.9 | 0.1 |
| MYOTIS | 7.7 | 0.8 | 0.6 | 0.1 | 0.2 | 0.1 | 199.2 | <0.001 | 2.9 | 0.3 |
| UNHI | 2.1 | 0.2 | 0.4 | 0.1 | 0.2 | 0.0 | 140.2 | <0.001 | 0.9 | 0.1 |
| UNLO | 1.5 | 0.2 | 2.1 | 0.3 | 1.2 | 0.2 | 7.9 | 0.019 | 1.6 | 0.1 |
| ALLBATS | 14.5 | 1.5 | 6.8 | 0.7 | 5.1 | 0.5 | 41.3 | <0.001 | 8.9 | 0.6 |

P < 0.001) at 1.5 m (14.5 ± 1.5) compared to either 22 m (6.8 ± 0.7) or 60 m (5.1 ± 0.5). The MYOTIS group also was detected more frequently at 1.5 m than at higher altitudes. In contrast, LACI was more active at 22 m and 60 m than at 1.5 m. There was little difference in activity among detectors for EPFU/LANO, LABO, or TREEBATS groups. In late spring, ALLBATS were detected more frequently at 1.5 m compared to 22 m and 60 m. Activity of MYOTIS and EPFU/LANO groups decreased with increasing altitude. In contrast, LACI was detected more often at higher altitudes. In fall, activity of ALLBATS was higher at 1.5 m. The MYOTIS and UNHI groups also were detected more frequently at 1.5 m. Activity of LACI and TREEBATS (1.5 m = 4.6 ± 0.8, 22 m = 6.1 ± 0.9, 60 m = 5.2 ± 0.6; H = 6.3, $P$ = 0.4) groups were detected more often at higher altitudes.

## DISCUSSION

Because a paucity of information exists concerning many life history traits of bats, predicting impacts of wind power development on migratory species can be problematic. Recent articles have presented recommendations for acoustic monitoring studies to capture both the spatial (horizontal and vertical strata) and temporal (nightly, seasonal, and annual) variability in bat activity (Gannon et al. 2003, Hayes 2000, Kunz et al. 2007). Furthermore, many states have provided protocols for bat studies at commercial wind-energy sites, including New York (NYSDEC 2007). Our pre-construction study attempted to follow these protocols and in doing so, we were able to provide baseline information on both temporal and altitudinal activity patterns of bats, particularly migratory tree-roosting bats at the proposed Crown City site.

This study was conducted at a proposed wind-energy facility located on mixed agriculture-forest habitat interspersed with small wetlands, so statistical inferences are limited to this site. Because our results are based on 1 sampling location (i.e., 1 tower), we are unable to discuss differences in bat activity caused by habitat variations on the project area. However, our sampling effort allowed us to characterize both temporal (nightly, seasonal) and altitudinal patterns of bat activity at 1 tower on the project area. Because we were unable to completely sample in early spring (~15 April–27 May) for a variety of reasons (e.g., delays in tower installation, equipment failures, and CF card exchange problems), and because fatality data suggests bats are most vulnerable from July–September, we focus our discussion on the fall season.

Our results (mean passes/detector-night) for fall appear higher than other studies in New York but within the range of those reported from the eastern United States (Appendix 1). It is important to note, however, that all fall starting dates for studies in New York and the Eatsern US in Appendix 1 were later (up to 2 months later in the most extreme case) than our starting date of July 1. Because we found our highest level of bat activity during early July (see below) this difference in starting dates could account for the high activity levels report in this study. Variability in activity rates among studies could also be the result of differences in habitat, landscape, elevation, and climate. The local habitat features (proximity to forest edge and ponds) at Crown City presumably provides quality foraging areas for bats compared to other landscapes (e.g., agricultural areas) in the region. However, variations in activity also may be attributed to differences in sampling effort (i.e., number of detectors or towers), sampling dates, altitude of detectors, detector position (e.g., tower vs. guy-wires) and analytical methods. We characterized the different key sampling attributes of previous studies so that appropriate comparisons can be made to this study (i.e., only comparing metrics from studies with “comparable” or perhaps “unknown comparability” to metrics from this study). In general, comparability among acoustic monitoring studies is problematic at this point in time, thus strengthening the rationale for standard methodology in future studies (Arnett et al. 2008, Gannon et al. 2003, Hayes 2000, Kunz et al. 2007b).

We found the highest levels of bat activity in mid-July which is consistent with data recorded at proposed wind-energy facilities at Roaring Brook, NY (Mabee and Schwab 2008) and Hoosac, MA (Arnett et al. 2007b), and high mortality rates reported at Maple Ridge, NY (Jain et al. 2007) and Foote Creek Rim, WY (Gruver 2002). However, studies at lower latitudes have reported peaks in activity later in fall (early to mid August) at Casselman, PA (Arnett et al. 2006) and Butler Ridge, WI (Redell et al. 2006). Data from these studies suggests that variations in seasonal peak activity may be attributed to differences in latitude. Although, Kerns et al. (2005) documented a strong positive correlation in the timing of fatalities between sites (Meyersdale, PA and Mountaineer, WV) located ~90 km apart, no studies to date have examined these patterns at larger scales.

We observed differences in peak activity among species of migratory tree-roosting bats during fall. In our study, periods of high activity by cavity-roosting species (EPFU/LANO) preceded those of foliage-roosting bats (LACI and LABO). Migratory patterns among bats also appear to vary during spring (Reynolds 2006). Because these species comprise a disproportionately high percentage of fatalities (Arnett et al. 2008), it is important for acoustic monitoring studies to provide the highest resolution in identification rather than consolidate bats into total bat calls or high and low frequency phonic groups (Kunz et al. 2007b). Proper species (or species group) identification will aid in determining species movement patterns and may offer wind-energy developers better information for making decisions on turbine placement and operation..

We recorded high levels of activity for most phonic groups in late May/early June. Reynolds (2006) reported similar results at Maple Ridge. Higher bat activity in late spring may be attributed to migratory movement patterns of certain species (i.e., EPFU/LANO and LACI; Reynolds 2006). We observed little difference in activity levels between late spring and fall. Similarities between seasons are likely attributed to habitat features in close proximity to the tower. Adjacent features include forested edge and small ponds, both of which may provide favorable commuting and foraging conditions for bats across seasons (Limpens and Kapteyn 1991, Verboom and Huitema 1997, Zimmerman and Glanz 2000)

Our highest peak in activity occurred in mid-July with high activity continuing into August. Mabee and Schwab (2008) observed similar activity patterns at Roaring Brook, NY. In addition, many studies have reported higher fatality rates in fall (Arnett et al. 2008). Increases in bat activity and fatality at wind-energy facilities at certain times may be attributed to seasonal increases in insect abundance and availability within particular habitats, as well as life history traits of certain bat species (i.e., preparations for hibernation or migration, and mating; Horn et al. 2008). Furthermore, if wind-energy facilities are located along fall migratory routes, bat activity may increase at specific times during this season.

We observed within night peaks in activity between 1–2 hrs past sunset which is consistent with studies conducted in the region (Arnett 2006, 2007b, Reynolds 2006). Similar to our results, many studies have reported a second, smaller peak in bat activity closer to sunrise (Erkert 1982, Hayes 1997, Maier 1992, Kunz 1973, Taylor and O'Neil 1988). We found nightly activity varied slightly between heights with the highest activity at 1.5m occurring at 2 hr past sunset, and higher activity at 1 hr past sunset for both 22 m and 60 m detectors. This is likely attributed to temporal variations in insect abundance and availability at different heights (Hayes 2000).

Our results are consistent with other studies showing variations in bat activity at different altitudes (Hayes and Gruver 2000, Kalcounis et al. 1999). The airspace in which certain species of bats occur generally can be predicted by their echomorpholgy (body size, wing shape, call frequency; Aldridge and Rautenbach 1987). Larger, less maneuverable bats with lower call frequencies typically fly higher and in more open habitats, whereas smaller, more maneuverable bats with higher call frequencies fly lower to the ground and in more cluttered (higher vegetation) habitats. Several pre-construction studies reported higher activity by high frequency calling bats (e.g., MYOTIS, PESU, LABO) at lower detectors and higher activity by low frequency calling bats (e.g., EPFU/LANO, LACI) at higher detectors (Arnett et al. 2006, 2007b, Redell et al. 2006). Bats in our study followed similar trends, with most phonic groups, particularly MYOTIS, detected more frequently at 1.5m in both late spring and fall, whereas LACI were recorded more often at higher altitudes in both seasons.

Overall, our ability to identify activity patterns of bats within a season, night, and altitude may provide useful information for predicting when, where, and which bats may be most impacted by wind turbines. No available information exists comparing pre-construction activity levels with post-construction fatalities. However, several studies have shown a positive correlation (r = 0.79) between total number of bat calls/night and estimated fatalities/turbine/year (see Kunz et al. 2007b), suggesting acoustic monitoring may be useful in resolving potential negative impacts of wind development on bat populations.

## SUMMARY OF RESULTS

The key results of our bat acoustic monitoring study were: (1) peak mean activity (passes/tower) for ALLBATS occurred in mid-July; (2) peak activity of TREEBATS also occurred in mid-July and varied among species with higher activity levels of EPFU/LANO proceeding LABO and LACI; (3) mean activity for ALLBATS was 8.9 ± 0.6 passes/ detector-night across the entire study, and was relatively consistent between late spring (10.5 ± 1.0) and fall (8.4 ± 0.7); (4) mean activity rate for TREEBATS was 5.1 ± 0.3 passes/detector-night (late spring = 4.6 ± 0.4; fall = 5.2 ± 0.4); (5) peak activity for all phonic groups occurred 1–2 hours after sunset in both seasons and for the entire study; and (6) Mean activity (passes/detector-night) of ALLBATS across the entire study was higher at 1.5 m (14.5 ± 1.5) than at 22 m (6.8 ± 0.7) and 60 m (5.1 ± 0.5) with most phonic groups showing similar trends except LACI which were detected more frequently at higher altitudes.

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Appendix 1. Summary of bat acoustic studies at wind power development projects from New York and other states. An X denotes data not provided in the literature. Current project in boldface.

| Project | Study period | Nights[a] | Total passes | Dectors/ tower | Towers | Mean passes/ tower/ night | Mean passes/ detector - night | Detector Height (m) | Methods[b] | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| Spring | | | | | | | | | | |
| Bliss Windpark, NY | 4/20/05–6/13/05 | 55 | 6,032 | 2 | 1[c] | 109.67 | 54.84 | 15, 30 | 3 | Ecology & Environment 2006 |
| Centerville, NY | 4/06/06–6/07/06 | 63 | 270 | 2 | 1 | 4.29 | 2.15 | 10, 25 | 3 | Woodlot 2006e |
| Cohocton, NY | 5/2/05–5/30/05 | 29 | 21 | 1 | 1 | 0.72 | 0.72 | X | 3 | Woodlot 2006c |
| **Crown City, NY** | **5/28/08–6/30/08** | **34** | **1,067** | **3** | **1** | **31.38** | **10.46** | **1.5, 22, 60** | | **Hein et al. 2008-this study** |
| Dairy Hills Wind, NY | 4/15/05–6/02/05 | 10* | 27 | 1 | 1 | 2.70 | 2.70 | 1.0 | 3 | Young et al. 2006 |
| Howard, NY | 4/15/06–6/7/06 | 116* | 50 | 3 | 1 | 1.29 | 0.43 | 8, 20, 50 | 3 | Woodlot 2006b |
| Jordanville, NY | 4/14/05–5/13/05 | 29 | 15 | 1 | 1 | 0.52 | 0.52 | 30 | 3 | Woodlot 2005a |
| Maple Ridge, NY | 4/10/05–6/22/05 | 74 | 459 | 3 | 2 | 3.10 | 1.03 | 7, 25, 50 | 2 | Reynolds 2006 |
| Prattsburgh, NY | 4/15/05–5/30/05 | 57* | 16 | 2 | 1 | 0.56 | 0.28 | 15, 30 | 3 | Woodlot 2005c |
| Wethersfield, NY | 4/06/06–6/07/06 | 63 | 192 | 2 | 1 | 3.05 | 1.52 | 10, 25 | 3 | Woodlot 2006e |
| Deerfield Wind, VT | 4/14/06–6/13/06 | 194* | 15 | 2 | 2 | 0.16 | 0.08 | ~15, ~30 | 2 | Woodlot 2006d |
| Fall | | | | | | | | | | |
| Bliss Windpark, NY | 8/15/05–10/9/05 | 56 | 3,725 | 2 | 1[c] | 66.52 | 33.26 | 15, 30 | 3 | Ecology & Environment 2006 |
| Centerville, NY | 7/25/06–10/10/06 | 89* | 5 | 2 | 2 | 0.12 | 0.06 | 15, 35 | 2 | Woodlot 2006a |
| Cohocton, NY | 9/3/05–10/15/05 | 122* | 191 | 2 | 1 | 3.14 | 1.57 | 15, 23 | 3 | Woodlot 2006c |
| **Crown City, NY** | **7/01/08–10/15/08** | **313*** | **2,615** | **3** | **1** | **24.4** | **8.35** | **1.5, 22, 60** | | **Hein et al. 2008-this study** |
| Dairy Hills Wind, NY | 8/16/05–10/14/05 | 83* | 296 | 2 | 1 | 7.13 | 3.56 | 1.0, 50 | 3 | Young et al. 2006 |
| Howard, NY | 8/3/05–8/19/05 | 27* | 60 | 2 | 1 | 4.44 | 2.22 | 27, 48 | 3 | Woodlot 2005b |
| Roaring Brook, NY | 7/20/07–10/15/07 | 88 | 4,257 | 2 | 3 | 16.13 | 8.06 | 1.5, 44 | 2 | Mabee et al. 2008 |
| Wethersfield, NY | 7/25/06–10/09/06 | 80* | 22 | 2 | 2 | 0.60 | 0.30 | 15, 35 | 2 | Woodlot 2006a |
| Hoosac Wind, MA | 7/26/06–11/11/06 | 109 | 4,816 | 3 | 5 | 8.90 | 3.00 | 10, 31, 39 | 2 | Arnett et al. 2007b |
| Somerset County, PA | 8/1/05–11/1/05 | 93 | 9,162 | 3 | 5 | 19.70 | 6.57 | 1.5, 22, 44 | 2 | Arnett et al. 2006 |
| Buffalo Mountain, TN | 9/1/00–9/30/03 | 149* | X | X | X | X | 23.7 | X | 3 | Fiedler 2004 |
| Mountaineer, WV | 8/31/04–9/11/04 | 33* | X | X | X | X | 38.2 | X | 3 | Arnett (unpublished data) |
| Top of Iowa, IA | 9/4/03–10/9/03<br>5/10/04–9/29/04 | 42* | 1,465 | X | X | X | 34.9 | X | 3 | Jain 2005 |
| Buffalo Ridge, MN | 6/15/01–9/15/01<br>6/15/02–9/15/02 | 216* | 452 | X | X | X | 2.1 | X | 3 | Johnson et al. 2004 |

[a]Asterisks denotes detector-nights because not all dates during study period were sampled.
[b]1 = methodology, sampling intensity (spatial and vertical), sampling dates, and analysis similar to current study (comparable), 2 = differences in methodology, sampling intensity, sampling dates, or analysis (unknown comparability), 3 = multiple differences in methodology, sampling intensity, sampling dates, and analysis (not comparable).
[c]Detectors mounted on silos

# B Literature Review Bird Data (BBA, BBS, CBC) Tables

**Table B-1 Bird Species and Their Breeding Status in New York State Breeding Bird Atlas Blocks in the Crown City Project Area**

| Common Name | Listed Species | Block | | | | | |
|---|---|---|---|---|---|---|---|
| | | 4071B | 4072B | 4072D | 4171A | 4072C | 4172C |
| Canada Goose | | - | C | C | PR | C | C |
| Wood Duck | | - | - | C | - | PO | |
| Mallard | | PO | PR | C | PR | PO | PR |
| Ring-necked Pheasant | | - | - | PO | - | PO | PO |
| Ruffed Grouse | | - | C | PO | - | PO | PO |
| Wild Turkey | | - | C | C | - | C | C |
| Great Blue Heron | | - | PR | PO | - | PO | PO |
| Turkey Vulture | | PR | PR | PO | PO | C | PR |
| Northern Harrier | T | PO | - | PO | - | - | - |
| Sharp-shinned Hawk | SC | - | PO | - | PO | - | - |
| Cooper's Hawk | SC | C | - | - | C | - | - |
| Broad-winged Hawk | | PO | PR | - | PO | - | - |
| Red-tailed Hawk | | PR | PR | C | PO | C | C |
| American Kestrel | | PO | PO | PO | PO | - | - |
| Merlin | | - | - | - | - | PO | - |
| Killdeer | | PR | C | C | PR | PO | PO |
| Spotted Sandpiper | | - | - | PO | - | - | - |
| Wilson's Snipe | | - | - | PR | - | - | - |
| Rock Pigeon | | C | C | C | C | C | C |
| Mourning Dove | | PR | PO | C | PR | PR | C |
| Black-billed Cuckoo | | - | PO | PO | - | C | - |
| Eastern Screech-owl | | - | PO | - | - | - | PO |
| Great Horned Owl | | - | PO | PO | - | - | PO |
| Barred Owl | | - | - | PO | - | - | - |
| Chimney Swift | | C | - | - | - | - | - |
| Ruby-throated Hummingbird | | PR | C | PO | PR | C | C |
| Red-bellied Woodpecker | | PO | - | - | - | - | - |
| Yellow-bellied Sapsucker | | C | PR | C | C | C | C |
| Downy Woodpecker | | - | PO | C | PO | PO | C |
| Hairy Woodpecker | | C | PR | PR | PO | PO | PO |
| Northern Flicker | | C | C | PO | C | C | PR |
| Pileated Woodpecker | | - | PO | PO | PO | PO | PR |
| Eastern Wood-Pewee | | PR | - | PO | PR | C | PO |
| Acadian Flycatcher | | PO | - | - | - | - | PR |
| Alder Flycatcher | | - | PO | PO | PO | PO | PR |
| Willow Flycatcher | | PO | PO | PO | PO | PO | - |
| Least Flycatcher | | PR | PR | PR | PR | PR | C |
| Eastern Phoebe | | - | C | PO | C | C | C |
| Great Crested Flycatcher | | PO | PO | - | PO | PO | PO |
| Eastern Kingbird | | PR | PR | C | PR | C | PR |
| Yellow-throated Vireo | | PO | - | PR | - | PO | PO |

**Table B-1 Bird Species and Their Breeding Status in New York State Breeding Bird Atlas Blocks in the Crown City Project Area**

| Common Name | Listed Species | Block | | | | | |
|---|---|---|---|---|---|---|---|
| | | 4071B | 4072B | 4072D | 4171A | 4072C | 4172C |
| Blue-headed Vireo | | PR | PR | - | PR | PO | PO |
| Warbling Vireo | | PR | PO | PR | PR | PO | PO |
| Red-eyed Vireo | | PR | PO | C | PR | C | PR |
| Blue Jay | | PR | PO | PO | PR | C | PO |
| American Crow | | PR | PO | C | PR | C | C |
| Common Raven | | - | PO | - | - | PO | - |
| Tree Swallow | | C | C | PR | C | C | C |
| Northern Rough-winged Swallow | | C | - | - | C | PO | - |
| Bank Swallow | | - | - | C | C | PO | - |
| Barn Swallow | | C | C | C | C | C | C |
| Black-capped Chickadee | | PR | C | C | C | C | C |
| Tufted Titmouse | | PR | PR | - | PR | PR | PR |
| Red-breasted Nuthatch | | - | - | - | PR | - | PO |
| White-breasted Nuthatch | | PR | PO | PR | PO | C | C |
| Brown Creeper | | - | - | - | - | - | PR |
| Carolina Wren | | - | PO | - | - | - | - |
| House Wren | | C | C | C | C | C | - |
| Winter Wren | | - | - | - | PO | - | PO |
| Golden-crowned Kinglet | | - | - | - | PR | - | - |
| Blue-gray Gnatcatcher | | - | - | C | - | C | - |
| Eastern Bluebird | | C | - | PO | C | C | C |
| Veery | | PO | C | PR | PR | PR | PR |
| Hermit Thrush | | PO | - | - | PO | - | PO |
| Wood Thrush | | PO | PR | PR | PO | PR | C |
| American Robin | | C | PO | C | C | PR | C |
| Gray Catbird | | PR | C | C | PR | C | C |
| Brown Thrasher | | PR | - | - | PO | PO | - |
| European Starling | | C | C | C | C | C | C |
| Cedar Waxwing | | PR | PO | PR | PR | PO | - |
| Blue-winged Warbler | | - | PO | PO | PO | PR | - |
| Nashville Warbler | | PO | PO | - | PO | - | PO |
| Yellow Warbler | | C | C | C | PR | C | PR |
| Chestnut-sided Warbler | | PR | C | C | PR | PO | C |
| Magnolia Warbler | | PR | PO | - | PR | PO | PO |
| Black-throated Blue Warbler | | - | PO | - | PO | PO | PO |
| Yellow-rumped Warbler | | PR | PR | - | PR | PO | - |
| Black-throated Green Warbler | | PR | PR | PR | PR | PO | PO |
| Blackburnian Warbler | | PR | - | - | PR | - | PR |
| Black-and-white Warbler | | PO | PR | - | PO | - | PR |
| American Redstart | | PR | C | C | - | C | PR |
| Ovenbird | | PR | PR | PR | C | PR | PR |

**Table B-1 Bird Species and Their Breeding Status in New York State Breeding Bird Atlas Blocks in the Crown City Project Area**

| Common Name | Listed Species | Block | | | | | |
|---|---|---|---|---|---|---|---|
| | | 4071B | 4072B | 4072D | 4171A | 4072C | 4172C |
| Northern Waterthrush | | - | - | PO | PO | - | PR |
| Louisiana Waterthrush | | PO | PO | - | - | - | PO |
| Mourning Warbler | | PR | C | - | - | PO | C |
| Common Yellowthroat | | PR | C | C | C | C | PR |
| Hooded Warbler | | - | - | - | PO | - | PO |
| Canada Warbler | | - | PR | - | PO | - | C |
| Scarlet Tanager | | PR | PR | PR | PR | - | PR |
| Eastern Towhee | | PO | PO | PR | PO | C | - |
| Chipping Sparrow | | C | C | PR | PR | PO | - |
| Field Sparrow | | PO | PO | PO | PR | C | - |
| Vesper Sparrow | SC | - | - | - | - | PO | - |
| Savannah Sparrow | | PO | C | PO | PR | C | PO |
| Song Sparrow | | C | C | C | PR | C | PO |
| Swamp Sparrow | | - | - | PO | - | - | PO |
| White-throated Sparrow | | - | - | - | PO | - | - |
| Dark-eyed Junco | | PR | PR | PO | C | C | C |
| Scarlet Tanager | | - | - | - | - | PO | - |
| Northern Cardinal | | PR | C | PO | - | C | PR |
| Rose-breasted Grosbeak | | PR | C | C | PR | C | PR |
| Indigo Bunting | | PR | PR | C | C | C | PO |
| Bobolink | | PR | C | - | PR | PR | PO |
| Red-winged Blackbird | | C | C | C | C | C | PO |
| Eastern Meadowlark | | PO | - | PO | PR | - | - |
| Common Grackle | | C | C | PR | PR | C | PO |
| Brown-headed Cowbird | | PR | PR | PR | PR | C | PO |
| Baltimore Oriole | | - | PR | PO | PR | C | C |
| Purple Finch | | C | C | - | PR | PO | C |
| House Finch | | PR | PO | PO | - | PO | C |
| Pine Siskin | | - | - | - | C | - | PR |
| American Goldfinch | | PR | PR | PR | PO | PR | PO |
| House Sparrow | | C | C | C | C | C | C |
| **Possible Breeders** | | **19** | **28** | **29** | **26** | **32** | **31** |
| **Probable Breeders** | | **37** | **23** | **18** | **37** | **9** | **22** |
| **Confirmed Breeders** | | **20** | **30** | **30** | **21** | **41** | **28** |
| **Species Total** | | **76** | **81** | **77** | **84** | **82** | **81** |
| **Collective Species Total** | **117** | | | | | | |

Source: New York State Breeding Bird Atlas 2000

Key:
C = confirmed
PO = possible
PR = probable
SC = special concern (NY)
T = threatened (NY)

**Table B-2 Bird Species Recorded During Dryden Breeding Bird Surveys**

| Common Name | Listed Species | Birds Per Route<br>Dryden |
|---|---|---|
| Canada Goose | | 1.49 |
| Wood Duck | | 0.39 |
| Mallard | | 0.71 |
| Common Merganser | | 0.02 |
| Ring-necked Pheasant | | 3.15 |
| Ruffed Grouse | | 0.05 |
| Wild Turkey | | 0.34 |
| American Bittern | SC | 0.02 |
| Great Blue Heron | | 0.76 |
| Green Heron | | 0.20 |
| Turkey Vulture | | 0.17 |
| Osprey | SC | 0.02 |
| Northern Harrier | T | 0.07 |
| Sharp-shinned Hawk | SC | 0.05 |
| Cooper's Hawk | SC | 0.02 |
| Red-shouldered Hawk | SC | 0.07 |
| Broad-winged Hawk | | 0.02 |
| Red-tailed Hawk | | 0.71 |
| American Kestrel | | 0.93 |
| Killdeer | | 6.37 |
| Spotted Sandpiper | | 0.32 |
| Upland Sandpiper | T | 0.20 |
| Wilson's Snipe | | 0.37 |
| Ring-billed Gull | | 0.24 |
| Herring Gull | | 0.02 |
| Rock Pigeon | | 19.34 |
| Mourning Dove | | 19.98 |
| Black-billed Cuckoo | | 0.71 |
| Yellow-billed Cuckoo | | 0.34 |
| Eastern Screech-Owl | | 0.07 |
| Great Horned Owl | | 0.02 |
| Barred Owl | | 0.02 |
| Chimney Swift | | 3.41 |
| Ruby-throated Hummingbird | | 0.41 |
| Belted Kingfisher | | 0.49 |
| Red-bellied Woodpecker | | 0.27 |
| Yellow-bellied Sapsucker | | 2.15 |
| Downy Woodpecker | | 2.24 |
| Hairy Woodpecker | | 0.29 |
| Northern Flicker | | 5.15 |

**Table B-2 Bird Species Recorded During Dryden Breeding Bird Surveys**

| Common Name | Listed Species | Birds Per Route Dryden |
|---|---|---|
| Pileated Woodpecker | | 0.51 |
| Eastern Wood-Pewee | | 2.83 |
| Alder Flycatcher | | 1.22 |
| Willow Flycatcher | | 3.80 |
| Willow-Alder Flycatcher | | 5.02 |
| Least Flycatcher | | 3.66 |
| Eastern Phoebe | | 6.85 |
| Great Crested Flycatcher | | 2.24 |
| Eastern Kingbird | | 5.59 |
| Yellow-throated Vireo | | 0.59 |
| Blue-headed Vireo | | 0.66 |
| Warbling Vireo | | 4.95 |
| Red-eyed Vireo | | 16.39 |
| Blue Jay | | 9.51 |
| American Crow | | 43.02 |
| Horned Lark | SC | 0.12 |
| Tree Swallow | | 9.29 |
| Northern Rough-winged Swallow | | 1.49 |
| Bank Swallow | | 2.20 |
| Cliff Swallow | | 0.34 |
| Barn Swallow | | 23.39 |
| Black-capped Chickadee | | 7.85 |
| Tufted Titmouse | | 0.93 |
| Red-breasted Nuthatch | | 0.20 |
| White-breasted Nuthatch | | 0.88 |
| Brown Creeper | | 0.05 |
| Carolina Wren | | 0.02 |
| House Wren | | 12.07 |
| Winter Wren | | 0.12 |
| Golden-crowned Kinglet | | 0.12 |
| Eastern Bluebird | | 0.78 |
| Veery | | 2.32 |
| Hermit Thrush | | 0.51 |
| Wood Thrush | | 15.95 |
| American Robin | | 61.59 |
| Gray Catbird | | 12.12 |
| Northern Mockingbird | | 0.34 |
| Brown Thrasher | | 2.78 |
| European Starling | | 96.80 |
| Cedar Waxwing | | 9.39 |

**Table B-2 Bird Species Recorded During Dryden Breeding Bird Surveys**

| Common Name | Listed Species | Birds Per Route Dryden |
|---|---|---|
| Ovenbird | | 4.24 |
| Blue-winged Warbler | | 0.59 |
| Nashville Warbler | | 0.05 |
| Yellow Warbler | | 22.56 |
| Chestnut-sided Warbler | | 2.61 |
| Magnolia Warbler | | 0.37 |
| Black-throated Blue Warbler | | 0.12 |
| Yellow-rumped Warbler | | 0.51 |
| Black-throated Green Warbler | | 1.24 |
| Blackburnian Warbler | | 0.17 |
| Prairie Warbler | | 0.02 |
| Cerulean Warbler | SC | 0.02 |
| Black-and-white Warbler | | 0.17 |
| American Redstart | | 2.15 |
| Ovenbird | | 4.24 |
| Louisiana Waterthrush | | 0.05 |
| Mourning Warbler | | 0.37 |
| Common Yellowthroat | | 29.49 |
| Hooded Warbler | | 0.02 |
| Canada Warbler | | 0.07 |
| Scarlet Tanager | | 2.88 |
| Eastern Towhee | | 5.10 |
| Chipping Sparrow | | 19.32 |
| Clay-colored Sparrow | | 0.02 |
| Field Sparrow | | 8.90 |
| Vesper Sparrow | SC | 0.54 |
| Savannah Sparrow | | 15.00 |
| Grasshopper Sparrow | SC | 0.24 |
| Henslow's Sparrow | T | 0.66 |
| Song Sparrow | | 46.15 |
| Swamp Sparrow | | 1.10 |
| White-throated Sparrow | | 0.12 |
| Dark-eyed Junco | | 1.24 |
| Northern Cardinal | | 7.39 |
| Rose-breasted Grosbeak | | 6.83 |
| Indigo Bunting | | 8.80 |
| Bobolink | | 12.17 |
| Red-winged Blackbird | | 126.61 |
| Eastern Meadowlark | | 13.93 |
| Common Grackle | | 56.85 |

**Table B-2 Bird Species Recorded During Dryden Breeding Bird Surveys**

| Common Name | Listed Species | Birds Per Route<br>Dryden |
|---|---|---|
| Brown-headed Cowbird | | 10.88 |
| Baltimore Oriole | | 14.27 |
| Purple Finch | | 1.66 |
| House Finch | | 6.32 |
| Pine Siskin | | 0.05 |
| American Goldfinch | | 20.12 |
| House Sparrow | | 27.49 |

Source: Sauer et al. 2008.

Key:
SC = Species of Special Concern (NY)
T = Threatened (NY)

**Table B-3 Species Recorded During the Last 10 Years of the Cortland Christmas Bird Count (2000-2009)[1]**

| Common Name | Listed Species | Year | | | | | | | | | | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | |
| Snow Goose | | -- | -- | -- | 2 | -- | -- | -- | -- | 550 | | **552** |
| Canada Goose | | 115 | 2,500 | 248 | 2,865 | 1,331 | 3,000 | 5,521 | 2,307 | 1,858 | 3,151 | **24,438** |
| Wood Duck | | 1 | -- | -- | -- | -- | 3 | -- | -- | | 1 | **5** |
| Gadwall | | -- | 1 | -- | -- | -- | -- | -- | -- | 1 | | **2** |
| American Black Duck | | 7 | 56 | 39 | 25 | 25 | 32 | 11 | 29 | 25 | 22 | **285** |
| Mallard | | 315 | 672 | 509 | 324 | 380 | 825 | 460 | 450 | 487 | 502 | **5,557** |
| Blue-winged Teal | | -- | -- | -- | -- | -- | -- | 1 | -- | | | **1** |
| Northern Pintail | | -- | -- | 2 | -- | -- | -- | -- | -- | | | **2** |
| Canvasback | | 2 | -- | -- | -- | -- | -- | -- | -- | | | **2** |
| Redhead | | 316 | -- | 2 | -- | -- | 3 | 4 | 0 | 16 | 19 | **360** |
| Ring-necked Duck | | -- | 2 | 1 | 129 | 38 | 1 | 10 | 5 | | 1 | **187** |
| Greater Scaup | | 17 | -- | 0 | -- | 2 | -- | -- | 3 | | | **22** |
| Lesser Scaup | | -- | -- | 1 | -- | -- | 0 | 8 | 23 | 4 | 25 | **61** |
| Bufflehead | | 29 | 15 | 20 | 18 | 16 | 2 | 4 | 12 | 5 | 9 | **169** |
| Common Goldeneye | | 58 | 14 | 50 | 82 | 43 | 47 | 34 | 120 | 57 | 55 | **580** |
| Hooded Merganser | | 4 | 4 | 12 | 16 | 19 | 26 | 19 | 15 | 18 | 24 | **164** |
| Common Merganser | | 3 | 10 | -- | 11 | 63 | 14 | 32 | 4 | 4 | 20 | **162** |
| Red-breasted Merganser | | -- | 2 | -- | -- | -- | -- | -- | -- | | | **2** |
| Ruddy Duck | | -- | -- | -- | -- | 1 | 0 | -- | -- | | | **1** |
| Ring-necked Pheasant | | -- | -- | 4 | 8 | 2 | 6 | 2 | 4 | 2 | 4 | **32** |
| Ruffed Grouse | | 0 | 10 | 1 | -- | 3 | 1 | 7 | 6 | 12 | 16 | **57** |
| Wild Turkey | | 79 | 161 | 432 | 21 | 16 | 165 | 34 | 85 | 105 | 287 | **1,461** |
| Red-throated Loon | | -- | -- | -- | -- | -- | 1 | -- | -- | | | **1** |
| Common Loon | SC | -- | 48 | 2 | -- | -- | 1 | 6 | 0 | | 1 | **58** |
| Pied-billed Grebe | T | -- | -- | -- | -- | -- | 1 | 1 | -- | 2 | | **4** |
| Horned Grebe | | -- | -- | -- | -- | -- | -- | -- | 1 | | | **1** |
| Red-necked Grebe | | -- | -- | -- | -- | -- | 1 | -- | -- | | | **1** |
| Great Blue Heron | | 1 | 2 | 6 | 4 | -- | 5 | 8 | 1 | 1 | | **30** |
| Bald Eagle | T | 1 | -- | 1 | -- | -- | -- | -- | 1 | 1 | | **4** |

**Table B-3 Species Recorded During the Last 10 Years of the Cortland Christmas Bird Count (2000-2009)[1]**

| Common Name | Listed Species | Year 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Northern Harrier | T | 0 | 11 | -- | -- | 3 | 1 | 0 | -- | 3 | 1 | **19** |
| Sharp-shinned Hawk | SC | 1 | 2 | 3 | 4 | 4 | 4 | 1 | 2 | 3 | 2 | **28** |
| Cooper's Hawk | SC | 4 | 2 | 4 | 5 | 5 | 5 | 3 | 10 | 9 | 9 | **58** |
| Northern Goshawk | SC | 0 | 0 | 0 | -- | -- | 1 | -- | 1 | | | **2** |
| Red-shouldered Hawk | SC | | | | | | | | | | 1 | **1** |
| Red-tailed Hawk | | 26 | 48 | 18 | 17 | 48 | 62 | 39 | 68 | 69 | 94 | **517** |
| Rough-legged Hawk | | 7 | 26 | 6 | 4 | 8 | 12 | 12 | 11 | 10 | 9 | **112** |
| Golden Eagle | E | -- | -- | -- | -- | 1 | -- | -- | -- | | | **1** |
| American Kestrel | | 1 | 6 | 6 | -- | -- | 2 | 4 | 2 | 2 | 1 | **27** |
| Merlin | | -- | -- | -- | -- | 1 | -- | 1 | 2 | 1 | | **5** |
| American Coot | | 5 | -- | 2 | -- | -- | -- | 2 | -- | | | **17** |
| Sandhill Crane | | | | | | | | | | | 6 | **12** |
| Ring-billed Gull | | 20 | 1717 | 306 | 244 | 836 | 196 | 145 | 56 | 231 | 380 | **4,304** |
| Herring Gull | | 20 | 64 | 82 | 331 | 301 | 58 | 32 | 55 | 110 | 85 | **1,369** |
| Great Black-backed Gull | | 17 | 6 | 64 | 92 | 249 | 58 | 23 | 4 | 4 | 6 | **535** |
| Rock Pigeon | | 704 | 1,221 | 1,568 | 834 | 588 | 1,062 | 703 | 1,229 | 1,129 | 1,578 | **11,620** |
| Mourning Dove | | 216 | 244 | 588 | 301 | 243 | 481 | 90 | 626 | 258 | 603 | **3,929** |
| Eastern Screech-Owl | | 2 | 5 | -- | -- | 0 | -- | 2 | 0 | 2 | 5 | **16** |
| Great Horned Owl | | 2 | 1 | -- | 1 | 1 | 2 | 1 | 2 | 1 | 1 | **12** |
| Barred Owl | | 1 | 1 | -- | -- | 0 | 1 | 1 | 1 | 2 | 3 | **10** |
| Long-eared Owl | | -- | -- | -- | -- | -- | -- | 2 | 1 | 2 | 1 | **6** |
| Short-eared Owl | E | -- | 3 | -- | -- | -- | -- | -- | -- | | | **3** |
| Northern Saw-whet Owl | | -- | 1 | -- | -- | -- | -- | 1 | 0 | | | **2** |
| Belted Kingfisher | | -- | 4 | 4 | -- | 1 | 1 | 2 | 2 | 1 | | **17** |
| Red-bellied Woodpecker | | 2 | 17 | 9 | 27 | 10 | 14 | 17 | 29 | 21 | 34 | **186** |
| Yellow-bellied Sapsucker | | -- | 1 | -- | -- | -- | -- | -- | 1 | | 1 | **3** |
| Downy Woodpecker | | 29 | 61 | 59 | 54 | 57 | 106 | 63 | 98 | 99 | 140 | **807** |
| Hairy Woodpecker | | 10 | 19 | 15 | 17 | 14 | 27 | 23 | 37 | 35 | 61 | **266** |
| Northern Flicker | | 0 | 5 | 3 | -- | 2 | 3 | -- | 1 | 1 | 2 | **17** |

**Table B-3 Species Recorded During the Last 10 Years of the Cortland Christmas Bird Count (2000-2009)[1]**

| Common Name | Listed Species | Year | | | | | | | | | | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | |
| Pileated Woodpecker | | 2 | 2 | -- | 1 | 0 | 4 | 5 | 9 | 3 | 9 | **39** |
| Eastern Phoebe | | -- | -- | -- | -- | 1 | -- | -- | -- | | | **1** |
| Northern Shrike | | 1 | 2 | 2 | -- | 1 | 1 | -- | 5 | 4 | 3 | **23** |
| Blue Jay | | 229 | 123 | 214 | 236 | 146 | 329 | 367 | 312 | 241 | 355 | **2,636** |
| American Crow | | 709 | 4,247 | 3,411 | 1,736 | 1,556 | 2,859 | 6,151 | 11,827 | 3,715 | 2,771 | **40,894** |
| Common Raven | | -- | 1 | 0 | -- | 4 | 2 | 6 | 6 | 7 | 9 | **35** |
| Horned Lark | SC | 142 | 143 | 163 | 89 | 90 | 375 | 21 | 27 | 34 | 56 | **1,153** |
| Black-capped Chickadee | | 254 | 690 | 733 | 379 | 617 | 1,127 | 1,003 | 820 | 951 | 1,276 | **8,144** |
| Tufted Titmouse | | 4 | 33 | 37 | 43 | 32 | 54 | 17 | 68 | 85 | 113 | **514** |
| Red-breasted Nuthatch | | 31 | 26 | 14 | 48 | 40 | 32 | 101 | 55 | 73 | 41 | **482** |
| White-breasted Nuthatch | | 14 | 74 | 57 | 31 | 44 | 75 | 69 | 92 | 82 | 130 | **700** |
| Brown Creeper | | 1 | 7 | 4 | 7 | 5 | 7 | 20 | 7 | 6 | 16 | **85** |
| Carolina Wren | | -- | 2 | -- | 1 | 0 | 2 | 0 | 1 | 2 | 5 | **16** |
| Golden-crowned Kinglet | | 21 | 44 | 35 | 6 | 17 | 14 | 25 | 23 | 23 | 46 | **260** |
| Eastern Bluebird | | 5 | 3 | 17 | 2 | 1 | 16 | 3 | 16 | 7 | 8 | **82** |
| Hermit Thrush | | | | | | | | | | | 1 | **1** |
| American Robin | | 17 | 11 | 42 | 2 | 2 | 2 | 28 | 257 | 9 | 2 | **462** |
| Northern Mockingbird | | -- | -- | 3 | 1 | -- | 1 | 3 | 0 | | | **9** |
| European Starling | | 1,970 | 3,501 | 4,001 | 1,717 | 1,577 | 2,458 | 4,246 | 2,636 | 3,083 | 2,971 | **29,853** |
| Bohemian Waxwing | | -- | -- | -- | 1 | -- | -- | -- | -- | | | **1** |
| Cedar Waxwing | | 8 | 231 | 235 | 70 | 83 | 114 | 36 | 40 | 87 | 22 | **932** |
| Eastern Towhee | | 1 | -- | -- | -- | -- | 1 | -- | -- | | | **2** |
| American Tree Sparrow | | 185 | 104 | 613 | 264 | 138 | 337 | 60 | 249 | 173 | 444 | **2,673** |
| Chipping Sparrow | | -- | 1 | -- | -- | -- | -- | -- | -- | | 1 | **2** |
| Savannah Sparrow | | | | | | | | | | | 1 | **1** |
| Song Sparrow | | 7 | 1 | 10 | 2 | 1 | 6 | 14 | 11 | 3 | 8 | **63** |
| Swamp Sparrow | | 1 | -- | -- | -- | 1 | -- | 1 | 0 | 1 | | **4** |
| White-throated Sparrow | | 4 | 7 | 7 | 33 | 8 | 29 | 4 | 8 | 8 | 17 | **126** |
| White-crowned Sparrow | | -- | -- | -- | -- | -- | -- | 1 | -- | | | **1** |
| Dark-eyed Junco | | 161 | 203 | 270 | 224 | 237 | 357 | 405 | 602 | 443 | 437 | **3,444** |

**Table B-3 Species Recorded During the Last 10 Years of the Cortland Christmas Bird Count (2000-2009)[1]**

| Common Name | Listed Species | Year | | | | | | | | | | Grand Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | |
| Lapland Longspur | | 1 | -- | 0 | 2 | -- | 1 | -- | 0 | | | **4** |
| Snow Bunting | | 117 | 9 | 0 | 420 | 245 | 110 | -- | 155 | 350 | 274 | **1,680** |
| Northern Cardinal | | 46 | 46 | 81 | 42 | 60 | 103 | 44 | 91 | 99 | 157 | **794** |
| Red-winged Blackbird | | 2 | 13 | -- | -- | 3 | -- | 1 | 1 | 3 | 1 | **24** |
| Eastern Meadowlark | | -- | -- | -- | -- | -- | -- | 1 | -- | | | **1** |
| Rusty Blackbird | | -- | -- | -- | -- | -- | 2 | 1 | -- | | | **3** |
| Common Grackle | | -- | 51 | -- | -- | -- | -- | -- | -- | | | **51** |
| Brown-headed Cowbird | | -- | 2 | 30 | 44 | 10 | 3 | 12 | 25 | 13 | 21 | **160** |
| Pine Grosbeak | | -- | 5 | -- | -- | -- | -- | -- | 16 | | | **21** |
| Purple Finch | | 5 | -- | 2 | 1 | 14 | 1 | 48 | 2 | 3 | 8 | **85** |
| House Finch | | 93 | 319 | 257 | 292 | 221 | 173 | 41 | 211 | 107 | 165 | **1,994** |
| Red Crossbill | | -- | 1 | -- | -- | -- | -- | -- | 0 | | | **1** |
| White-winged Crossbill | | -- | 6 | -- | -- | -- | 0 | -- | -- | 333 | | **339** |
| Common Redpoll | | -- | 89 | -- | 61 | 4 | -- | -- | 539 | | | **856** |
| Hoary Redpoll | | -- | -- | -- | -- | -- | -- | -- | 0 | | | **0** |
| Pine Siskin | | -- | 5 | -- | 28 | 0 | 1 | 1 | 2 | 52 | 1 | **90** |
| American Goldfinch | | 103 | 162 | 205 | 457 | 260 | 436 | 76 | 249 | 358 | 289 | **2632** |
| Evening Grosbeak | | -- | 158 | -- | 82 | -- | 43 | -- | 147 | | | **475** |
| House Sparrow | | 260 | 390 | 366 | 236 | 262 | 417 | 331 | 331 | 280 | 499 | **3,475** |
| **Total Birds** | | **6,409** | **17,674** | **14,876** | **11,994** | **9,991** | **15,722** | **20,471** | **24,144** | **15,779** | **17,317** | **163,425** |
| **Species Total** | | **64** | **73** | **62** | **57** | **66** | **74** | **73** | **79** | **70** | **70** | **106** |

Source: National Audubon Society 2012

Note:
[1] Zeros in the table indicate that a species was observed during the week of the Christmas Bird Count but not officially observed on the day of the count.

Key:
E = Endangered (NY)
SC = Special Concern (NY)
T = Threatened (NY)

# C E & E Raptor Survey Data (Spring 2008)

## Table C-1 Spring Migrant Raptor Survey Totals in the Project Area by Date

**( - indicates 0 sightings)**

| Species | Apr 02, 2008 | Apr 03, 2008 | Apr 10, 2008 | Apr 17, 2008 | Apr 18, 2008 | Apr 19, 2008 | May 03, 2008 | May 04, 2008 | May 11, 2008 | May 14, 2008 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Snow Goose | - | 31 | - | - | - | - | - | - | - | - | **31** |
| Canada Goose | - | 41 | 2 | - | - | - | - | - | - | - | **43** |
| Common Merganser | - | 1 | - | - | - | - | - | - | - | - | **1** |
| Great Blue Heron | - | 10 | - | - | - | - | - | - | 1 | - | **11** |
| Black Vulture | - | 2 | - | - | - | - | - | - | - | - | **2** |
| Turkey Vulture | 4 | 36 | 14 | 40 | 12 | 27 | 40 | 43 | 35 | 24 | **275** |
| Osprey | - | - | - | - | - | 1 | 2 | 3 | - | 1 | **7** |
| Bald Eagle | - | - | - | - | - | - | - | - | 2 | - | **2** |
| Northern Harrier | 1 | 2 | - | 2 | - | - | - | - | 3 | - | **8** |
| Sharp-shinned Hawk | - | 2 | - | 1 | - | 2 | 4 | 4 | - | - | **13** |
| Cooper's Hawk | - | - | 1 | - | - | - | - | - | - | - | **1** |
| Red-shouldered Hawk | - | 3 | - | - | - | 1 | 1 | - | - | - | **5** |
| Broad-winged Hawk | - | - | - | - | - | - | 3 | 3 | 1 | - | **7** |
| Red-tailed Hawk | 10 | 20 | 13 | 5 | 14 | 8 | 12 | 13 | 4 | 6 | **105** |
| Golden Eagle | 1 | 1 | - | - | - | - | - | - | - | - | **2** |
| American Kestrel | 1 | 1 | - | - | - | - | - | - | - | - | **2** |
| Merlin | - | 1 | - | - | - | - | - | - | - | - | **1** |
| unidentified raptor | 1 | 4 | - | - | - | - | - | - | - | - | **5** |
| unid. Gull | - | 300 | 460 | - | - | - | - | - | - | - | **760** |
| American Crow | 15 | 118 | - | - | - | - | - | - | - | - | **133** |
| Common Raven | 1 | 3 | 8 | 1 | 1 | - | - | - | - | 1 | **15** |
| unidentified Blackbird | 30 | - | - | - | - | - | - | - | - | - | **30** |
| **Total Birds:** | **64** | **576** | **498** | **49** | **27** | **39** | **62** | **66** | **46** | **32** | **1459** |
| **Species Count:** | **9** | **17** | **6** | **5** | **3** | **5** | **6** | **5** | **6** | **4** | |

**Table C-2 Flight Direction for all Raptors (Migrants and Locals) in the Project Area by Species**

**( - indicates 0 sightings)**

| Species | N | NE | E | SE | S | SW | W | NW | Local | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Snow Goose | - | 31 | - | - | - | - | - | - | - | **31** |
| Canada Goose | - | 36 | - | - | - | - | 7 | - | - | **43** |
| Common Merganser | 1 | - | - | - | - | - | - | - | - | **1** |
| Great Blue Heron | 3 | 8 | - | - | - | - | - | - | - | **11** |
| Black Vulture | - | - | - | 2 | - | - | - | - | - | **2** |
| Turkey Vulture | 37 | 22 | 2 | 4 | 25 | 7 | 7 | 13 | 158 | **275** |
| Osprey | 3 | 4 | - | - | - | - | - | - | - | **7** |
| Bald Eagle | 2 | - | - | - | - | - | - | - | - | **2** |
| Northern Harrier | 2 | 2 | - | - | - | - | 1 | 1 | 2 | **8** |
| Sharp-shinned Hawk | 2 | 5 | 1 | - | - | 1 | 2 | - | 2 | **13** |
| Cooper's Hawk | - | 1 | - | - | - | - | - | - | - | **1** |
| Red-shouldered Hawk | 2 | 2 | 1 | - | - | - | - | - | - | **5** |
| Broad-winged Hawk | - | 7 | - | - | - | - | - | - | - | **7** |
| Red-tailed Hawk | 24 | 12 | 3 | - | 1 | 1 | - | 3 | 61 | **105** |
| Golden Eagle | - | 2 | - | - | - | - | - | - | - | **2** |
| American Kestrel | - | 1 | - | - | - | - | - | - | 1 | **2** |
| Merlin | - | 1 | - | - | - | - | - | - | - | **1** |
| unidentified raptor | - | 4 | - | - | - | - | 1 | - | - | **5** |
| unid. Gull | - | - | - | - | - | - | - | - | 760 | **760** |
| American Crow | 15 | 118 | - | - | - | - | - | - | - | **133** |
| Common Raven | 1 | 1 | 4 | 1 | - | - | - | 1 | 7 | **15** |
| unidentified Blackbird | - | - | - | - | - | - | - | 30 | - | **30** |
| **Total Birds:** | **92** | **257** | **11** | **7** | **26** | **9** | **18** | **48** | **991** | **1459** |
| **Species Count:** | **11** | **17** | **5** | **3** | **2** | **3** | **5** | **5** | **7** | |
| **Total Species:** | **22** | | | | | | | | | |

**Table C-3 Flight Direction for all Raptors (Migrants and Locals) in the Project Area by Date**
**( - indicates 0 sightings)**

| Survey | N | NE | E | SE | S | SW | W | NW | Local | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 4/2/2008 | 21 | 2 | 3 | 1 | - | - | 1 | 31 | 5 | **64** |
| 4/3/2008 | 19 | 211 | 1 | 2 | 16 | 2 | 9 | 4 | 312 | **576** |
| 4/10/2008 | 11 | 4 | 5 | - | 1 | 3 | 2 | 3 | 469 | **498** |
| 4/17/2008 | 13 | 4 | - | 3 | 3 | 2 | 1 | 6 | 17 | **49** |
| 4/18/2008 | 8 | - | - | - | - | - | - | 4 | 15 | **27** |
| 4/19/2008 | 8 | 4 | 1 | - | 4 | 1 | - | - | 21 | **39** |
| 5/3/2008 | 6 | 12 | 1 | - | 2 | - | - | - | 41 | **62** |
| 5/4/2008 | 3 | 11 | - | 1 | - | 1 | 4 | - | 46 | **66** |
| 5/11/2008 | 3 | 8 | - | - | - | - | 1 | - | 34 | **46** |
| 5/14/2008 | - | 1 | - | - | - | - | - | - | 31 | **32** |
| **Total Birds:** | **92** | **257** | **11** | **7** | **26** | **9** | **18** | **48** | **991** | **1459** |
| **% of Total:** | **6.3%** | **17.6%** | **0.8%** | **0.5%** | **1.8%** | **0.6%** | **1.2%** | **3.3%** | **67.9%** | |

**Table C-4 Raptor Flight Height in the Project Area by Species**
**( - indicates 0 sightings)**

| Species | Migrants and Locals Less Than 500’ | Migrants and Locals Greater Than 500’ | Migrants Less Than 500’ | Migrants Greater Than 500’ |
|---|---|---|---|---|
| Snow Goose | - | 31 | - | 31 |
| Canada Goose | 6 | 37 | 6 | 37 |
| Common Merganser | - | 1 | - | 1 |
| Great Blue Heron | - | 11 | - | 11 |
| Black Vulture | - | 2 | - | 2 |
| Turkey Vulture | 212 | 63 | 69 | 44 |
| Osprey | 5 | 2 | 5 | 2 |
| Bald Eagle | 2 | - | 2 | - |
| Northern Harrier | 4 | 4 | 2 | 3 |
| Sharp-shinned Hawk | 9 | 4 | 7 | 3 |
| Cooper's Hawk | - | 1 | - | 1 |
| Red-shouldered Hawk | 3 | 2 | 3 | 2 |
| Broad-winged Hawk | 4 | 3 | 4 | 3 |
| Red-tailed Hawk | 44 | 61 | 4 | 27 |
| Golden Eagle | - | 2 | - | 2 |
| American Kestrel | 1 | 1 | - | 1 |
| Merlin | 1 | - | 1 | - |
| unidentified raptor | 1 | 4 | 1 | 4 |
| unid. Gull | 760 | - | - | - |
| American Crow | 133 | - | - | - |
| Common Raven | 7 | 8 | - | 8 |
| unidentified Blackbird | 30 | - | 30 | - |
| **Total Birds:** | **1222** | **237** | **134** | **182** |
| **Species Count:** | **16** | **17** | **12** | **17** |

**Table C-5 Spring and Fall Raptor Survey Weather Summary**

| Date | Survey Mean Temperature (ºF) | Survey Max Temperature (ºF) | Survey Min Temperature (ºF) | Survey Avg. Wind Speed (mph) | Survey Wind Direction | Survey Max. Wind Speed (mph) | Visibility (miles) | Comments |
|---|---|---|---|---|---|---|---|---|
| **2008 Spring** | | | | | | | | |
| 4/02/2008 | 29 | 32 | 25 | 13 | NW | 24 | 5 | |
| 4/03/2008 | 33 | 38 | 26 | 7 | SSE | 13 | 5 | |
| 4/10/2008 | 46 | 52 | 39 | 5 | NW | 11 | 5 | |
| 4/17/2008 | 71 | 75 | 65 | 4 | SW | 5 | 5 | |
| 4/18/2008 | 72 | 80 | 65 | 3 | NW | 5 | 5 | |
| 4/19/2008 | 73 | 80 | 60 | 8 | S | 12 | 5 | |
| 5/03/2008 | 54 | 60 | 55 | 9 | SE | 12 | 4 | |
| 5/04/2008 | 50 | 50 | 50 | 12 | W | 15 | 5 | |
| 5/11/2008 | 59 | 60 | 55 | 13 | SE | 15 | 5 | |
| 5/14/2008 | 66 | 70 | 60 | 10 | S | 15 | 5 | |
| **2008 Fall** | | | | | | | | |
| 9/02/2008 | 75 | 79 | 71 | 5 | NW | 8 | 5 | |
| 9/10/2008 | 58 | 63 | 53 | 4 | N | 9 | 5 | |
| 9/18/2008 | 57 | 59 | 53 | 8 | N | 15 | 5 | |
| 9/25/2008 | 67 | 70 | 63 | 3 | E | 7 | 5 | |
| 10/07/2008 | 52 | 59 | 41 | 3 | N | 7 | 5 | |
| 10/15/2008 | 58 | 68 | 48 | 3 | W | 7 | 5 | |
| 10/31/2008 | 52 | 61 | 44 | 6 | SW | 11 | 5 | |
| 11/12/2008 | 42 | 45 | 37 | 4 | S | 6 | 5 | |
| 11/21/2008 | 20 | 21 | 18 | 5 | NW | 8 | 1 | Light Snow |
| 12/03/2008 | 31 | 33 | 24 | 5 | S | 14 | 5 | |

## Table C-6 Spring NYS Migratory Raptor Survey Data

| Location | Year | Dates Sampled | No. of Days | No. of Hours Sampled | Total No. Individuals | Raptors/hr | No. of Species Seen |
|---|---|---|---|---|---|---|---|
| Clinton, Clinton Co. | 2005 | 4/18-4/20 | 3 | (21) | 0 | 0 | 0 |
| Altona, Clinton Co. | 2005 | 5/4-5/6 | 3 | (21) | 0 | 0 | 0 |
| Wethersfield, Wyoming Co. | 2005 | 4/22-4/29 | 3 | 21 | 5 | 0.1 | 3 |
| Bliss, Wyoming Co. | 2005 | 4/21-4/28 | 3 | (21) | 19 | (0.9) | 4 |
| Ellenburg, Clinton Co. | 2006 | 4/30-5/5 | 3 | 18 | 20 | 1.1 | 5 |
| Chateaugay, Franklin Co. | 2006 | 4/19-4/28 | 3 | 21 | 40 | 1.9 | 12 |
| Dairy Hills, Wyoming Co. | 2005 | 4/15-4/26 | 5 | 20 | 50 | (2.5) | 6 |
| Cohocton, Steuben Co. | 2005 | Not reported | 10 | 60 | 164 | 2.73 | 11 |
| **Crown City Wind Farm, Cortland Co.** | **2008** | **4/2-5/14** | **10** | **69.3** | **435** | **2.8** | **13** |
| Marble River, Clinton Co. | 2005 | 4/5-5/6 | 10 | 60 | 170 | 2.83 | 11 |
| Jericho Rise, Franklin Co. | 2007 | 4/4-5/28 | 8 | 32 | 112 | 3 | 10 |
| High Sheldon, Wyoming Co. | 2005 | 4/2-5/14 | 7 | 37 | 119 | 3.2 | 7 |
| Moresville, Delaware Co. | 2005 | 3/28-5/10 | 8 | 45 | 170 | 3.8 | 6 |
| Arkwright, Chautauqua Co. | 2005/2007 | 4/16-5/22 | 5 | 20 | 55 | 4.37 | 8 |
| Stockton, Chautauqua Co. | 2005/2007 | 4/16-5/15 | 5 | 20 | 55 | 4.37 | 8 |
| Howard, Steuben Co. | 2006 | 4/3-5/14 | 9 | 52.5 | 260 | 4.95 | 11 |
| Windfarm Prattsburgh, Steuben Co. | 2005 | Not reported | 10 | (60) | 314 | 5.23 | 15 |
| Steel Winds, Erie Co. | 2005 | 4/1-5/9 | 7 | 48 | 292 | 6.1 | 11 |
| West Hill, Madison Co. | 2005 | 4/5-5/16 | 10 | 60 | 375 | 6.25 | 12 |
| St. Lawrence, Jefferson Co. | 2006 | 4/14-5/12 | 4 | 12 | 79 | 6.5 | 10 |
| Ripley-Westfield, Chautauqua Co. – Project Area | 2008 | 3/17-5/29 | 34 | 236.2 | 1,581 | 6.7 | 14 |
| St. Lawrence, Jefferson Co. | 2006 | 4/14-5/12 | 4 | 12 | 91 | 7.5 | 8 |
| Alabama, Genesee Co. | 2005 | 4/16-4/29 | 5 | 20 | 177 | 9 | 8 |
| St. Lawrence, Jefferson Co. | 2007 | 3/21-5/1 | 7 | 21 | 205 | 9.8 | 9 |
| St. Lawrence, Jefferson Co. | 2007 | 3/21-5/1 | 7 | 21 | 232 | 11.0 | 8 |

## Table C-6 Spring NYS Migratory Raptor Survey Data

| Location | Year | Dates Sampled | No. of Days | No. of Hours Sampled | Total No. Individuals | Raptors/hr | No. of Species Seen |
|---|---|---|---|---|---|---|---|
| Villenova/Ball Hill Chautauqua Co. | 2007/2008 | 3/30-5/13 | 9 | 63 | 671 | 10.7 | 12 |
| Horse Creek, Jefferson Co. | 2005 | 3/30-5/7 | 10 | 58 | 700 | 12.1 | 14 |

Notes:
Data provided by the NYSDEC (2009), additional entries provided by E & E.

New York State Department of Environmental Conservation (NYSDEC). 2009. "Publicly Available Raptor Results for Proposed Wind Sites," Web site accessed at: http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum.pdf in July 2012.

# D E & E Raptor Survey Data (Fall 2008)

**Table D-1 Fall Migrant Raptor Survey Totals in the Project Area by Date**

**( - indicates 0 sightings)**

| Species | Sep 02, 2008 | Sep 10, 2008 | Sep 18, 2008 | Sep 25, 2008 | Oct 07, 2008 | Oct 15, 2008 | Oct 31, 2008 | Nov 12, 2008 | Nov 21, 2008 | Dec 03, 2008 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Canada Goose | - | 46 | 325 | 16 | 64 | - | - | - | - | - | **451** |
| Turkey Vulture | 75 | 163 | 90 | 140 | 30 | 32 | - | 1 | - | - | **531** |
| Osprey | - | 1 | - | - | - | - | - | - | - | - | **1** |
| Bald Eagle | - | 3 | 1 | 1 | - | - | - | - | - | - | **5** |
| Northern Harrier | - | - | - | 1 | - | - | - | - | - | - | **1** |
| Sharp-shinned Hawk | - | - | 2 | 1 | 2 | 1 | 1 | 1 | - | - | **8** |
| Cooper's Hawk | - | 1 | 1 | - | - | - | - | - | - | - | **2** |
| Red-shouldered Hawk | - | 1 | 1 | - | - | - | - | - | - | - | **2** |
| Broad-winged Hawk | - | 145 | 12 | - | - | - | - | - | - | - | **157** |
| Red-tailed Hawk | - | 6 | 3 | 1 | 4 | 6 | 7 | 9 | 2 | 5 | **43** |
| Rough-legged Hawk | - | - | - | - | - | - | - | 1 | - | - | **1** |
| American Kestrel | - | 3 | - | 1 | - | - | - | - | - | - | **4** |
| unidentified raptor | - | 3 | 1 | - | - | - | - | - | - | - | **4** |
| Common Raven | 1 | 2 | 3 | 1 | 3 | - | - | - | - | - | **10** |
| **Total Birds:** | **76** | **374** | **439** | **162** | **103** | **39** | **8** | **12** | **2** | **5** | **1220** |
| **Species Count:** | **2** | **11** | **10** | **8** | **5** | **3** | **2** | **4** | **1** | **1** | |

**Table D-2 Flight Directions for all Raptors (Migrants and Locals) in the Project Area by Species**
**( - indicates 0 sightings)**

| Species | N | NE | E | SE | S | SW | W | NW | Local | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Canada Goose | 36 | 8 | 3 | - | 310 | 29 | 34 | - | - | **451** |
| Turkey Vulture | 245 | 42 | 17 | 27 | 64 | 16 | 35 | 31 | 20 | **531** |
| Osprey | - | - | - | - | 1 | - | - | - | - | **1** |
| Bald Eagle | - | - | - | - | 1 | 3 | 1 | - | - | **5** |
| Northern Harrier | - | - | - | - | - | - | 1 | - | - | **1** |
| Sharp-shinned Hawk | - | - | - | 1 | 3 | 1 | - | - | 1 | **8** |
| Cooper's Hawk | - | - | - | - | - | 1 | - | - | 1 | **2** |
| Red-shouldered Hawk | - | - | - | 1 | 1 | - | - | - | - | **2** |
| Broad-winged Hawk | - | - | - | - | 145 | 12 | - | - | - | **157** |
| Red-tailed Hawk | - | - | 2 | - | 12 | 12 | 1 | - | - | **43** |
| Rough-legged Hawk | - | - | - | - | 1 | - | - | - | - | **1** |
| American Kestrel | - | - | - | - | 3 | - | - | - | 1 | **4** |
| unidentified raptor | - | - | - | - | 2 | - | 2 | - | - | **4** |
| Common Raven | 3 | 1 | - | 1 | 2 | - | - | - | 3 | **10** |
| **Total Birds:** | **284** | **51** | **22** | **30** | **545** | **74** | **74** | **31** | **26** | **1220** |
| **Species Count:** | **3** | **3** | **3** | **4** | **12** | **7** | **6** | **1** | **5** | **3** |
| **Total Species:** | **14** | | | | | | | | | |

**Table D-3 Flight Direction for all Raptors (Migrants and Locals) in the Project Area by Date**
**( - indicates 0 sightings)**

| Survey | N | NE | E | SE | S | SW | W | NW | Local | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 9/2/2008 | 13 | 11 | 1 | 10 | 13 | 5 | - | 23 | - | **76** |
| 9/10/2008 | 89 | 26 | 3 | 9 | 168 | 6 | 67 | 5 | 1 | **374** |
| 9/18/2008 | 50 | 13 | - | 3 | 308 | 21 | - | 1 | 12 | **439** |
| 9/25/2008 | 72 | 1 | 16 | 8 | 21 | 5 | 6 | 1 | 1 | **162** |
| 10/7/2008 | 45 | - | 1 | - | 12 | 29 | - | - | 12 | **103** |
| 10/15/2008 | 15 | - | - | - | 17 | 5 | 1 | 1 | - | **39** |
| 10/31/2008 | - | - | - | - | - | - | - | - | - | **8** |
| 11/12/2008 | - | - | - | - | 4 | 3 | - | - | - | **12** |
| 11/21/2008 | - | - | - | - | 1 | - | - | - | - | **2** |
| 12/3/2008 | - | - | 1 | - | 1 | - | - | - | - | **5** |
| **Total Birds:** | **284** | **51** | **22** | **30** | **545** | **74** | **74** | **31** | **26** | **1220** |
| **% of Total:** | **23.3%** | **4.2%** | **1.8%** | **2.5%** | **44.7%** | **6.1%** | **6.1%** | **2.5%** | **2.1%** | |

**Table D-4 Raptor Flight Height in the Project Area by Species**
**( - indicates 0 sightings)**

| Species | Migrants and Locals Less Than 500’ | Migrants and Locals Greater Than 500’ | Migrants Less Than 500’ | Migrants Greater Than 500’ |
|---|---|---|---|---|
| Canada Goose | 18 | 433 | 18 | **433** |
| Turkey Vulture | 335 | 196 | 290 | **196** |
| Osprey | - | 1 | - | **1** |
| Bald Eagle | - | 5 | - | **5** |
| Northern Harrier | - | 1 | - | **1** |
| Sharp-shinned Hawk | 4 | 4 | - | **4** |
| Cooper's Hawk | 1 | 1 | - | **1** |
| Red-shouldered Hawk | - | 2 | - | **2** |
| Broad-winged Hawk | - | 157 | - | **157** |
| Red-tailed Hawk | 23 | 20 | 2 | **20** |
| Rough-legged Hawk | - | 1 | - | **1** |
| American Kestrel | 1 | 3 | - | **3** |
| unidentified raptor | - | 4 | - | **4** |
| Common Raven | 2 | 8 | 2 | **7** |
| **Total Birds:** | **384** | **836** | **312** | **835** |
| **Species Count:** | **7** | **14** | **4** | **14** |

**Table D-5 Fall NYS Migratory Raptor Survey Data**

| Location | Year | Dates Sampled | No. of Days | No. of Hours Sampled | Total No. Individuals | Raptors/hr | No. of Species Seen |
|---|---|---|---|---|---|---|---|
| Bliss, Wyoming Co. | 2005 | 9/12-9/17 | 3 | (21) | 0 | 0 | 0 |
| Clinton, Clinton Co. | 2005 | 9/23-9/28 | 3 | (21) | 0 | 0 | 0 |
| Altona, Clinton Co. | 2005 | 9/24-9/30 | 3 | (21) | 0 | 0 | 0 |
| Chateaugay and Bellmont, Franklin Co. | 2007 | 10/16-11/28 | 9 | 60 | 48 | 0.8 | 8 |
| Ripley-Westfield, Chautauqua Co. | 2008 | 9/4-11/12 | 10 | 71 | 80 | 1.1 | 7 |
| Chateaugay and Bellmont, Franklin Co. | 2006 | 9/16-10/26 | 3 | 21 | 34 | 1.6 | 5 |
| Allegany, Cattaraugus Co. | 2007 | 9/8-10/11 | 11 | 63.8 | 125 | 2.0 | 10 |
| Jericho Rise, Franklin Co. | 2007 | 9/12-10/26 | 7 | 28 | 59 | 2.1 | 7 |
| Jordanville, Herkimer Co. | 2006 | 10/13-11/30 | 44 | 234.7 | 629 | (2.7) | 12 |
| Villenova/Ball Hill, Chautauqua Co. | 2007/2008 | 9/15-11/1 | 3 | 21 | 94 | 2.8 | 8 |
| Dairy Hills, Wyoming Co. | 2005 | 9/11-10/10 | 4 | 16 | 48 | (3) | 6 |
| Windfarm Prattsburgh, Steuben Co. | 2004 | Not reported | 13 | 73 | 220 | 3.01 | 10 |
| High Sheldon, Wyoming Co. | 2005 | 8/29-11/4 | 8 | 53.5 | 168 | 3.1 | 9 |
| Cohocton, Steuben Co. | 2004 | Not reported | 8 | 41 | 128 | 3.1 | 8 |
| Moresville, Delaware Co. | 2005 | 8/31-11/3 | 11 | 72 | 228 | 3.2 | 11 |
| Cohocton, Steuben Co. | 2005 | Not reported | 7 | 40 | 131 | 3.27 | 10 |
| Centerville, Allegany Co. | 2006 | 9/11-10/21 | 3 | 21.5 | 73 | 3.4 | 10 |
| Howard, Steuben Co. | 2005 | 9/1-10/28 | 10 | 57 | 206 | 3.6 | 12 |
| Marble River, Clinton Co. | 2005 | 9/6-11/2 | 10 | 60 | 217 | 3.6 | 15 |
| Arkwright, Chautauqua Co. | 2005/2007 | 9/17-10/28 | 12 | 18 | 49 | 4.37 | 5 |
| Stockton, Chautauqua Co. | 2005/2007 | 9/17-10/15 | 6 | 18 | 38 | 4.65 | 4 |
| Wethersfield, Wyoming Co. | 2005/2006 | 9/13-11/1 | 6 | 44.8 | 231 | 5.2 | 11 |
| West Hill, Madison Co. | 2005 | 9/6-10/31 | 11 | 65 | 369 | 5.68 | 14 |
| Alabama, Genesee Co. | 2005 | 9/11-10/10 | 5 | 19 | 148 | 8 | 4 |

**Table D-5 Fall NYS Migratory Raptor Survey Data**

| Location | Year | Dates Sampled | No. of Days | No. of Hours Sampled | Total No. Individuals | Raptors/hr | No. of Species Seen |
|---|---|---|---|---|---|---|---|
| Horse Creek, Jefferson Co. | 2005 | 9/9-10/16 | 11 | 63.5 | 575 | 9.1 | 13 |
| St. Lawrence, Jefferson Co. | 2006 | 9/23-11/11 | 10 | 30 | 288 | 9.6 | 10 |
| **Crown City Wind Farm, Cortland Co.** | **2008** | **9/2-12/13** | **10** | **59.3** | **759** | **10.0** | **11** |

Notes:
Data provided by the NYSDEC (2009), additional entries provided by E & E.

New York State Department of Environmental Conservation (NYSDEC). 2009. "Publicly Available Raptor Results for Proposed Wind Sites," Web site accessed at: http://www.dec.ny.gov/docs/wildlife_pdf/raptorwinsum.pdf in July 2012.

E

# E & E Migratory Bird Survey Data (Spring 2008)

**Table E-1 Spring Migratory Bird Survey Totals**

| Species | 5/10/2008 | 5/15/2008 | 5/20/2008 | 5/28/2008 | Total |
|---|---|---|---|---|---|
| Canada Goose | 3 | 1 | 11 | 0 | **15** |
| Mallard | 0 | 0 | 1 | 0 | **1** |
| Hooded Merganser | 0 | 0 | 1 | 1 | **2** |
| Ring-necked Pheasant | 0 | 0 | 0 | 1 | **1** |
| Ruffed Grouse | 2 | 3 | 0 | 3 | **8** |
| Wild Turkey | 3 | 1 | 6 | 1 | **11** |
| Great Blue Heron | 1 | 0 | 0 | 0 | **1** |
| Turkey Vulture | 0 | 0 | 0 | 1 | **1** |
| Red-tailed Hawk | 0 | 0 | 1 | 1 | **2** |
| Killdeer | 0 | 0 | 4 | 0 | **4** |
| Spotted Sandpiper | 0 | 0 | 1 | 1 | **2** |
| Ring-billed Gull | 1 | 0 | 6 | 1 | **8** |
| Mourning Dove | 4 | 3 | 3 | 4 | **14** |
| Black-billed Cuckoo | 0 | 0 | 0 | 3 | **3** |
| Yellow-billed Cuckoo | 0 | 1 | 1 | 2 | **4** |
| Ruby-thr. Hummingbird | 0 | 0 | 0 | 1 | **1** |
| Yellow-bellied Sapsucker | 2 | 2 | 2 | 7 | **13** |
| Downy Woodpecker | 0 | 0 | 0 | 1 | **1** |
| Hairy Woodpecker | 0 | 0 | 0 | 1 | **1** |
| Northern Flicker | 3 | 1 | 1 | 3 | **8** |
| Pileated Woodpecker | 4 | 3 | 1 | 0 | **8** |
| Eastern Wood-Pewee | 0 | 0 | 1 | 1 | **2** |
| Alder Flycatcher | 0 | 0 | 0 | 3 | **3** |
| Least Flycatcher | 8 | 7 | 6 | 5 | **26** |
| Eastern Phoebe | 0 | 0 | 1 | 1 | **2** |
| Great Crested Flycatcher | 0 | 0 | 4 | 2 | **6** |
| Eastern Kingbird | 0 | 2 | 2 | 2 | **6** |
| Blue-headed Vireo | 2 | 5 | 1 | 1 | **9** |
| Warbling Vireo | 0 | 0 | 1 | 0 | **1** |
| Red-eyed Vireo | 2 | 1 | 13 | 16 | **32** |
| Blue Jay | 8 | 5 | 12 | 5 | **30** |
| American Crow | 22 | 22 | 30 | 24 | **98** |
| Common Raven | 3 | 0 | 0 | 3 | **6** |
| Bank Swallow | 0 | 1 | 0 | 0 | **1** |
| Barn Swallow | 0 | 0 | 2 | 5 | **7** |
| Black-capped Chickadee | 7 | 5 | 5 | 11 | **28** |
| Tufted Titmouse | 3 | 0 | 1 | 1 | **5** |
| Red-breasted Nuthatch | 1 | 0 | 0 | 0 | **1** |
| White-breasted Nuthatch | 0 | 0 | 1 | 2 | **3** |
| House Wren | 2 | 3 | 2 | 4 | **11** |
| Winter Wren | 1 | 0 | 1 | 0 | **2** |
| Eastern Bluebird | 1 | 0 | 1 | 0 | **2** |
| Veery | 0 | 0 | 4 | 3 | **7** |
| Hermit Thrush | 1 | 1 | 1 | 2 | **5** |
| Wood Thrush | 14 | 14 | 5 | 7 | **40** |

**Table E-1 Spring Migratory Bird Survey Totals**

| Species | 5/10/2008 | 5/15/2008 | 5/20/2008 | 5/28/2008 | Total |
|---|---|---|---|---|---|
| American Robin | 14 | 16 | 32 | 17 | **79** |
| Gray Catbird | 5 | 11 | 13 | 9 | **38** |
| Brown Thrasher | 4 | 1 | 1 | 0 | **6** |
| Cedar Waxwing | 0 | 0 | 0 | 3 | **3** |
| Blue-winged Warbler | 3 | 1 | 1 | 1 | **6** |
| Nashville Warbler | 7 | 1 | 1 | 0 | **9** |
| Yellow Warbler | 5 | 8 | 11 | 11 | **35** |
| Chestnut-sided Warbler | 0 | 3 | 6 | 6 | **15** |
| Magnolia Warbler | 0 | 1 | 1 | 0 | **2** |
| Black-throated Blue Warbler | 2 | 0 | 2 | 4 | **8** |
| Yellow-rumped Warbler | 4 | 2 | 0 | 0 | **6** |
| Black-thr. Green Warbler | 2 | 4 | 4 | 1 | **11** |
| Blackburnian Warbler | 1 | 3 | 0 | 1 | **5** |
| Bay-breasted Warbler | 0 | 1 | 0 | 0 | **1** |
| Blackpoll Warbler | 0 | 0 | 0 | 2 | **2** |
| Black-and-white Warbler | 0 | 3 | 0 | 1 | **4** |
| American Redstart | 0 | 0 | 2 | 5 | **7** |
| Ovenbird | 24 | 21 | 18 | 17 | **80** |
| Northern Waterthrush | 0 | 0 | 1 | 1 | **2** |
| Mourning Warbler | 2 | 0 | 1 | 2 | **5** |
| Common Yellowthroat | 26 | 33 | 29 | 32 | **120** |
| Hooded Warbler | 0 | 0 | 1 | 3 | **4** |
| Wilson's Warbler | 0 | 1 | 0 | 0 | **1** |
| Canada Warbler | 1 | 1 | 0 | 1 | **3** |
| Scarlet Tanager | 3 | 3 | 4 | 2 | **12** |
| Eastern Towhee | 5 | 6 | 1 | 3 | **15** |
| Chipping Sparrow | 9 | 2 | 2 | 5 | **18** |
| Field Sparrow | 8 | 6 | 6 | 6 | **26** |
| Savannah Sparrow | 4 | 2 | 0 | 5 | **11** |
| Song Sparrow | 9 | 27 | 27 | 21 | **84** |
| Dark-eyed Junco | 0 | 0 | 1 | 2 | **3** |
| Northern Cardinal | 1 | 1 | 0 | 0 | **2** |
| Rose-breasted Grosbeak | 5 | 8 | 8 | 7 | **28** |
| Indigo Bunting | 0 | 2 | 3 | 12 | **17** |
| Bobolink | 6 | 10 | 23 | 12 | **51** |
| Red-winged Blackbird | 18 | 12 | 32 | 17 | **79** |
| Eastern Meadowlark | 1 | 0 | 0 | 2 | **3** |
| Common Grackle | 1 | 0 | 10 | 3 | **14** |
| Brown-headed Cowbird | 11 | 7 | 7 | 4 | **29** |
| Baltimore Oriole | 0 | 2 | 10 | 7 | **19** |
| Purple Finch | 0 | 2 | 1 | 2 | **5** |
| American Goldfinch | 10 | 4 | 23 | 13 | **50** |
| **Total Birds:** | **289** | **286** | **415** | **370** | **1360** |
| **Species Count:** | **51** | **51** | **64** | **70** | |
| **Total Species:** | **87** | | | | |

**Table E-2  Spring Migratory Survey Results, May 10, 2008**

| Species | 5/10/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | Total |
| Canada Goose | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Ruffed Grouse | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Wild Turkey | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Great Blue Heron | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Ring-billed Gull | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Mourning Dove | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **4** |
| Yellow-bellied Sapsucker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | **2** |
| Northern Flicker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **3** |
| Pileated Woodpecker | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | **4** |
| Least Flycatcher | 0 | 0 | 0 | 0 | 3 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | **8** |
| Blue-headed Vireo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | **2** |
| Red-eyed Vireo | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Blue Jay | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 2 | 0 | 1 | 1 | **8** |
| American Crow | 0 | 1 | 3 | 2 | 0 | 2 | 0 | 0 | 6 | 1 | 1 | 1 | 1 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | **22** |
| Common Raven | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Black-capped Chickadee | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | **7** |
| Tufted Titmouse | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | **3** |
| Red-breasted Nuthatch | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| House Wren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **2** |
| Winter Wren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Eastern Bluebird | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Hermit Thrush | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| Wood Thrush | 1 | 1 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | **14** |
| American Robin | 0 | 0 | 0 | 1 | 2 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 2 | 2 | 0 | **14** |
| Gray Catbird | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **5** |
| Brown Thrasher | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **4** |
| Blue-winged Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | **3** |
| Nashville Warbler | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | **7** |
| Yellow Warbler | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **5** |
| Black-throated Blue Warbler | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **2** |

**Table E-2 Spring Migratory Survey Results, May 10, 2008**

| Species | 5/10/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | Total |
| Yellow-rumped Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **4** |
| Black-thr. Green Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | **2** |
| Blackburnian Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **1** |
| Ovenbird | 3 | 2 | 0 | 0 | 2 | 3 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 2 | 3 | 1 | 1 | 1 | **24** |
| Mourning Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Common Yellowthroat | 0 | 2 | 2 | 2 | 2 | 1 | 0 | 1 | 0 | 1 | 1 | 2 | 1 | 2 | 2 | 0 | 1 | 2 | 2 | 2 | **26** |
| Canada Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **1** |
| Scarlet Tanager | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **3** |
| Eastern Towhee | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **5** |
| Chipping Sparrow | 0 | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | **9** |
| Field Sparrow | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | **8** |
| Savannah Sparrow | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **4** |
| Song Sparrow | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | **9** |
| Northern Cardinal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Rose-breasted Grosbeak | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **5** |
| Bobolink | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | **6** |
| Red-winged Blackbird | 0 | 3 | 1 | 0 | 1 | 0 | 5 | 1 | 1 | 2 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | **18** |
| Eastern Meadowlark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Common Grackle | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Brown-headed Cowbird | 0 | 5 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | **11** |
| American Goldfinch | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 4 | **10** |
| **Total Birds:** | **10** | **22** | **15** | **11** | **19** | **15** | **18** | **11** | **19** | **12** | **14** | **13** | **11** | **14** | **19** | **9** | **15** | **11** | **17** | **14** | **289** |
| **Species Count:** | **7** | **12** | **11** | **7** | **12** | **10** | **12** | **11** | **12** | **10** | **11** | **11** | **10** | **12** | **10** | **8** | **11** | **9** | **14** | **10** | |
| **Total Species:** | **51** | | | | | | | | | | | | | | | | | | | | |

**Table E-3 Spring Migratory Survey Results, May 15, 2008**

| Species | 5/15/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | Total |
| Canada Goose | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Ruffed Grouse | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | **3** |
| Wild Turkey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Mourning Dove | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **3** |
| Yellow-billed Cuckoo | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Yellow-bellied Sapsucker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **2** |
| Northern Flicker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Pileated Woodpecker | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | **3** |
| Least Flycatcher | 0 | 0 | 0 | 1 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **7** |
| Eastern Kingbird | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Blue-headed Vireo | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | **5** |
| Red-eyed Vireo | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Blue Jay | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **5** |
| American Crow | 1 | 0 | 2 | 0 | 1 | 4 | 0 | 1 | 3 | 2 | 4 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | **22** |
| Bank Swallow | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Black-capped Chickadee | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **5** |
| House Wren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **3** |
| Hermit Thrush | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Wood Thrush | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 2 | 2 | 1 | 2 | 0 | 0 | 1 | **14** |
| American Robin | 0 | 3 | 0 | 0 | 0 | 1 | 5 | 0 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | **16** |
| Gray Catbird | 0 | 0 | 1 | 0 | 2 | 1 | 0 | 1 | 2 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **11** |
| Brown Thrasher | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Blue-winged Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Nashville Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Yellow Warbler | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **8** |
| Chestnut-sided Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Magnolia Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| Yellow-rumped Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | **2** |
| Black-thr. Green Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | **4** |
| Blackburnian Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | **3** |

**Table E-3 Spring Migratory Survey Results, May 15, 2008**

| Species | 5/15/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | Total |
| Bay-breasted Warbler | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Black-and-white Warbler | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Ovenbird | 2 | 1 | 1 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | **21** |
| Common Yellowthroat | 0 | 3 | 2 | 3 | 2 | 0 | 1 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 0 | 0 | 0 | 2 | 1 | **33** |
| Wilson's Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Canada Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Scarlet Tanager | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Eastern Towhee | 1 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **6** |
| Chipping Sparrow | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | **2** |
| Field Sparrow | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | **6** |
| Savannah Sparrow | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | **2** |
| Song Sparrow | 0 | 0 | 1 | 11 | 1 | 0 | 1 | 2 | 3 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 3 | 1 | 0 | **27** |
| Northern Cardinal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Rose-breasted Grosbeak | 0 | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | **8** |
| Indigo Bunting | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Bobolink | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 2 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | **10** |
| Red-winged Blackbird | 0 | 2 | 1 | 1 | 1 | 0 | 1 | 1 | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **12** |
| Brown-headed Cowbird | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **7** |
| Baltimore Oriole | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **2** |
| Purple Finch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | **2** |
| American Goldfinch | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **4** |
| **Total Birds:** | **8** | **13** | **12** | **24** | **20** | **11** | **16** | **15** | **21** | **16** | **16** | **16** | **16** | **14** | **14** | **13** | **8** | **9** | **12** | **12** | **286** |
| **Species Count:** | **7** | **8** | **10** | **11** | **13** | **7** | **11** | **10** | **10** | **11** | **12** | **9** | **12** | **11** | **10** | **8** | **6** | **6** | **10** | **11** | |
| **Total Species:** | **51** | | | | | | | | | | | | | | | | | | | | |

**Table E-4 Spring Migratory Survey Results, May 20, 2008**

| Species | 5/20/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | Total |
| Canada Goose | 0 | 2 | 1 | 2 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **11** |
| Mallard | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Hooded Merganser | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Wild Turkey | 0 | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **6** |
| Red-tailed Hawk | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Killdeer | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **4** |
| Spotted Sandpiper | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Ring-billed Gull | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **6** |
| Mourning Dove | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **3** |
| Yellow-billed Cuckoo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Yellow-bellied Sapsucker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **2** |
| Northern Flicker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Pileated Woodpecker | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Eastern Wood-Pewee | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Least Flycatcher | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | **6** |
| Eastern Phoebe | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Great Crested Flycatcher | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **4** |
| Eastern Kingbird | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **2** |
| Blue-headed Vireo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **1** |
| Warbling Vireo | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Red-eyed Vireo | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | **13** |
| Blue Jay | 0 | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 1 | 0 | **12** |
| American Crow | 1 | 1 | 1 | 2 | 0 | 2 | 1 | 1 | 9 | 3 | 0 | 4 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | **30** |
| Barn Swallow | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Black-capped Chickadee | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | **5** |
| Tufted Titmouse | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **1** |
| White-breasted Nuthatch | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| House Wren | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **2** |
| Winter Wren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Eastern Bluebird | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |

**Table E-4 Spring Migratory Survey Results, May 20, 2008**

| Species | 5/20/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | Total |
| Veery | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **4** |
| Hermit Thrush | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Wood Thrush | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | **5** |
| American Robin | 0 | 1 | 1 | 4 | 5 | 0 | 5 | 0 | 2 | 0 | 3 | 0 | 1 | 1 | 4 | 0 | 1 | 0 | 3 | 1 | **32** |
| Gray Catbird | 0 | 2 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 2 | 0 | 1 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 1 | **13** |
| Brown Thrasher | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **1** |
| Blue-winged Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **1** |
| Nashville Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Yellow Warbler | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 3 | **11** |
| Chestnut-sided Warbler | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | **6** |
| Magnolia Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Black-throated Blue Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | **2** |
| Black-thr. Green Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | **4** |
| American Redstart | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | **2** |
| Ovenbird | 2 | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 2 | 3 | 1 | 1 | 1 | **18** |
| Northern Waterthrush | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Mourning Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **1** |
| Common Yellowthroat | 1 | 3 | 0 | 2 | 2 | 0 | 2 | 3 | 1 | 1 | 1 | 2 | 3 | 1 | 1 | 0 | 0 | 2 | 2 | 2 | **29** |
| Hooded Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Scarlet Tanager | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **4** |
| Eastern Towhee | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Chipping Sparrow | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Field Sparrow | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | **6** |
| Song Sparrow | 0 | 1 | 3 | 0 | 2 | 0 | 1 | 1 | 3 | 3 | 0 | 2 | 1 | 2 | 2 | 0 | 0 | 1 | 2 | 3 | **27** |
| Dark-eyed Junco | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Rose-breasted Grosbeak | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | **8** |
| Indigo Bunting | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **3** |
| Bobolink | 0 | 1 | 0 | 1 | 2 | 0 | 0 | 9 | 4 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | **23** |
| Red-winged Blackbird | 0 | 3 | 4 | 0 | 8 | 0 | 5 | 0 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | **32** |
| Common Grackle | 0 | 1 | 2 | 0 | 2 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **10** |
| Brown-headed Cowbird | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **7** |

**Table E-4 Spring Migratory Survey Results, May 20, 2008**

| Species | 5/20/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | Total |
| Baltimore Oriole | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | **10** |
| Purple Finch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| American Goldfinch | 1 | 1 | 2 | 1 | 0 | 0 | 1 | 7 | 0 | 0 | 2 | 0 | 1 | 3 | 3 | 0 | 0 | 1 | 0 | 0 | **23** |
| **Total Birds:** | **8** | **26** | **31** | **18** | **34** | **10** | **31** | **31** | **35** | **23** | **13** | **16** | **18** | **22** | **23** | **8** | **18** | **9** | **16** | **25** | **415** |
| **Species Count:** | **7** | **19** | **18** | **11** | **16** | **7** | **21** | **13** | **13** | **15** | **10** | **11** | **14** | **13** | **11** | **7** | **15** | **8** | **12** | **16** | |
| **Total Species:** | **64** | | | | | | | | | | | | | | | | | | | | |

**Table E-5 Spring Migratory Survey Results, May 28, 2008**

| Species | 5/28/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | Total |
| Hooded Merganser | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Ring-necked Pheasant | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Ruffed Grouse | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | **3** |
| Wild Turkey | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Turkey Vulture | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **1** |
| Red-tailed Hawk | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Spotted Sandpiper | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Ring-billed Gull | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Mourning Dove | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | **4** |
| Black-billed Cuckoo | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Yellow-billed Cuckoo | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **2** |
| Ruby-thr. Hummingbird | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **1** |
| Yellow-bellied Sapsucker | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | **7** |
| Downy Woodpecker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Hairy Woodpecker | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Northern Flicker | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | **3** |
| Eastern Wood-Pewee | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Alder Flycatcher | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | **3** |
| Least Flycatcher | 0 | 0 | 0 | 0 | 2 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **5** |
| Eastern Phoebe | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Great Crested Flycatcher | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Eastern Kingbird | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Blue-headed Vireo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **1** |
| Red-eyed Vireo | 2 | 0 | 1 | 1 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | **16** |
| Blue Jay | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | **5** |
| American Crow | 1 | 4 | 1 | 0 | 0 | 0 | 0 | 1 | 4 | 2 | 4 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 3 | **24** |
| Common Raven | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **3** |
| Barn Swallow | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **5** |
| Black-capped Chickadee | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | **11** |
| Tufted Titmouse | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **1** |

**Table E-5 Spring Migratory Survey Results, May 28, 2008**

| Species | 5/28/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | Total |
| White-breasted Nuthatch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **2** |
| House Wren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | **4** |
| Veery | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **3** |
| Hermit Thrush | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **2** |
| Wood Thrush | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **7** |
| American Robin | 0 | 1 | 0 | 2 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 3 | 0 | 3 | 0 | 0 | 1 | 0 | **17** |
| Gray Catbird | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | **9** |
| Cedar Waxwing | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **3** |
| Blue-winged Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **1** |
| Yellow Warbler | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 3 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | **11** |
| Chestnut-sided Warbler | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **6** |
| Black-throated Blue Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | **4** |
| Black-thr. Green Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Blackburnian Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **1** |
| Blackpoll Warbler | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Black-and-white Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| American Redstart | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **5** |
| Ovenbird | 2 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 3 | 1 | 0 | 0 | 1 | 2 | 1 | 0 | 1 | 1 | **17** |
| Northern Waterthrush | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Mourning Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **2** |
| Common Yellowthroat | 0 | 2 | 3 | 2 | 1 | 2 | 1 | 1 | 3 | 2 | 2 | 0 | 1 | 1 | 3 | 1 | 1 | 0 | 2 | 4 | **32** |
| Hooded Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | **3** |
| Canada Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Scarlet Tanager | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | **2** |
| Eastern Towhee | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Chipping Sparrow | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **5** |
| Field Sparrow | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | **6** |
| Savannah Sparrow | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **5** |
| Song Sparrow | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 3 | 1 | **21** |
| Dark-eyed Junco | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **2** |
| Rose-breasted Grosbeak | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | **7** |

**Table E-5 Spring Migratory Survey Results, May 28, 2008**

| Species | 5/28/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | Total |
| Indigo Bunting | 0 | 2 | 2 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | **12** |
| Bobolink | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 5 | 0 | 0 | 1 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | **12** |
| Red-winged Blackbird | 1 | 1 | 1 | 1 | 8 | 0 | 1 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **17** |
| Eastern Meadowlark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **2** |
| Common Grackle | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Brown-headed Cowbird | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **4** |
| Baltimore Oriole | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | **7** |
| Purple Finch | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| American Goldfinch | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 2 | **13** |
| **Total Birds:** | **19** | **19** | **16** | **17** | **25** | **15** | **20** | **29** | **23** | **15** | **28** | **12** | **14** | **20** | **21** | **21** | **11** | **0** | **24** | **21** | **370** |
| **Species Count:** | **15** | **14** | **13** | **14** | **16** | **12** | **17** | **17** | **13** | **10** | **16** | **10** | **13** | **17** | **15** | **18** | **10** | **0** | **19** | **15** | |
| **Total Species:** | **70** | | | | | | | | | | | | | | | | | | | | |

**Table E-6 Spring NYS Migratory Survey Data Summary**

| Location | Year | Dates Sampled | No. of Days | Total No. Species | Average No. of Species/Point | Total No. Observations | Average No. of Observations/ point | No. of Survey Points |
|---|---|---|---|---|---|---|---|---|
| Ellenburg, Clinton Co. | 2006 | 5/16 | 1 | 43 | 8.0 | 301 | 12.0 | 25 |
| Chateaugay, Franklin Co. | 2006 | 5/18 | 1 | 53 | 9.1 | 389 | 13.9 | 28 |
| Stone Church, St. Lawrence Co. | 2010 | 5/5-5/24 | 4 | 78 | 11.1 | 1,928 | 24.1 | 20 |
| Ripley-Westfield, Chautauqua Co. – Escarpment & Lake Erie Plain (outside Project Area) | 2008 | 4/25-5/28 | 6 | 117 | 11.2 | 2,847 | 21.5 | 22 |
| Wethersfield, Wyoming Co. | 2006 | 5/10, 5/17 | 2 | 67 | 11.4 | 1,291 | 26.9 | 24 |
| **Crown City Wind Farm, Cortland Co.** | **2008** | **5/10 – 5/28** | **4** | **87** | **11.7** | **1.360** | **17.0** | **20** |
| Centerville, Allegany Co. | 2008 | 5/15, 5/21 | 2 | 72 | 12.0 | 1,163 | 25.3 | 23 |
| Centerville, Allegany Co. | 2006 | 5/6, 5/26 | 2 | 85 | 12.2 | 1,139 | 20.3 | 28 |
| Clinton, Clinton Co. | 2005 | 5/25 | 1 | 49 | 12.2 | 315 | 17.5 | 18 |
| Bliss, Wyoming Co. | 2005 | 5/12-5/26 | 3 | 87 | 12.3 | 1,644 | 19.6 | 28 |
| Villenova (Ball Hill), Chautauqua Co. | 2008 | 5/6, 5/16 | 2 | 75 | 12.4 | 1,603 | 24.3 | 33 |
| Altona, Clinton Co. | 2005 | 5/26 | 1 | 37 | 12.9 | 160 | 22.9 | 7 |
| Chautauqua Windpower, Chautauqua Co. – Inland area | 2003 | 5/1-5/30 | 5 | 119+ | 13.4 | 5,410+ | 20.6 | 23 |
| Chautauqua Windpower, Chautauqua Co. – Ridge area | 2003 | 5/1-5/30 | 5 | 119+ | 13.4 | 5,410+ | 20.2 | 11 |
| Villenova (Ball Hill), Chautauqua Co. | 2007 | 5/11, 5/22 | 2 | 90 | 14.8 | 1,624 | 29 | 28 |
| Chautauqua Windpower, Chautauqua Co. – Lake Erie Plain | 2003 | 5/1-5/30 | 4 | 119+ | 14.8 | 5,410+ | 27.8 | 10 |
| Ripley-Westfield, Chautauqua Co. – Project Area | 2008 | 4/25-5/28 | 6 | 101 | 15.4 | 5,020 | 29.9 | 28 |

F

# E & E Migratory Bird Survey Data (Fall 2008)

**Table F-1 Fall Migratory Bird Survey Totals, Breeding Bird Survey by Date**

| Species | 9/3/2008 | 9/11/2008 | 9/19/2008 | 9/26/2008 | Total |
|---|---|---|---|---|---|
| Canada Goose | - | 7 | 49 | 2 | **11** |
| Mallard | - | - | - | 1 | **1** |
| Wild Turkey | 12 | 11 | 21 | 1 | **45** |
| Turkey Vulture | 5 | - | 28 | 22 | **55** |
| Sharp-shinned Hawk | - | - | - | 1 | **1** |
| Red-shouldered Hawk | - | - | 2 | - | **2** |
| Red-tailed Hawk | 2 | 1 | - | 4 | **7** |
| American Kestrel | 1 | - | 3 | 3 | **7** |
| Killdeer | 2 | - | - | 10 | **12** |
| Ring-billed Gull | 7 | 16 | 22 | 49 | **94** |
| Mourning Dove | 5 | 9 | 4 | 7 | **25** |
| Black-billed Cuckoo | 2 | - | - | - | **2** |
| Ruby-thr. Hummingbird | 3 | - | 1 | 2 | **6** |
| Belted Kingfisher | 1 | 1 | - | - | **2** |
| Yellow-bellied Sapsucker | 5 | 3 | 2 | - | **10** |
| Downy Woodpecker | 3 | 3 | 1 | 2 | **9** |
| Hairy Woodpecker | 1 | 2 | - | 2 | **5** |
| Northern Flicker | 6 | 7 | 4 | 2 | **19** |
| Pileated Woodpecker | 2 | - | - | 1 | **3** |
| Eastern Wood-Pewee | 1 | 3 | - | 1 | **5** |
| Least Flycatcher | 3 | - | - | - | **3** |
| Blue-headed Vireo | 1 | 4 | 4 | 1 | **10** |
| Red-eyed Vireo | - | 2 | 2 | - | **4** |
| Blue Jay | 50 | 57 | 69 | 47 | **223** |
| American Crow | 29 | 36 | 32 | 121 | **218** |
| Common Raven | 3 | 2 | - | 4 | **9** |
| Horned Lark | 1 | - | - | - | **1** |
| Barn Swallow | 1 | - | - | - | **1** |
| Black-capped Chickadee | 32 | 42 | 17 | 23 | **114** |
| Tufted Titmouse | 1 | - | - | - | **1** |
| Red-breasted Nuthatch | - | - | 2 | 1 | **3** |
| White-breasted Nuthatch | 4 | 3 | 2 | 1 | **10** |
| Brown Creeper | - | - | 1 | - | **1** |
| Winter Wren | 1 | - | - | - | **1** |
| Ruby-crowned Kinglet | 1 | - | - | - | **1** |
| Eastern Bluebird | 1 | - | - | - | **1** |
| Veery | 2 | - | - | - | **2** |
| Hermit Thrush | 3 | - | - | - | **3** |
| Wood Thrush | 1 | - | 2 | - | **3** |
| American Robin | 11 | 26 | 11 | 24 | **72** |
| Gray Catbird | 17 | 13 | 2 | 9 | **41** |
| Cedar Waxwing | 52 | 17 | 4 | 16 | **89** |
| Blue-winged Warbler | 1 | - | - | - | **1** |
| Yellow Warbler | 1 | - | - | - | **1** |
| Magnolia Warbler | 1 | - | - | - | **1** |

**Table F-1 Fall Migratory Bird Survey Totals, Breeding Bird Survey by Date**

| Species | 9/3/2008 | 9/11/2008 | 9/19/2008 | 9/26/2008 | Total |
|---|---|---|---|---|---|
| Black-throated Blue Warbler | 1 | - | 1 | 1 | **3** |
| Blackburnian Warbler | - | - | 2 | - | **2** |
| American Redstart | 1 | - | - | - | **1** |
| Common Yellowthroat | 3 | 9 | 2 | 5 | **19** |
| Hooded Warbler | 3 | - | - | - | **3** |
| Wilson's Warbler | 5 | - | - | - | **5** |
| Canada Warbler | - | 1 | 2 | - | **3** |
| Eastern Towhee | 1 | 1 | - | - | **2** |
| Chipping Sparrow | - | 2 | 1 | - | **3** |
| Savannah Sparrow | 2 | - | 2 | - | **4** |
| Song Sparrow | 19 | 23 | 20 | 3 | **65** |
| Dark-eyed Junco | 6 | 1 | - | 17 | **24** |
| Northern Cardinal | 2 | - | 1 | - | **3** |
| Red-winged Blackbird | - | 14 | 33 | 83 | **130** |
| Common Grackle | - | - | - | 2 | **2** |
| Purple Finch | 3 | 5 | - | 4 | **12** |
| American Goldfinch | 38 | 35 | 25 | 18 | **116** |
| **Total Birds:** | **359** | **356** | **374** | **490** | **1579** |
| **Species Count:** | **50** | **30** | **33** | **34** | |
| **Total Species:** | **62** | | | | |

**Table F-2 Fall Migratory Bird Survey Results, September 3, 2008**

| Species | ( - indicates 0 sightings) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9/3/2008 | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Total |
| Wild Turkey | 9 | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - | - | - | **12** |
| Turkey Vulture | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5 | - | - | - | - | - | **5** |
| Red-tailed Hawk | - | - | - | - | - | - | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | **2** |
| American Kestrel | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Killdeer | - | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **2** |
| Ring-billed Gull | - | - | - | - | - | - | - | - | 5 | 1 | 1 | - | - | - | - | - | - | - | - | - | **7** |
| Mourning Dove | - | - | - | - | - | - | - | - | 4 | - | 1 | - | - | - | - | - | - | - | - | - | **5** |
| Black-billed Cuckoo | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - | **2** |
| Ruby-thr. Hummingbird | - | 1 | - | - | - | - | - | - | 1 | - | - | - | - | - | - | 1 | - | - | - | - | **3** |
| Belted Kingfisher | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | **1** |
| Yellow-bellied Sapsucker | - | 1 | - | - | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - | 1 | - | 1 | **5** |
| Downy Woodpecker | - | - | - | - | - | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **3** |
| Hairy Woodpecker | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | **1** |
| Northern Flicker | 1 | 1 | - | - | - | - | - | 2 | - | - | 1 | - | - | - | - | 1 | - | - | - | - | **6** |
| Pileated Woodpecker | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | 1 | - | - | - | **2** |
| Eastern Wood-Pewee | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Least Flycatcher | - | 2 | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | **3** |
| Blue-headed Vireo | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | **1** |
| Blue Jay | 3 | 2 | 1 | 2 | 4 | 3 | 3 | 3 | 1 | 1 | 4 | 3 | 3 | 4 | 2 | 2 | 2 | - | 2 | 5 | **50** |
| American Crow | 1 | - | - | - | - | 1 | 2 | - | 3 | 5 | 2 | 6 | 2 | 1 | - | 1 | - | 2 | 2 | 1 | **29** |
| Common Raven | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | 1 | 1 | - | - | - | **3** |
| Horned Lark | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Barn Swallow | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Black-capped Chickadee | 3 | 2 | 2 | 5 | - | 1 | 4 | 3 | - | 3 | 1 | - | 1 | 4 | 1 | 1 | 1 | - | - | - | **32** |
| Tufted Titmouse | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| White-breasted Nuthatch | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | 2 | 1 | - | - | - | **4** |
| Winter Wren | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | **1** |
| Ruby-crowned Kinglet | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Eastern Bluebird | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Veery | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | **2** |

**Table F-2 Fall Migratory Bird Survey Results, September 3, 2008**

| Species | ( - indicates 0 sightings) 9/3/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Total |
| Hermit Thrush | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - | - | - | - | 1 | - | - | **3** |
| Wood Thrush | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| American Robin | 1 | 1 | - | 6 | - | 1 | - | - | - | - | - | - | - | - | - | 1 | - | - | - | 1 | **11** |
| Gray Catbird | - | 1 | - | 1 | - | - | 2 | 2 | 3 | 1 | - | 1 | 1 | 2 | - | - | - | 1 | 1 | 1 | **17** |
| Cedar Waxwing | - | 11 | - | 10 | - | - | - | - | 5 | 2 | 2 | - | - | 9 | 11 | - | - | - | 1 | 1 | **52** |
| Blue-winged Warbler | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Yellow Warbler | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Magnolia Warbler | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Black-throated Blue Warbler | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | **1** |
| American Redstart | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Common Yellowthroat | - | 1 | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | **3** |
| Hooded Warbler | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | 2 | - | - | - | **3** |
| Wilson's Warbler | - | - | - | - | - | - | 2 | - | - | - | - | 1 | - | - | 1 | - | 1 | - | - | - | **5** |
| Eastern Towhee | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Savannah Sparrow | - | - | - | - | 1 | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | **2** |
| Song Sparrow | - | 2 | 1 | - | 4 | - | - | 2 | - | 2 | 2 | - | - | - | 4 | - | - | 1 | - | 1 | **19** |
| Dark-eyed Junco | - | - | - | - | - | - | - | 4 | - | - | - | - | - | - | - | - | 2 | - | - | - | **6** |
| Northern Cardinal | - | - | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - | - | - | - | - | **2** |
| Purple Finch | - | - | - | - | - | - | - | - | 1 | - | - | - | - | 2 | - | - | - | - | - | - | **3** |
| American Goldfinch | 3 | - | 2 | 3 | 5 | 1 | 3 | 10 | 3 | - | - | 1 | - | 2 | 1 | - | 1 | - | 2 | 1 | **38** |
| **Total Birds:** | **22** | **29** | **7** | **30** | **15** | **10** | **19** | **33** | **27** | **17** | **19** | **14** | **10** | **28** | **26** | **11** | **14** | **8** | **8** | **12** | **359** |
| **Species Count:** | **8** | **15** | **5** | **9** | **5** | **9** | **9** | **7** | **10** | **8** | **11** | **7** | **6** | **10** | **8** | **9** | **11** | **7** | **5** | **8** | |
| **Total Species:** | **50** | | | | | | | | | | | | | | | | | | | | |

**Table F-3 Fall Migratory Bird Survey Results, September 11, 2008**

| Species | ( - indicates 0 sightings) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9/11/2008 | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Total |
| Canada Goose | - | - | - | - | - | - | - | - | - | - | - | - | 4 | - | - | - | - | - | 3 | - | **7** |
| Wild Turkey | - | - | - | - | - | - | - | - | - | - | - | - | 7 | - | 4 | - | - | - | - | - | **11** |
| Red-tailed Hawk | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Ring-billed Gull | - | - | - | - | - | - | - | - | 8 | 8 | - | - | - | - | - | - | - | - | - | - | **16** |
| Mourning Dove | - | - | - | - | 1 | - | - | - | 5 | 3 | - | - | - | - | - | - | - | - | - | - | **9** |
| Belted Kingfisher | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | **1** |
| Yellow-bellied Sapsucker | - | - | 1 | - | - | 1 | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | **3** |
| Downy Woodpecker | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | 1 | 1 | - | - | - | **3** |
| Hairy Woodpecker | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | **2** |
| Northern Flicker | - | - | - | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 2 | 1 | - | - | - | - | **7** |
| Eastern Wood-Pewee | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | 1 | - | - | - | **3** |
| Blue-headed Vireo | - | - | - | - | 1 | 1 | - | - | - | 1 | - | - | - | - | - | - | - | - | - | 1 | **4** |
| Red-eyed Vireo | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | 1 | - | **2** |
| Blue Jay | 2 | 4 | 2 | 5 | 6 | 4 | 2 | 2 | - | 4 | 1 | 2 | 4 | 2 | 4 | 4 | 1 | 2 | 2 | 4 | **57** |
| American Crow | 1 | - | - | 2 | 2 | 2 | 5 | 6 | 3 | 3 | 3 | - | 2 | 1 | 1 | - | - | 1 | 2 | 2 | **36** |
| Common Raven | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | **2** |
| Black-capped Chickadee | 2 | 1 | 9 | - | 1 | 2 | - | 2 | 2 | 2 | 2 | - | - | 3 | - | 6 | 4 | - | 3 | 3 | **42** |
| White-breasted Nuthatch | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | 1 | - | **3** |
| American Robin | - | - | 2 | 20 | - | 1 | - | - | 1 | - | 1 | - | - | - | - | - | - | - | - | 1 | **26** |
| Gray Catbird | - | - | - | - | 1 | - | - | 2 | 4 | 2 | 1 | 1 | - | 1 | - | - | - | - | 1 | - | **13** |
| Cedar Waxwing | - | 7 | 2 | 2 | 5 | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | **17** |
| Common Yellowthroat | - | 2 | 2 | - | - | - | - | 1 | - | 1 | 1 | - | - | 1 | - | - | - | - | - | 1 | **9** |
| Canada Warbler | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Eastern Towhee | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Chipping Sparrow | - | - | 1 | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | **2** |
| Song Sparrow | - | - | 4 | - | 6 | - | - | - | 2 | 6 | - | 2 | - | - | 3 | - | - | - | - | - | **23** |
| Dark-eyed Junco | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | **1** |

**Table F-3 Fall Migratory Bird Survey Results, September 11, 2008**

| Species | ( - indicates 0 sightings) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9/11/2008 | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Total |
| Red-winged Blackbird | - | - | - | - | - | - | - | - | - | 13 | - | - | - | - | - | - | - | - | - | 1 | **14** |
| Purple Finch | - | - | 1 | - | - | - | - | - | - | 4 | - | - | - | - | - | - | - | - | - | - | **5** |
| American Goldfinch | 2 | - | 9 | - | 2 | - | - | 4 | - | 3 | - | 1 | 1 | 2 | 3 | - | 2 | - | 6 | - | **35** |
| **Total Birds:** | **8** | **14** | **34** | **32** | **26** | **13** | **7** | **18** | **27** | **53** | **10** | **6** | **18** | **12** | **17** | **15** | **10** | **3** | **20** | **13** | **356** |
| **Species Count:** | **5** | **4** | **11** | **6** | **10** | **6** | **2** | **2** | **9** | **15** | **7** | **4** | **5** | **8** | **6** | **6** | **6** | **2** | **9** | **7** | |
| **Total Species:** | **30** | | | | | | | | | | | | | | | | | | | | |

**Table F-4 Fall Migratory Bird Survey Results, September 19, 2008**

| Species | ( - indicates 0 sightings) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9/19/2008 | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Total |
| Canada Goose | - | - | - | - | 4 | - | - | - | - | - | 9 | - | 36 | - | - | - | - | - | - | - | **49** |
| Wild Turkey | - | - | - | - | - | - | - | - | - | - | 10 | - | - | - | 1 | - | - | - | 1 | 9 | **21** |
| Turkey Vulture | - | - | - | - | - | - | - | 3 | 16 | - | 9 | - | - | - | - | - | - | - | - | - | **28** |
| Red-shouldered Hawk | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | 1 | - | - | - | **2** |
| American Kestrel | - | - | - | - | - | - | - | - | 1 | - | 2 | - | - | - | - | - | - | - | - | - | **3** |
| Ring-billed Gull | - | - | - | - | - | - | - | - | 10 | 7 | 5 | - | - | - | - | - | - | - | - | - | **22** |
| Mourning Dove | 1 | - | - | - | 2 | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | **4** |
| Ruby-thr. Hummingbird | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | **1** |
| Yellow-bellied Sapsucker | - | - | - | - | - | 1 | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | **2** |
| Downy Woodpecker | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | **1** |
| Northern Flicker | - | 1 | - | 1 | - | 1 | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | **4** |
| Blue-headed Vireo | 2 | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | 1 | - | - | - | **4** |
| Red-eyed Vireo | - | - | - | 1 | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | **2** |
| Blue Jay | 5 | 2 | 4 | 4 | 5 | 19 | 5 | 3 | 1 | 3 | 2 | 2 | 4 | 2 | 3 | - | 2 | - | - | 3 | **69** |
| American Crow | 1 | 4 | 2 | 5 | - | 1 | 4 | 3 | 3 | - | 3 | 1 | - | - | 1 | - | - | - | 1 | 3 | **32** |
| Black-capped Chickadee | - | - | - | 2 | - | 4 | 1 | - | - | 1 | - | 2 | 1 | - | - | 3 | 1 | - | 2 | - | **17** |
| Red-breasted Nuthatch | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | 1 | - | - | - | - | **2** |
| White-breasted Nuthatch | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | **2** |
| Brown Creeper | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | **1** |
| Wood Thrush | 1 | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **2** |
| American Robin | - | - | 1 | - | - | 1 | 2 | - | - | - | - | 1 | - | 4 | 1 | - | - | 1 | - | - | **11** |
| Gray Catbird | - | - | - | - | - | - | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | **2** |
| Cedar Waxwing | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | 3 | - | - | **4** |
| Black-throated Blue Warbler | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Blackburnian Warbler | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - | - | - | **2** |
| Common Yellowthroat | - | - | - | 1 | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | **2** |
| Canada Warbler | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | **2** |
| Chipping Sparrow | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Savannah Sparrow | - | - | - | - | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - | - | - | **2** |
| Song Sparrow | 1 | 3 | - | 1 | 9 | - | 1 | 1 | - | 2 | - | 1 | - | - | 1 | - | - | - | - | - | **20** |
| Northern Cardinal | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | **1** |

**Table F-4 Fall Migratory Bird Survey Results, September 19, 2008**

| Species | ( - indicates 0 sightings) 9/19/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Total |
| Red-winged Blackbird | - | - | - | - | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 30 | **33** |
| American Goldfinch | - | 1 | - | 1 | - | - | - | 2 | - | 2 | 3 | 1 | 5 | 6 | 2 | 1 | 1 | - | - | - | **25** |
| **Total Birds:** | **11** | **11** | **7** | **19** | **23** | **27** | **17** | **13** | **33** | **17** | **44** | **11** | **47** | **15** | **10** | **6** | **10** | **4** | **4** | **45** | **374** |
| **Species Count:** | **6** | **5** | **3** | **11** | **5** | **4** | **9** | **2** | **7** | **7** | **9** | **8** | **5** | **6** | **7** | **4** | **8** | **2** | **3** | **4** | |
| **Total Species:** | **33** | | | | | | | | | | | | | | | | | | | | |

**Table F-5 Fall Migratory Bird Survey Results, September 26, 2008**

| Species | ( - indicates 0 sightings) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9/26/2008 | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Total |
| Canada Goose | - | - | - | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **2** |
| Mallard | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | **1** |
| Wild Turkey | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Turkey Vulture | - | 1 | - | - | - | - | - | - | 5 | - | 16 | - | - | - | - | - | - | - | - | - | **22** |
| Sharp-shinned Hawk | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Red-tailed Hawk | - | - | - | - | - | - | - | 1 | - | 2 | 1 | - | - | - | - | - | - | - | - | - | **4** |
| American Kestrel | - | - | - | - | - | - | - | 2 | - | - | 1 | - | - | - | - | - | - | - | - | - | **3** |
| Killdeer | - | - | - | - | 1 | - | 9 | - | - | - | - | - | - | - | - | - | - | - | - | - | **10** |
| Ring-billed Gull | - | - | - | - | - | - | - | - | 15 | 16 | 18 | - | - | - | - | - | - | - | - | - | **49** |
| Mourning Dove | - | - | - | - | 1 | - | - | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | **7** |
| Ruby-thr. Hummingbird | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | **2** |
| Downy Woodpecker | - | - | 1 | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | **2** |
| Hairy Woodpecker | - | 1 | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | **2** |
| Northern Flicker | - | - | - | - | - | - | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - | - | **2** |
| Pileated Woodpecker | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | **1** |
| Eastern Wood-Pewee | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1** |
| Blue-headed Vireo | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | **1** |
| Blue Jay | 4 | 4 | 2 | 1 | 9 | 5 | 2 | 4 | 1 | - | - | 2 | 1 | 6 | - | 1 | - | 2 | 1 | 2 | **47** |
| American Crow | 1 | - | 2 | 8 | 68 | 2 | 10 | 2 | 1 | 7 | 4 | 5 | 2 | 2 | 5 | - | - | - | 2 | - | **121** |
| Common Raven | - | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - | - | - | 1 | - | 1 | - | **4** |
| Black-capped Chickadee | 1 | - | - | 4 | - | 4 | 1 | - | - | 5 | - | 2 | 1 | 3 | 1 | 1 | - | - | - | - | **23** |
| Red-breasted Nuthatch | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | **1** |
| White-breasted Nuthatch | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | **1** |
| American Robin | 2 | - | - | 1 | 3 | 1 | 5 | - | 1 | - | - | - | 5 | 5 | - | - | 1 | - | - | - | **24** |
| Gray Catbird | - | - | - | - | - | - | 1 | - | 1 | 1 | - | 3 | - | 1 | - | - | - | - | 2 | - | **9** |
| Cedar Waxwing | - | - | - | - | - | - | - | - | - | 2 | 1 | 13 | - | - | - | - | - | - | - | - | **16** |
| Black-throated Blue Warbler | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - | **1** |
| Common Yellowthroat | - | - | - | - | - | - | 1 | - | 1 | - | - | 1 | - | 1 | - | - | - | - | 1 | - | **5** |
| Song Sparrow | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - | - | - | 1 | 1 | **3** |
| Dark-eyed Junco | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | 9 | 5 | 1 | - | - | 1 | **17** |
| Red-winged Blackbird | - | - | - | - | - | 60 | 23 | - | - | - | - | - | - | - | - | - | - | - | - | - | **83** |

**Table F-5 Fall Migratory Bird Survey Results, September 26, 2008**

| Species | ( - indicates 0 sightings) 9/26/2008 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Total |
| Common Grackle | - | - | - | - | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **2** |
| Purple Finch | - | - | - | - | - | - | - | - | - | 2 | - | 1 | - | - | 1 | - | - | - | - | - | **4** |
| American Goldfinch | - | - | 5 | - | 1 | - | - | 2 | 1 | 3 | 5 | 1 | - | - | - | - | - | - | - | - | **18** |
| **Total Birds:** | **9** | **6** | **10** | **15** | **89** | **72** | **52** | **14** | **31** | **39** | **46** | **30** | **10** | **24** | **16** | **8** | **4** | **2** | **9** | **4** | **490** |
| **Species Count:** | **5** | **3** | **4** | **5** | **11** | **4** | **8** | **1** | **11** | **9** | **7** | **10** | **5** | **12** | **4** | **4** | **4** | **1** | **7** | **3** | |
| **Total Species:** | **34** | | | | | | | | | | | | | | | | | | | | |

# G E & E Breeding Bird Survey Data

**Table G-1 Breeding Bird Survey Totals by Date**

| Species | 6/9 – 6/10 | 6/24 - 6/25 | Total |
|---|---|---|---|
| Canada Goose | 2 | 2 | **4** |
| Ring-necked Pheasant | 1 | 0 | **1** |
| Wild Turkey | 3 | 13 | **16** |
| Great Blue Heron | 0 | 1 | **1** |
| Turkey Vulture | 3 | 5 | **8** |
| Broad-winged Hawk | 0 | 1 | **1** |
| Red-tailed Hawk | 0 | 1 | **1** |
| Killdeer | 1 | 1 | **2** |
| Mourning Dove | 2 | 5 | **7** |
| Black-billed Cuckoo | 2 | 2 | **4** |
| Yellow-billed Cuckoo | 2 | 2 | **4** |
| Yellow-bellied Sapsucker | 4 | 9 | **13** |
| Downy Woodpecker | 1 | 1 | **2** |
| Northern Flicker | 3 | 2 | **5** |
| Pileated Woodpecker | 0 | 1 | **1** |
| Eastern Wood-Pewee | 8 | 10 | **18** |
| Least Flycatcher | 2 | 3 | **5** |
| Great Crested Flycatcher | 4 | 5 | **9** |
| Eastern Kingbird | 1 | 6 | **7** |
| Blue-headed Vireo | 1 | 5 | **6** |
| Red-eyed Vireo | 42 | 36 | **78** |
| Blue Jay | 16 | 16 | **32** |
| American Crow | 29 | 66 | **95** |
| Barn Swallow | 1 | 10 | **11** |
| Black-capped Chickadee | 11 | 11 | **22** |
| Tufted Titmouse | 2 | 0 | **2** |
| Red-breasted Nuthatch | 0 | 2 | **2** |
| White-breasted Nuthatch | 2 | 3 | **5** |
| Brown Creeper | 1 | 1 | **2** |
| House Wren | 1 | 5 | **6** |
| Winter Wren | 1 | 1 | **2** |
| Eastern Bluebird | 0 | 1 | **1** |
| Veery | 15 | 16 | **31** |
| Hermit Thrush | 8 | 11 | **19** |
| Wood Thrush | 5 | 3 | **8** |
| American Robin | 37 | 51 | **88** |
| Gray Catbird | 3 | 8 | **11** |
| Brown Thrasher | 2 | 1 | **3** |
| Cedar Waxwing | 2 | 15 | **17** |
| Nashville Warbler | 1 | 0 | **1** |
| Yellow Warbler | 2 | 4 | **6** |
| Chestnut-sided Warbler | 4 | 4 | **8** |
| Magnolia Warbler | 1 | 0 | **1** |
| Black-throated Blue Warbler | 6 | 9 | **15** |
| Yellow-rumped Warbler | 2 | 4 | **6** |

**Table G-1 Breeding Bird Survey Totals by Date**

| Species | 6/9 – 6/10 | 6/24 - 6/25 | Total |
|---|---|---|---|
| Black-thr. Green Warbler | 1 | 6 | **7** |
| Black-and-white Warbler | 1 | 3 | **4** |
| American Redstart | 13 | 8 | **21** |
| Ovenbird | 28 | 26 | **54** |
| Mourning Warbler | 6 | 7 | **13** |
| Common Yellowthroat | 12 | 15 | **27** |
| Hooded Warbler | 7 | 8 | **15** |
| Canada Warbler | 1 | 0 | **1** |
| Scarlet Tanager | 2 | 10 | **12** |
| Eastern Towhee | 7 | 3 | **10** |
| Chipping Sparrow | 2 | 8 | **10** |
| Field Sparrow | 5 | 4 | **9** |
| Vesper Sparrow | 1 | 0 | **1** |
| Savannah Sparrow | 9 | 17 | **26** |
| Song Sparrow | 25 | 25 | **50** |
| Dark-eyed Junco | 3 | 3 | **6** |
| Rose-breasted Grosbeak | 13 | 18 | **31** |
| Indigo Bunting | 9 | 9 | **18** |
| Bobolink | 5 | 10 | **15** |
| Red-winged Blackbird | 8 | 23 | **31** |
| Common Grackle | 1 | 3 | **4** |
| Brown-headed Cowbird | 9 | 7 | **16** |
| Baltimore Oriole | 0 | 1 | **1** |
| Purple Finch | 0 | 2 | **2** |
| American Goldfinch | 6 | 19 | **25** |
| **Total Birds:** | **408** | **588** | **996** |
| **Species Count:** | **64** | **64** | |
| **Total Species:** | **70** | | |

**Table G-2 Breeding Bird Survey Results, June 9, 2008**

| Species | 6/9/2008 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 6 | 10 | 11 | 12 | 17 | 19 | 21 | 22 | 24 | 25 | Total |
| Canada Goose | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Ring-necked Pheasant | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **1** |
| Wild Turkey | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Turkey Vulture | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Mourning Dove | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **1** |
| Black-billed Cuckoo | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Yellow-bellied | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **2** |
| Downy Woodpecker | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Northern Flicker | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **2** |
| Eastern Wood-Pewee | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | **3** |
| Least Flycatcher | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | **2** |
| Great Crested | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **2** |
| Eastern Kingbird | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Red-eyed Vireo | 2 | 3 | 2 | 2 | 0 | 3 | 2 | 1 | 2 | 2 | 1 | 3 | 2 | **25** |
| Blue Jay | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | **6** |
| American Crow | 2 | 7 | 0 | 3 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | **17** |
| Barn Swallow | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Black-capped Chickadee | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **5** |
| Tufted Titmouse | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| White-breasted | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | **2** |
| House Wren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Veery | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | **7** |
| Hermit Thrush | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 2 | 0 | **6** |
| Wood Thrush | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **2** |
| American Robin | 4 | 4 | 2 | 3 | 2 | 2 | 0 | 2 | 2 | 1 | 0 | 2 | 2 | **26** |
| Gray Catbird | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| Brown Thrasher | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Cedar Waxwing | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Yellow Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| Black-throated Blue | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | **4** |

**Table G-2 Breeding Bird Survey Results, June 9, 2008**

| Species | 6/9/2008 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 6 | 10 | 11 | 12 | 17 | 19 | 21 | 22 | 24 | 25 | Total |
| Warbler | | | | | | | | | | | | | | |
| Black-thr. Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **1** |
| American Redstart | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 3 | 0 | 0 | 1 | 0 | **6** |
| Ovenbird | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 2 | 0 | **12** |
| Mourning Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | **2** |
| Common Yellowthroat | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | **5** |
| Hooded Warbler | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | **4** |
| Canada Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| Chipping Sparrow | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **2** |
| Field Sparrow | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Vesper Sparrow | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Savannah Sparrow | 2 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **7** |
| Song Sparrow | 2 | 2 | 0 | 3 | 2 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | **14** |
| Rose-breasted | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | **6** |
| Indigo Bunting | 1 | 2 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **7** |
| Bobolink | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Red-winged Blackbird | 0 | 1 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **7** |
| Brown-headed Cowbird | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | **4** |
| American Goldfinch | 2 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **6** |
| **Total Birds:** | **22** | **28** | **13** | **23** | **24** | **19** | **9** | **16** | **14** | **11** | **14** | **14** | **12** | **219** |
| **Species Count:** | **13** | **12** | **9** | **13** | **14** | **11** | **7** | **13** | **8** | **8** | **11** | **9** | **8** | |
| **Total Species:** | **48** | | | | | | | | | | | | | |

**Table G-3 Breeding Bird Survey Results, June 10, 2008**

| Species | 6/10/2008 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 26 | 27 | 28 | 29 | 32 | 34 | 35 | 39 | 40 | 41 | 42 | Total |
| Wild Turkey | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **2** |
| Killdeer | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Mourning Dove | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Black-billed Cuckoo | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **1** |
| Yellow-billed Cuckoo | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **2** |
| Yellow-bellied | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **2** |
| Northern Flicker | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Eastern Wood-Pewee | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | **5** |
| Great Crested | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Blue-headed Vireo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Red-eyed Vireo | 4 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 3 | 0 | **17** |
| Blue Jay | 0 | 2 | 0 | 2 | 2 | 0 | 0 | 2 | 1 | 1 | 0 | **10** |
| American Crow | 3 | 3 | 1 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **12** |
| Black-capped Chickadee | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 1 | 0 | **6** |
| Brown Creeper | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| Winter Wren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Veery | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 1 | 1 | 0 | **8** |
| Hermit Thrush | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Wood Thrush | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | **3** |
| American Robin | 3 | 0 | 2 | 0 | 0 | 3 | 0 | 1 | 2 | 0 | 0 | **11** |
| Gray Catbird | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **2** |
| Brown Thrasher | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Nashville Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Yellow Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Chestnut-sided Warbler | 0 | 0 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | **4** |
| Magnolia Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| Black-throated Blue | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | **2** |
| Warbler | | | | | | | | | | | | |
| Yellow-rumped Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | **2** |
| Black-and-white | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |

**Table G-3 Breeding Bird Survey Results, June 10, 2008**

| Species | 6/10/2008 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 26 | 27 | 28 | 29 | 32 | 34 | 35 | 39 | 40 | 41 | 42 | Total |
| American Redstart | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 1 | 2 | 0 | 0 | **7** |
| Ovenbird | 1 | 1 | 3 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 0 | **16** |
| Mourning Warbler | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | **4** |
| Common Yellowthroat | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 3 | **7** |
| Hooded Warbler | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | **3** |
| Scarlet Tanager | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **2** |
| Eastern Towhee | 0 | 2 | 1 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | **7** |
| Field Sparrow | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | **4** |
| Savannah Sparrow | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Song Sparrow | 2 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | **11** |
| Dark-eyed Junco | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | **3** |
| Rose-breasted | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 2 | 1 | 0 | **7** |
| Indigo Bunting | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Bobolink | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | **3** |
| Red-winged Blackbird | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Common Grackle | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Brown-headed Cowbird | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | **5** |
| **Total Birds:** | **29** | **17** | **20** | **15** | **12** | **17** | **17** | **16** | **17** | **11** | **18** | **189** |
| **Species Count:** | **0** | **17** | **10** | **14** | **9** | **8** | **12** | **13** | **12** | **13** | **8** | **9** |
| **Total Species:** | **46** | | | | | | | | | | | |

**Table G-4 Breeding Bird Survey Results, June 24, 2008**

| Species | 6/24/2008 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 6 | 10 | 11 | 12 | 17 | 19 | 21 | 22 | 24 | 25 | Total |
| Canada Goose | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Wild Turkey | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 3 | **9** |
| Great Blue Heron | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Turkey Vulture | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Red-tailed Hawk | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Killdeer | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Black-billed Cuckoo | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Yellow-billed Cuckoo | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Yellow-bellied | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | **4** |
| Downy Woodpecker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **1** |
| Northern Flicker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | **2** |
| Eastern Wood-Pewee | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 1 | **6** |
| Least Flycatcher | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **2** |
| Great Crested | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | **2** |
| Eastern Kingbird | 2 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **5** |
| Blue-headed Vireo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Red-eyed Vireo | 2 | 2 | 3 | 3 | 0 | 1 | 2 | 2 | 3 | 2 | 2 | 1 | 1 | **24** |
| Blue Jay | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 3 | 0 | 3 | 0 | **9** |
| American Crow | 5 | 5 | 0 | 7 | 4 | 8 | 0 | 0 | 1 | 1 | 4 | 0 | 4 | **39** |
| Barn Swallow | 0 | 3 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **7** |
| Black-capped Chickadee | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | **7** |
| Red-breasted Nuthatch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| White-breasted | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **2** |
| House Wren | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **3** |
| Eastern Bluebird | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Veery | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 2 | 0 | 1 | 1 | 2 | 0 | **9** |
| Hermit Thrush | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 2 | 0 | **5** |
| Wood Thrush | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **2** |
| American Robin | 3 | 3 | 2 | 4 | 2 | 4 | 0 | 3 | 3 | 0 | 2 | 3 | 1 | **30** |
| Gray Catbird | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |

**Table G-4 Breeding Bird Survey Results, June 24, 2008**

| Species | 6/24/2008 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 6 | 10 | 11 | 12 | 17 | 19 | 21 | 22 | 24 | 25 | Total |
| Brown Thrasher | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Cedar Waxwing | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Yellow Warbler | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Chestnut-sided Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **1** |
| Black-throated Blue | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | **4** |
| Warbler | | | | | | | | | | | | | | |
| Black-thr. Green | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | **4** |
| Black-and-white | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| American Redstart | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | **5** |
| Ovenbird | 0 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 0 | 0 | 1 | 2 | **14** |
| Mourning Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 1 | **4** |
| Common Yellowthroat | 2 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | **8** |
| Hooded Warbler | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | **5** |
| Scarlet Tanager | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | **5** |
| Chipping Sparrow | 1 | 0 | 0 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **5** |
| Field Sparrow | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Savannah Sparrow | 3 | 6 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **13** |
| Song Sparrow | 1 | 3 | 0 | 2 | 3 | 2 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | **14** |
| Rose-breasted | 0 | 0 | 2 | 0 | 2 | 0 | 1 | 1 | 1 | 0 | 2 | 0 | 2 | **11** |
| Indigo Bunting | 1 | 1 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **7** |
| Bobolink | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Red-winged Blackbird | 2 | 4 | 0 | 0 | 7 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **17** |
| Common Grackle | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | **2** |
| Brown-headed Cowbird | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Purple Finch | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| American Goldfinch | 3 | 3 | 0 | 2 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 1 | 0 | **13** |
| **Total Birds:** | **30** | **35** | **18** | **31** | **40** | **41** | **16** | **20** | **20** | **19** | **19** | **21** | **20** | **330** |
| **Species Count:** | **16** | **13** | **12** | **15** | **17** | **17** | **10** | **14** | **14** | **12** | **12** | **13** | **12** | |
| **Total Species:** | **55** | | | | | | | | | | | | | |

**Table G-5 Breeding Bird Survey Results, June 25, 2008**

| Species | 6/25/2008 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 26 | 27 | 28 | 29 | 32 | 34 | 35 | 39 | 40 | 41 | 42 | Total |
| Wild Turkey | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | **4** |
| Turkey Vulture | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | **3** |
| Broad-winged Hawk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| Mourning Dove | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | **5** |
| Black-billed Cuckoo | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Yellow-billed Cuckoo | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **1** |
| Yellow-bellied | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | **5** |
| Pileated Woodpecker | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **1** |
| Eastern Wood-Pewee | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | **4** |
| Least Flycatcher | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Great Crested | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | **3** |
| Eastern Kingbird | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Blue-headed Vireo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | **4** |
| Red-eyed Vireo | 2 | 0 | 0 | 1 | 2 | 2 | 2 | 1 | 0 | 2 | 0 | **12** |
| Blue Jay | 1 | 0 | 1 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | **7** |
| American Crow | 6 | 7 | 2 | 2 | 3 | 0 | 3 | 0 | 2 | 2 | 0 | **27** |
| Barn Swallow | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Black-capped Chickadee | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | **4** |
| Red-breasted Nuthatch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| White-breasted | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Brown Creeper | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **1** |
| House Wren | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Winter Wren | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| Veery | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 0 | 0 | **7** |
| Hermit Thrush | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 2 | 0 | 1 | 0 | **6** |
| Wood Thrush | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| American Robin | 2 | 1 | 1 | 3 | 2 | 4 | 2 | 3 | 1 | 2 | 0 | **21** |
| Gray Catbird | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 3 | **6** |
| Cedar Waxwing | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **12** |
| Yellow Warbler | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | **2** |

**Table G-5 Breeding Bird Survey Results, June 25, 2008**

| Species | 6/25/2008 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 26 | 27 | 28 | 29 | 32 | 34 | 35 | 39 | 40 | 41 | 42 | Total |
| Chestnut-sided Warbler | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | **3** |
| Black-throated Blue | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | **5** |
| Warbler | | | | | | | | | | | | |
| Yellow-rumped Warbler | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 0 | **4** |
| Black-thr. Green | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **2** |
| Black-and-white | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **2** |
| American Redstart | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | **3** |
| Ovenbird | 0 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 2 | 0 | **12** |
| Mourning Warbler | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **3** |
| Common Yellowthroat | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | **7** |
| Hooded Warbler | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | **3** |
| Scarlet Tanager | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | **5** |
| Eastern Towhee | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Chipping Sparrow | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | **3** |
| Field Sparrow | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | **2** |
| Savannah Sparrow | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **4** |
| Song Sparrow | 1 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | **11** |
| Dark-eyed Junco | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | **3** |
| Rose-breasted | 0 | 2 | 1 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | **7** |
| Indigo Bunting | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Bobolink | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | **7** |
| Red-winged Blackbird | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | **6** |
| Common Grackle | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | **1** |
| Brown-headed Cowbird | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | **4** |
| Baltimore Oriole | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Purple Finch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **1** |
| American Goldfinch | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | **6** |
| **Total Birds:** | **44** | **21** | **19** | **22** | **17** | **21** | **22** | **19** | **16** | **17** | **40** | **258** |
| **Species Count:** | **16** | **11** | **15** | **14** | **11** | **13** | **14** | **13** | **12** | **13** | **14** | |
| **Total Species:** | **56** | | | | | | | | | | | |

**Table G-6 NYS Breeding Bird Surveys**

| Location | Year | Dates Sampled | No. of Days | Total No. Species | Average No. of Species/Point | Total No. Observations | Average No. of Observations/point | No. of Survey Points |
|---|---|---|---|---|---|---|---|---|
| Chateaugay, Franklin Co. | 2006 | 6/8, 6/20 | 2 | 42 | 6.5 | 327 | 11.7 | 14* |
| Altona, Clinton Co. | 2007 | 6/19, 6/20 | 2 | 40 | 6.6 | 224 | 9.0 | 25 |
| Ellenberg, Clinton Co. | 2006 | 6/7, 6/19 | 2 | 46 | 6.7 | 266 | 11.5 | 10* |
| Wethersfield, Wyoming Co. | 2006 | 6/5, 6/22 | 2 | 54 | 7.7 | 408 | 14.6 | 15* |
| Altona, Clinton Co. | 2005 | 6/8, 6/28 | 2 | 41 | 9.8 | 193 | 13.8 | 7* |
| Clinton, Clinton Co. | 2005 | 6/9, 6/29 | 2 | 57 | 9.9 | 289 | 13.1 | 11* |
| Centerville, Allegany Co. | 2006 | 6/6, 6/23 | 2 | 46 | 10.2 | 252 | 26.2 | 14* |
| Ellenburg, Clinton Co. | 2007 | 6/18 | 1 | 49 | 10.2 | 397 | 16.5 | 24 |
| Bliss, Wyoming Co. | 2007 | 6/14, 6/16 | 2 | 60 | 10.7 | 486 | 18.0 | 10 |
| Centerville, Allegany Co. | 2008 | 6/3, 6/4 | 2 | 66 | 11.1 | 508 | 21.2 | 24* |
| Villenova (Ball Hill), Chautauqua Co. | 2007 | 6/11, 6/26 | 2 | 68 | 11.2 | 609 | 23.4 | 13* |
| Ripley-Westfield, Chautauqua Co. | 2008 | 6/6, 6/7 | 2 | 60 | 11.4 | 578 | 22.2 | 26 |
| Chautauqua Windpower, Chautauqua Co. | 2003 | 6/15, 6/28 | 2 | 81 | 11.3 | 1,416 | 16.2 | 44 |
| Bliss, Wyoming Co. | 2005 | 6/10, 6/28 | 2 | 54 | 11.7 | 294 | 16.4 | 9* |
| Clinton, Clinton Co. | 2007 | 6/12, 6/13 | 2 | 65 | 11.7 | 433 | 18.8 | 23 |
| **Crown City Wind Farm, Cortland Co.** | **2008** | **6/9, 6/10, 6/24, 6/25** | **4** | **70** | **12.2** | **996** | **20.8** | **24** |
| Villenova (Ball Hill), Chautauqua Co. | 2008 | 6/11, 6/12 | 2 | 72 | 14.1 | 653 | 25.1 | 26 |
| Allegany Wind Project, Cattaraugus Co. | 2007 | 5/15, 5/16, 6/7, 6/8, 6/21, 6/22 | 6 | 52 | N/A | 715 | N/A | 30 |
| Dairy Hill Wind Project, Wyoming Co. | 2005 | 6/6, 6/7, 6/13, 6/14 | 4 | 58 | N/A | 747 | N/A | 30 |

* All survey points were surveyed each sample day.

# H E & E Active Bat Acoustical Monitoring Study Data

**Table H-1 Total Calls per Species Group per Survey Night in the Proposed Crown City Wind Farm Project Area**

| | June 3, 2008[1] | June 4, 2008 | June 5, 2008 | July 1, 2008 | July 2, 2008 | July 28, 2008 | Total |
|---|---|---|---|---|---|---|---|
| Myotis Species Group | 76 | 75 | 70 | 121 | 109 | 237 | **688** |
| Eastern Red/Tri-colored Bat Species Group | 0 | 1 | 2 | 42 | 3 | 4 | **52** |
| Big Brown/Silver-haired/ Hoary Bat Species Group | 8 | 2 | 2 | 55 | 31 | 27 | **125** |
| Unidentified Species Group | 24 | 18 | 17 | 27 | 15 | 42 | **143** |
| **Total Calls** | **108** | **96** | **91** | **245** | **158** | **310** | **1,008** |

[1] Site L was not sampled on the first survey night.

**Table H-2 Total Calls per Species Group per Survey Point on June 3, 2008, in the Proposed Crown City Wind Farm Project Area**

| Survey Point | A | B | C | D | E | F | G | H | I | J | K | L[1] | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Time | 2038 - 2048 | 2241 - 2253 | 2319 - 2329 | 2341 - 2351 | 2130 - 2140 | 0003 - 0013 | 0028 - 0038 | 0050 - 0102 | 0111 - 0121 | 0127 - 0137 | 0145 - 0155 | - | |
| Myotis Species Group | 0 | 6 | 1 | 1 | 4 | 38 | 0 | 8 | 16 | 2 | 0 | - | **76** |
| Eastern Red/ Tri-colored Bat Species Group | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | **0** |
| Big Brown/Silver-haired/Hoary Bat Species Group | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 5 | 0 | 0 | 0 | - | **8** |
| Unidentified Species Group | 0 | 1 | 0 | 1 | 11 | 4 | 0 | 0 | 0 | 6 | 1 | - | **24** |
| **Total Calls** | **0** | **7** | **3** | **2** | **16** | **42** | **0** | **13** | **16** | **8** | **1** | **-** | **108** |

[1] Site L was not sampled on the first survey night.

**Table H-3 Total Calls per Species Group per Survey Point on June 4, 2008, in the Proposed Crown City Wind Farm Project Area**

| Survey Point | A | B | C | D | E | F | G | H | I | J | K | L | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Time | 0115 - 0125 | 0047 - 0058 | 0015 - 0026 | 0033 - 0043 | 2347 - 2358 | 2318 - 2332 | 2236 - 2246 | 2212 - 2222 | 2154 - 2204 | 2134 - 2144 | 2103 - 2120 | 2258 - 2310 | |
| Myotis Species Group | 0 | 32 | 7 | 0 | 4 | 15 | 0 | 0 | 3 | 1 | 2 | 11 | **75** |
| Eastern Red/ Tri-colored Bat Species Group | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Big Brown/Silver-haired/Hoary Bat Species Group | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | **2** |
| Unidentified Species Group | 0 | 0 | 8 | 1 | 4 | 1 | 0 | 1 | 0 | 0 | 1 | 2 | **18** |
| **Total Calls** | **0** | **33** | **15** | **1** | **8** | **16** | **0** | **1** | **5** | **1** | **3** | **13** | **96** |

**Table H-4 Total Calls per Species Group per Survey Point on June 5, 2008, in the Proposed Crown City Wind Farm Project Area**

| Survey Point | A | B | C[1] | D | E | F | G[2] | H | I | J | K | L | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Time | 0009 - 0019 | 2304 - 2315 | 2325 - 2335 | 2341 - 2351 | 0031 - 0041 | 2246 - 2256 | 0123 - 0133 | 2042 - 2052 | 2102 - 2112 | 2120 - 2130 | 0059 - 0111 | 2226 - 2238 | |
| Myotis Species Group | 0 | 9 | 0 | 0 | 3 | 34 | 0 | 0 | 5 | 0 | 5 | 14 | **70** |
| Eastern Red/ Tri-colored Bat Species Group | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | **2** |
| Big Brown/Silver-haired/Hoary Bat Species Group | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | | **2** |
| Unidentified Species Group | 3 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 7 | 4 | **17** |
| **Total Calls** | **3** | **11** | **0** | **0** | **3** | **35** | **0** | **0** | **8** | **0** | **12** | **19** | **91** |

[1] Light rain during survey period

[2] Moderate winds at survey location during survey period

**Table H-5 Total Calls per Species Group per Survey Point on July 1, 2008, in the Proposed Crown City Wind Farm Project Area**

| Survey Point | A | B | C | D | E | F | G | H | I | J | K | L | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Time | 2239 - 2250 | 2151 - 2201 | 2116 - 2126 | 2132 - 2142 | 2212 - 2222 | 2305 - 2315 | 2349 - 2359 | 0010 - 0021 | 0030 - 0045 | 0052 - 0104 | 0119 - 0130 | 2324 - 2334 | |
| Myotis Species Group | 9 | 0 | 17 | 0 | 1 | 3 | 3 | 37 | 44 | 7 | 0 | 0 | **121** |
| Eastern Red/ Tri-colored Bat Species Group | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 41 | 0 | 0 | **42** |
| Big Brown/Silver-haired/Hoary Bat Species Group | 1 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 28 | 0 | **55** |
| Unidentified Species Group | 1 | 0 | 8 | 0 | 1 | 2 | 3 | 5 | 1 | 0 | 5 | 1 | **27** |
| **Total Calls** | **11** | **18** | **25** | **0** | **2** | **5** | **6** | **42** | **46** | **56** | **33** | **1** | **245** |

**Table H-6 Total Calls per Species Group per Survey Point on July 2, 2008, in the Proposed Crown City Wind Farm Project Area**

| Survey Point | A | B | C | D | E | F | G | H | I | J | K | L | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Time | 0126 - 0136 | 0029 - 0045 | 2354 - 0006 | 0013 - 0023 | 0058 - 0108 | 2333 - 2343 | 2221 - 2231 | 2157 - 2207 | 2135 - 2146 | 2114 - 2124 | 2249 - 2303 | 2315 - 2325 | |
| Myotis Species Group | 1 | 69 | 12 | 1 | 2 | 6 | 1 | 1 | 8 | 2 | 6 | 0 | **109** |
| Eastern Red/ Tri-colored Bat Species Group | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **3** |
| Big Brown/Silver-haired/Hoary Bat Species Group | 0 | 26 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 2 | 0 | 0 | **31** |
| Unidentified Species Group | 2 | 0 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 2 | 6 | 0 | **15** |
| **Total Calls** | **3** | **95** | **17** | **1** | **3** | **9** | **1** | **1** | **10** | **6** | **12** | **0** | **158** |

**Table H-7 Total Calls per Species Group per Survey Point on July 28, 2008, in the Proposed Crown City Wind Farm Project Area**

| Survey Point | A | B | C | D | E | F | G | H | I | J | K | L | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Time | 2323 - 2333 | 2343 - 2354 | 2125 - 2136 | 2141 - 2151 | 0025 - 0036 | 0002 - 0012 | 2045 - 2055 | 2236 - 2246 | 2222 - 2232 | 2205 - 2215 | 2256 - 2306 | 2105 - 2115 | |
| Myotis Species Group | 14 | 56 | 72 | 0 | 18 | 6 | 0 | 5 | 64 | 2 | 0 | 0 | **237** |
| Eastern Red/ Tri-colored Bat Species Group | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | **4** |
| Big Brown/Silver-haired/Hoary Bat Species Group | 0 | 0 | 2 | 0 | 0 | 3 | 7 | 0 | 2 | 11 | 0 | 2 | **27** |
| Unidentified Species Group | 5 | 0 | 3 | 2 | 14 | 0 | 1 | 5 | 1 | 5 | 3 | 3 | **42** |
| **Total Calls** | **19** | **56** | **77** | **3** | **32** | **9** | **8** | **12** | **67** | **18** | **3** | **6** | **310** |

**Table H-8 Call Files Recorded During Active Bat Acoustical Monitoring by Survey Point and the Crown City Wind Farm Project Area**

| Survey Point | Survey Night | Survey Time | Myotis Species Group | Eastern Red/ Tri-colored Bat Species Group | Big Brown/ Silver-haired/ Hoary Bat Species Group | Unidentified Species Group | Total Calls | Tempature [degrees F] | Cloud Cover | Wind Speed [mph] | Habitat |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 06/03/2008 | 2038 - 2048 | 0 | 0 | 0 | 0 | 0 | 62°F | Cloudy | 5 | Hardwood Forest (Logging Road) |
| | 06/04/2008 | 0115 - 0125 | 0 | 0 | 0 | 0 | 0 | 64°F | Mostly Cloudy | 0 | |
| | 06/05/2008 | 0009 - 0019 | 0 | 0 | 0 | 3 | 3 | 73°F | Cloudy | 10 | |
| | 07/01/2008 | 2239 - 2250 | 9 | 0 | 1 | 1 | 11 | 54°F | Clear | 0 | |
| | 07/02/2008 | 0126 - 0136 | 1 | 0 | 0 | 2 | 3 | 66°F | Clear | 8 | |
| | 07/28/2008 | 2323 - 2333 | 14 | 0 | 0 | 5 | 19 | 64°F | Cloudy | 6 | |
| | **A Total** | - | **24** | **0** | **1** | **11** | **36** | - | - | - | |
| B | 06/03/2008 | 2241 - 2253 | 6 | 0 | 0 | 1 | 7 | 61°F | Cloudy | 5 | Forested Wetland (Roadside) |
| | 06/04/2008 | 0047 - 0058 | 32 | 1 | 0 | 0 | 33 | 64°F | Mostly Cloudy | 0 | |
| | 06/05/2008 | 2304 - 2315 | 9 | 0 | 0 | 2 | 11 | 74°F | Cloudy | 12 | |
| | 07/01/2008 | 2151 - 2201 | 0 | 0 | 18 | 0 | 18 | 57°F | Clear | 5 | |
| | 07/02/2008 | 0029 -0045 | 69 | 0 | 26 | 0 | 95 | 70°F | Clear | 8 | |
| | 07/28/2008 | 2343 - 2354 | 56 | 0 | 0 | 0 | 56 | 62°F | Cloudy | 4 | |
| | **B Total** | - | **172** | **1** | **44** | **3** | **220** | - | - | - | |
| C | 06/03/2008 | 2319 - 2329 | 1 | 0 | 2 | 0 | 3 | 61°F | Cloudy | 5 | Pond |
| | 06/04/2008 | 0015 - 0026 | 7 | 0 | 0 | 8 | 15 | 65°F | Mostly Cloudy | 5 | |
| | 06/05/2008 | 2325 - 2335 | 0 | 0 | 0 | 0 | 0 | 73°F | Light Rain | 12 | |
| | 07/01/2008 | 2116 - 2126 | 17 | 0 | 0 | 8 | 25 | 59°F | Clear | 5 | |
| | 07/02/2008 | 2354 - 0006 | 12 | 2 | 1 | 2 | 17 | 70°F | Clear | 9 | |
| | 07/28/2008 | 2125 -2136 | 72 | 0 | 2 | 3 | 77 | 67°F | Cloudy | 10 | |
| | **C Total** | - | **109** | **2** | **5** | **21** | **137** | - | - | - | |

**Table H-8 Call Files Recorded During Active Bat Acoustical Monitoring by Survey Point and the Crown City Wind Farm Project Area**

| Survey Point | Survey Night | Survey Time | Myotis Species Group | Eastern Red/ Tri-colored Bat Species Group | Big Brown/ Silver-haired/ Hoary Bat Species Group | Unidentified Species Group | Total Calls | Tempature [degrees F] | Cloud Cover | Wind Speed [mph] | Habitat |
|---|---|---|---|---|---|---|---|---|---|---|---|
| D | 06/03/2008 | 2341 - 2351 | 1 | 0 | 0 | 1 | 2 | 61°F | Cloudy | 5 | Field (Hay) |
| | 06/04/2008 | 0033 - 0043 | 0 | 0 | 0 | 1 | 1 | 64°F | Mostly Cloudy | 0 | |
| | 06/05/2008 | 2341 - 2351 | 0 | 0 | 0 | 0 | 0 | 73°F | Cloudy | 10 | |
| | 07/01/2008 | 2132 - 2142 | 0 | 0 | 0 | 0 | 0 | 58°F | Clear | 5 | |
| | 07/02/2008 | 0013 - 0023 | 1 | 0 | 0 | 0 | 1 | 70°F | Clear | 9 | |
| | 07/28/2008 | 2141 - 2151 | 0 | 1 | 0 | 2 | 3 | 65°F | Cloudy | 10 | |
| | **D Total** | - | **2** | **1** | **0** | **4** | **7** | - | - | - | |
| E | 06/03/2008 | 2130 - 2140 | 4 | 0 | 1 | 11 | 16 | 61°F | Cloudy | 5 | Riparian |
| | 06/04/2008 | 2347 - 2358 | 4 | 0 | 0 | 4 | 8 | 65°F | Mostly Cloudy | 5 | |
| | 06/05/2008 | 0031 - 0041 | 3 | 0 | 0 | 0 | 3 | 73°F | Cloudy | 14 | |
| | 07/01/2008 | 2212 - 2222 | 1 | 0 | 0 | 1 | 2 | 57°F | Clear | 5 | |
| | 07/02/2008 | 0058 - 0108 | 2 | 0 | 0 | 1 | 3 | 69°F | Clear | 8 | |
| | 07/28/2008 | 0025 - 0036 | 18 | 0 | 0 | 14 | 32 | 62°F | Cloudy | 2 | |
| | **E Total** | - | **32** | **0** | **1** | **31** | **64** | - | - | - | |
| F | 06/03/2008 | 0003 - 0013 | 38 | 0 | 0 | 4 | 42 | 61°F | Cloudy | 5 | Hardwood Hedgerow/Pond |
| | 06/04/2008 | 2318 - 2332 | 15 | 0 | 0 | 1 | 16 | 65°F | Mostly Cloudy | 5 | |
| | 06/05/2008 | 2246 - 2256 | 34 | 0 | 0 | 1 | 35 | 74°F | Cloudy | 12 | |
| | 07/01/2008 | 2305 - 2315 | 3 | 0 | 0 | 2 | 5 | 54°F | Clear | 0 | |
| | 07/02/2008 | 2333 - 2343 | 6 | 0 | 1 | 2 | 9 | 69°F | Clear | 8 | |
| | 07/28/2008 | 0002 - 0012 | 6 | 0 | 3 | 0 | 9 | 62°F | Cloudy | 0 | |
| | **F Total** | - | **102** | **0** | **4** | **10** | **116** | - | - | - | |
| G | 06/03/2008 | 0028 -0038 | 0 | 0 | 0 | 0 | 0 | 61°F | Cloudy | 5 | Hardwood Field Edge (Corn) |
| | 06/04/2008 | 2236 -2246 | 0 | 0 | 0 | 0 | 0 | 65°F | Mostly Cloudy | 0 | |
| | 06/05/2008 | 0123 -0133 | 0 | 0 | 0 | 0 | 0 | 72°F | Cloudy | 12 | |
| | 07/01/2008 | 2349 - 2359 | 3 | 0 | 0 | 3 | 6 | 53°F | Clear | 5 | |
| | 07/02/2008 | 2221 - 2231 | 1 | 0 | 0 | 0 | 1 | 69°F | Clear | 9 | |
| | 07/28/2008 | 2045 - 2055 | 0 | 0 | 7 | 1 | 8 | 67°F | Cloudy | 10 | |
| | **G Total** | - | **4** | **0** | **7** | **4** | **15** | - | - | - | |

**Table H-8 Call Files Recorded During Active Bat Acoustical Monitoring by Survey Point and the Crown City Wind Farm Project Area**

| Survey Point | Survey Night | Survey Time | Myotis Species Group | Eastern Red/ Tri-colored Bat Species Group | Big Brown/ Silver-haired/ Hoary Bat Species Group | Unidentified Species Group | Total Calls | Tempature [degrees F] | Cloud Cover | Wind Speed [mph] | Habitat |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H | 06/03/2008 | 0050 - 0102 | 8 | 0 | 5 | 0 | 13 | 61°F | Cloudy | 5 | Coniferous Forest (State Forest Road) |
| | 06/04/2008 | 2212 - 2222 | 0 | 0 | 0 | 1 | 1 | 65°F | Mostly Cloudy | 0 | |
| | 06/05/2008 | 2042 - 2052 | 0 | 0 | 0 | 0 | 0 | 74°F | Cloudy | 10 | |
| | 07/01/2008 | 0010 - 0021 | 37 | 0 | 0 | 5 | 42 | 53°F | Clear | 5 | |
| | 07/02/2008 | 2157 - 2207 | 1 | 0 | 0 | 0 | 1 | 68°F | Clear | 7 | |
| | 07/28/2008 | 2236 - 2246 | 5 | 2 | 0 | 5 | 12 | 64°F | Cloudy | 8 | |
| | **H Total** | - | **51** | **2** | **5** | **11** | **69** | - | - | - | |
| I | 06/03/2008 | 0111 - 0121 | 16 | 0 | 0 | 0 | 16 | 61°F | Cloudy | 5 | Hardwood Forest (State Forest Road and Gas Line ROW) |
| | 06/04/2008 | 2154 - 2204 | 3 | 0 | 2 | 0 | 5 | 65°F | Mostly Cloudy | 0 | |
| | 06/05/2008 | 2102 - 2112 | 5 | 1 | 2 | 0 | 8 | 74°F | Cloudy | 10 | |
| | 07/01/2008 | 0030 - 0045 | 44 | 1 | 0 | 1 | 46 | 53°F | Clear | 5 | |
| | 07/02/2008 | 2135 - 2146 | 8 | 1 | 1 | 0 | 10 | 68°F | Clear | 8 | |
| | 07/28/2008 | 2222 - 2232 | 64 | 0 | 2 | 1 | 67 | 65°F | Cloudy | 10 | |
| | **I Total** | - | **140** | **3** | **7** | **2** | **152** | - | - | - | |
| J | 06/03/2008 | 0127 - 0137 | 2 | 0 | 0 | 6 | 8 | 61°F | Cloudy | 5 | Hardwood Field Edge (Hay) |
| | 06/04/2008 | 2134 - 2144 | 1 | 0 | 0 | 0 | 1 | 65°F | Mostly Cloudy | 0 | |
| | 06/05/2008 | 2120 - 2130 | 0 | 0 | 0 | 0 | 0 | 74°F | Cloudy | 10 | |
| | 07/01/2008 | 0052 - 0104 | 7 | 41 | 8 | 0 | 56 | 53°F | Clear | 5 | |
| | 07/02/2008 | 2114 - 2124 | 2 | 0 | 2 | 2 | 6 | 70°F | Clear | 6 | |
| | 07/28/2008 | 2205 - 2215 | 2 | 0 | 11 | 5 | 18 | 65°F | Cloudy | 10 | |
| | **J Total** | - | **14** | **41** | **21** | **13** | **89** | - | - | - | |
| K | 06/03/2008 | 0145 - 0155 | 0 | 0 | 0 | 1 | 1 | 61°F | Cloudy | 5 | Hardwood Forest Edge/Pond |
| | 06/04/2008 | 2103 - 2120 | 2 | 0 | 0 | 1 | 3 | 65°F | Mostly Cloudy | 0 | |
| | 06/05/2008 | 0059 - 0111 | 5 | 0 | 0 | 7 | 12 | 73°F | Cloudy | 14 | |
| | 07/01/2008 | 0119 - 0130 | 0 | 0 | 28 | 5 | 33 | 53°F | Clear | 5 | |
| | 07/02/2008 | 2249 - 2303 | 6 | 0 | 0 | 6 | 12 | 69°F | Clear | 8 | |
| | 07/28/2008 | 2256 -2306 | 0 | 0 | 0 | 3 | 3 | 64°F | Cloudy | 8 | |
| | **K Total** | - | **13** | **0** | **28** | **23** | **64** | - | - | - | |

**Table H-8 Call Files Recorded During Active Bat Acoustical Monitoring by Survey Point and the Crown City Wind Farm Project Area**

| Survey Point | Survey Night | Survey Time | Myotis Species Group | Eastern Red/ Tri-colored Bat Species Group | Big Brown/ Silver-haired/ Hoary Bat Species Group | Unidentified Species Group | Total Calls | Tempature [degrees F] | Cloud Cover | Wind Speed [mph] | Habitat |
|---|---|---|---|---|---|---|---|---|---|---|---|
| L | 06/03/2008 | - | - | - | - | - | - | - | - | - | Riparian (Roadside) |
| | 06/04/2008 | 2258 - 2310 | 11 | 0 | 0 | 2 | 13 | 65°F | Mostly Cloudy | 0 | |
| | 06/05/2008 | 2226 - 2238 | 14 | 1 | | 4 | 19 | 74°F | Cloudy | 12 | |
| | 07/01/2008 | 2324 - 2334 | 0 | 0 | 0 | 1 | 1 | 54°F | Clear | 0 | |
| | 07/02/2008 | 2315 - 2325 | 0 | 0 | 0 | 0 | 0 | 70°F | Clear | 8 | |
| | 07/28/2008 | 2105 - 2115 | 0 | 1 | 2 | 3 | 6 | 67°F | Cloudy | 10 | |
| | **L Total** | - | **25** | **2** | **2** | **10** | **39** | - | - | - | |

**Table H-9 AnaLook 4.9j Filter Parameters Altered from Default Settings[1]**

| Parameter | Value | Definition | Filters out: |
|---|---|---|---|
| Smooth | 15.0 | Sets the maximum distance between two successive points for them to be considered part of the same echolocation pulse. | Echoes, extraneous noise, poor-quality pulses |
| Bodyover | 80 | Removes echolocation pulse if the number of data points in the body (narrow band component) is less than the set value. | Fragmentary pulses, approach-phase pulses, and feeding buzzes |
| MinDur | 1.0 | Removes pulses that have a shorter duration than the set value. | Foraging calls (buzzes) and some fragmentary pulses |
| MinFMin | 12.0 | Removes pulses with a lower minimum frequency than the set value. | Extraneous noise |
| MinNCalls[2] | 2.0 | Removes files that have fewer pulses (N) than the set value. | Fragmentary and poor-quality pulses |

1 Adapted from Britzke and Murray 2000.
2 Parameter value is changed to 5.0 to sort out call files with a minimum of five pulses.