2010 Spring Avian Survey

Ashley Wind Energy Project
McIntosh County, North Dakota

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Public Service Commission

EXECUTIVE SUMMARY

Tetra Tech EC, Inc. (Tetra Tech) was contracted by CPV Ashley Renewable Energy Company, LLC (CPV) to undertake spring avian use surveys for the proposed Ashley Wind Energy Project (Project) in McIntosh County, North Dakota. The studies were conducted to identify potential avian impacts associated with building and operating the wind conversion facility. Weekly surveys were performed at the Project Area from March 23 to June 13, 2010, which included the spring through early summer seasons. Fixed point count surveys (800-meter [m] radius) were conducted at 7 points distributed throughout the Project Area.

A total 5,611 birds were observed within the Project Area from 90 species. Overall mean bird use within the Project Area was 61.66 birds/20 minutes (min) and ranged from 0 to 311 birds/20 min. Songbirds and waterfowl had the highest mean use out of all species groups observed (26.73 and 25.02 birds/20 min respectively). Waterbirds ranked third (5.21 birds/20 min) and gulls/terns (2.29 birds/20 min) ranked fourth for mean use among species groups at the Project Area.

The species with the highest mean use were the lesser scaup (6.45 birds/20 min), common grackle (5.90 birds/20 min), red-winged blackbird (5.84 birds/20 min), yellow-headed blackbird (5.47 birds/20 min), and mallard (4.62 birds/20 min). Additionally, European starling and common grackle had highest encounter rates within the rotor swept area (RSA) at 1.38 and 1.82 birds flying at RSA height/20 min, respectively. All of these species are widespread and have relatively stable populations; as a result, local mortality, should it occur, is unlikely to have regional population-level consequences. European starlings, however, are not protected by any federal or state laws.

American coots had the highest mean use among waterbirds at 3.51 birds/20min and accounted for 67.3 percent of all the waterbirds seen. However all waterbirds had a very low encounter rate of <0.05 birds flying at RSA height/20 min, suggesting a low probability of turbine collisions.

For gulls/terns species group, ring-billed gull had the highest encounter rate of 1.20 birds flying at RSA height/20 min. There are no reported fatalities for ring-billed gulls at other wind energy facilities with publicly available data. Given the encounter rate, it is possible that some mortality of ring-billed gulls may occur. However, any mortality observed, should it occur in the Project Area, is not expect to impact the regional North Dakota population as the regional population of ring-billed gulls are large and increasing.

The Swainson's hawk had the highest mean use among raptors (0.35 birds/20 min) and was one of three raptor species (besides great-horned owl and red-tailed hawk) nesting in the Project Area. Great-horned owl and red-tailed hawk had the next highest mean use among raptors (0.16 and 0.15 birds/20 min respectively). Despite the observed nesting use of the Project Area, Swainson's hawk, great-horned owl, and red-tailed hawk had low encounter rates within the Project Area implying a low likelihood of turbine collisions.

Given the number of raptor nests in the Project Area the risk of turbine-related fatalities may increase for nesting raptors (Swainson's hawk, red-tailed hawk, and great-horned owl) in late spring to early fall as the young begin to fledge from the nests. Additionally, construction and maintenance of the Project could lead to disturbance of nesting raptors within the Project Area. Disturbance of nesting raptors can result in complete desertion of nest, eggs, or young. Most of the species listed above are protected by the Migratory Bird Treaty Act (MBTA).

Listed and Sensitive Species

The biologist did not record any species listed on the Endangered Species Act or any federal candidate species. The biologist did detect a single bald eagle approximately 1 mile to the southwest of the Project Area in early spring. The Bald and Golden Eagle Protection Act (BGEPA) prohibits the take or disturbance of any bald eagle, alive or dead, including any part, nest, or egg. "Take" is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" a bald or golden eagle. "Disturb" means to agitate or bother an eagle to a degree that causes, or is likely to cause, 1) injury to an eagle, 2) a decrease in its productivity, or 3) nest abandonment. The United States Fish and Wildlife Service (USFWS) has implemented a permitting process to allow take of bald and golden eagles on a limited basis under certain conditions (i.e., if the USFWS determines that the take is compatible with the preservation of the eagles and cannot be practicably avoided). The limited number of eagle observations in the vicinity of the Project suggests a low probability of negative interactions between eagles and Project facilities.

Twenty-three species were detected that are listed as North Dakota State Species of Conservation Priority. A permit is not required for the take of North Dakota state-sensitive species, but most of these species are protected under the MBTA. Sharp-tailed grouse were observed during regular point count surveys and incidental observations. One active lek was found approximately 300 m north of the Project Area during the survey. The probability of sharp-tailed grouse fatalities is low as they typically fly low to the ground and, therefore, are at low risk of collision with turbines. Sharp-tailed grouse are a State Species of Conservation Priority but are also managed as a gamebird in North Dakota. Although the potential exists for wind energy development to have a negative impact on grouse behavior and habitat use, the extent and duration of the impact is unknown for sharp-tailed grouse.

Table ES-1. Spring Avian Use Summary

Variable	Result	Details
Non-raptors		
Mean use	60.92 birds/20 min	
Number of species with high encounter rates (>2.0 birds at RSA height/20 min)	None	
Federally listed[1] species observed within the Project Area	No	
State-listed species[2] within the Project Area	Yes	20 state-sensitive species (Section 4.3)
State-listed species within RSA	No	
Grouse leks observed within the Project Area	No	sharp-tailed grouse lek identified just outside Project Area (Section 4.4)
Raptors		
Mean use	0.74 birds/20 min	
Number of species with high encounter rates (>2.0 birds at RSA height/20 min)	None	
Federally listed species observed within the Project Area	No	
State-listed species within the Project Area	Yes	Swainson's hawk, ferruginous hawk, bald eagle and short-eared owl (Section 4.3)
State-listed species observed nesting within the Project Area	Yes	Swainson's hawk
State-listed species within the RSA	No	
Habitat		
Native habitat likely to be affected by development	Yes	native prairie and wetlands
Lakes (waterfowl attractant)	Yes	numerous small ponds
Wetlands (attractant for cranes, waterfowl, and other water-based species)	Yes	scattered throughout
Cliffs (raptor nesting and traveling)	No	
River (permanent water source, migration corridor)	No	
Known refuges or habitat features that may funnel migrants	Yes	two waterfowl production areas

[1]Federally listed species include species listed as endangered, threatened, or candidate species in the Endangered Species Act.
[2] The North Dakota Game and Fish Department (NDGFD) maintains a list of Species of Conservation Priority (Hagen et al. 2005).

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1.0 INTRODUCTION

Wind Energy and Birds

Wind energy provides a clean, renewable energy source that is in high demand. As wind power has become more common, the need to address potential environmental impacts has increased. Birds have been identified as a group potentially at risk because of collisions with wind turbines and power lines and displacement due to the presence of the associated structures (Erickson et al. 2005, Drewitt and Langston 2006, Arnett et al. 2007). Specifically, migrant passerines (e.g., songbirds) are found more often in post-construction mortality monitoring compared to other groups of birds (Arnett et al. 2007). In fact, at newer generation wind energy facilities outside of California, approximately 80 percent of documented mortalities have been songbirds, of which 50 percent are often nocturnal migrants (Erickson et al. 2001, Drewitt and Langston 2006, Johnson et al. 2007, Strickland and Morrison 2008). It is estimated that less than 0.01 percent of migrant songbirds that pass over wind farms are killed, based on radar data and mortality monitoring (Erickson 2007). Locally breeding songbirds may experience lower mortality rates than migrants because many of these species tend not to fly at turbine heights during the breeding season. However, some breeding songbird species have behaviors that increase the risk of collisions with turbines. For example, horned larks have been commonly found as fatalities at wind farms (Erickson et al. 2002). Mortality may be partially attributed to the flight displays in which male horned lark fly to heights of 80 meters (m) to 250 m (Pickwell 1931).

Despite the observation that most wind farm fatalities are songbirds, raptor mortality historically has received the most attention. Raptor mortality at newer generation wind projects has been low relative to previous generation wind farms, although there is substantial regional variation (Erickson et al. 2002, 2004, Johnson et al. 2002, Kerns and Kerlinger 2004, Jain et al. 2007). Although raptor mortality is reduced at newer generation facilities, mortality may not be eliminated by advances in turbine technology (e.g., turbine height, tower structure) and local micro-siting and site evaluation efforts are still necessary to lessen potential impacts to these species.

In addition to mortality associated with wind farms, concerns have been raised that some bird species may avoid areas near turbines after the wind farm is in operation (Drewitt and Langston 2006). For example, at the Buffalo Ridge wind energy facility in Lincoln County, Minnesota, densities of male songbirds were significantly lower in Conservation Reserve Program (CRP) grasslands containing turbines than in CRP grasslands without turbines. It was suggested that the reduced density may be due to avoidance of turbine noise and maintenance activities, and reduced habitat quality due to the presence of access roads and large gravel pads surrounding the turbines (Leddy et al. 1999). Reduced abundance of grassland songbirds was found within 50 m of a turbine pad for a wind farm in Washington and Oregon, but the investigators attributed displacement to the direct loss of habitat or reduced habitat quality and not the presence of the turbines (Erickson et al. 2004). Recent research at two sites in North and South Dakota (Shaffer and Johnson 2008) suggests that certain grassland songbird species (2 of 4 studied) may avoid turbines by as much as 200 m but these results have not been finalized nor verified at additional sites. None of these studies have addressed whether or not these avoidance effects are temporary (i.e., the birds may habituate to the presence of turbines over time) or permanent.

Particular concern over avoidance issues has been raised with respect to grouse species. Research studies are underway to evaluate the effects of wind energy development on lesser prairie-chickens, greater prairie-chickens, and greater sage-grouse. However, data from these studies has yet to be published. Conversely, several studies regarding the effects of other anthropogenic structures such as roads and buildings on grouse have been published (Pitman et al. 2005, Atamian et al. 2007, Lammers and Callopy 2007, Pruett et al. 2009).

Finally, most native birds are protected under the Migratory Bird Treaty Act (MBTA) of 1918. Under the MBTA it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product. Despite extensive liability provisions, the United States Fish and Wildlife Service (USFWS) has narrowly interpreted its permitting authority. "As currently written, USFWS's regulations establish a permitting scheme for a variety of intentional activities, such as hunting, falconry, certain import and export activities, depredation control, and scientific research. But...there is no permitting scheme for the incidental take of migratory birds during otherwise lawful activities" (Beveridge 2005). There is no permitting framework (i.e., incidental take permits) that allow a wind energy company to protect itself from liability at wind energy facilities; however, the USFWS does not usually take action if good faith efforts have been made to minimize impacts. To date, no wind energy development company has been charged for violations of the MBTA; however utilities have been prosecuted successfully.

Study Description

CPV Ashley Renewable Energy Company, LLC (CPV) is developing an up to approximately 200.1 megawatt (MW) wind energy conversion facility in south central North Dakota in McIntosh County (Figure 1). The Ashley Wind Energy Project (Project) is located on private lands under easement with CPV. CPV is committed to environmental due diligence and has contracted Tetra Tech EC, Inc. (Tetra Tech) to conduct spring avian surveys of the Project to quantify local avian use in the area and to identify potential avian impacts associated with building and/or operating the proposed facility.

The Project Area is 17,400 acres and is located in the Prairie Pothole Region. Although construction of a wind energy facility differs from wholesale conversion of grassland to agricultural croplands (e.g., smaller disturbance footprint), disturbances of native prairies, particularly those that surround permanent or semi-permanent wetlands (prairie potholes), have the potential to affect important breeding and migratory stopover areas. The potholes are rich in aquatic life and support globally significant populations of breeding waterfowl (Bryce et al. 1998). Native prairie remnants do occur on unbroken rangelands and include western wheatgrass, bluestem, needle-and-thread, and needlegrass. Prairie cordgrass and northern reedgrass occur near wetlands (Bryce et al. 1998). In addition, several National Waterfowl Production Areas (WPA) exist within and adjacent to the Project Area. WPAs are wetlands and grasslands set aside for the production of waterfowl and other wildlife species. These public lands, managed by the USFWS, were included in the National Wildlife Refuge System in 1966 through the National Wildlife Refuge Administration Act (USFWS 2007). Nearly 95 percent of WPAs are located in the prairie pothole areas of North and South Dakota, Minnesota, and Montana. North Dakota alone has 39 percent of the Nation's WPAs (USFWS 2007). By regulation, WPAs are open to hunting, fishing, and trapping in accordance with state laws. Other important wildlife-dependent uses allowed include wildlife observation, photography, and environmental education (USFWS 2007).

North Dakota has 365 documented bird species (Faanes and Stewart 1982) and is situated within the Central Flyway, one of the main bird migratory routes (USFWS 2008). The Central Flyway runs through the central portion of the United States and, as a consequence, the Project Area. Most birds that move along the Central Flyway travel from Canada through the central states, eventually reaching the tropics of South America via the Gulf of Mexico (USFWS 2008).

2.0 METHODS

To evaluate avian risk at wind energy facilities, standardized protocols for pre-construction point counts have been established and were used in this study. Data collected from these counts are used to identify species or species groups that may be at risk from Project development and may provide additional information for micro-siting wind facilities to minimize impacts to birds. Results in this report are presented in terms of species groups, and highlight federal and state-listed species, and species of concern.

2.1 Avian Surveys

2.1.1 Fixed-point Surveys

Tetra Tech employed a standard, accepted methodology for the avian surveys at the Project Area, designed to be responsive to the level of effort recommended in the National Wind Coordinating Committee (NWCC) Guidance Document and the USFWS Interim Guidelines. An experienced field biologist conducted 20-minute (min) point count surveys at 7 locations within the Project Area to evaluate avian use, behavior, and species composition during spring migration (Figure 2). The biologist conducted weekly surveys from March 23 to June 13, 2010 (Table 1), thereby encompassing the spring to early summer seasons. Tetra Tech distributed the survey locations throughout the Project Area and chose locations that maximized the 360-degree sight distance for the observer and covered a diversity of habitats.

The biologist collected data on all birds observed within an 800-m radius of the point count location. Surveys at each point lasted for 20 min, during which time the biologist continuously recorded any visual or auditory observations. The biologist recorded the following data: species, number of birds, time of observation, height aboveground, behavior, and flight directions (for those birds making non-localized flights). Data on flight direction can be found in Appendix 1. The biologist calibrated flight heights and distances with a laser rangefinder and used local transmission line poles and topographic maps as additional references.

The survey protocol used in this study is designed to collect data on all bird species rather than to target specific taxa. The benefit of using this protocol is that it estimates avian use throughout the day and captures activity by a variety of bird species. During the spring and summer breeding season, and to a lesser extent in the fall and winter, songbirds are most active in the morning and can be difficult to detect during the afternoon. In contrast, raptors become active as the sunlight heats the air and creates thermals, which individuals use for soaring (Ballam 1984). Thus, raptors are more readily detected several hours after sunrise. Therefore, this protocol is appropriate for characterizing the bird community using the Project Area during this time of year.

Tetra Tech chose 20-min survey periods because they provide adequate time to detect both raptors and non-raptors. However, time periods of 20 min may lead to double-counting of songbirds (i.e., counting the same individual more than once) because an individual may appear and disappear from view. For example, if a horned lark is detected perched on a fence then disappears from view and, 6 minutes later, a horned lark is seen flying, these birds are recorded as separate observations because it is not possible to distinguish individuals. Double-counting of birds is not problematic for this type of survey because the objective is to document activity and use in terms of number of birds noted per 20-min survey, not number of distinct individual birds.

Detectability varies among species and potentially not all individuals within the 800-m radius were counted. This variation in detectability can result in an overestimate of mean use for conspicuous species and an underestimate of mean use for reclusive species (Thompson 2002). Birds not easily identifiable, such as those seen under low light conditions or small birds seen at a distance were identified to the lowest taxonomic level possible. Hence, unidentified birds are included in the results.

2.1.2 Raptor Nest Surveys

The purpose of raptor nest surveys is to estimate the number of active and inactive raptor nests in the Project Area. The biologist conducted the raptor nest survey across the Project Area before trees began to leaf out. This helps to improve the detection of raptor nests. Where possible, the biologist also surveyed over an approximately 1-mile buffer around the Project Area. Once a nest was located, the biologist returned during the raptor breeding season to collect data on species, location, and activity status. The activity status (i.e., active or inactive) was determined by the presence of an adult or young, active territory defense by an individual, or the presence of feathers, egg shells or droppings underneath the nest. In addition, the biologist determined the nest condition and substrate. The biologist visited nests a minimum of two times, once to determine the location of the nest and once to determine if the nest was active. This second check also allowed biologist to detect late-nesting species, such as Swainson's hawks. Raptor nest surveys provide an estimate of the number and species of raptors that use stick nests in the area.

Results of the raptor nests monitored during the survey are in Appendix 2. Ground-nesting raptor species, such as northern harriers, were not surveyed.

2.1.3 Incidental Observations

Incidental observations included observations in the vicinity (i.e., within approximately 1 mile) of the Project Area that occurred 1) during travel between points, 2) before or after the official 20-min survey period, and 3) outside of the 800-m radius circular plot. The biologist recorded these observations on separate data sheets and these data were not used in the formal analysis; however, a summary of incidental birds is presented to provide additional information about species found in the local area.

2.1.4 Listed Species Information

A list of species currently protected under the Endangered Species Act (ESA) can be found at http://www.fws.gov/endangered/species/us-species.html. All native migratory species are protected by the MBTA.

The North Dakota Game and Fish Department (NDGFD) have identified 100 Species of Conservation Priority within North Dakota. These species are ranked in three priority levels based on such factors as known status, funding availability, and presence of breeding habitat within North Dakota (Hagen et al. 2005). The definitions of each rank are listed below:

> **Level I**: A species having a high level of conservation priority because of declining status either in North Dakota or across their range; or a high rate of occurrence in North Dakota constituting the core of the species' breeding range, but are at-risk range wide, and non- State Wildlife Grants funding is not readily available to them.
>
> **Level II**: Species having a moderate level of conservation priority; or a high level of conservation priority, but a substantial amount of non-State Wildlife Grant funding is available to them.
>
> **Level III**: North Dakota's species having a moderate level of conservation priority, but are believed to be peripheral or do not breed in North Dakota.

Species that are listed under the 100 Species of Conservation Priority are not afforded any formal protection by the state. NDGFD has plans to review and update the list of Species of Conservation Priority in 2010. Additional information on North Dakota Species of Conservation Priority can be found at: http://gf.nd.gov/conservation/toc.html.

2.1.5 Data Quality Assurance/Quality Control

Tetra Tech implemented quality assurance and quality control measures during all stages of data collection, analysis, and report preparation. To ensure legibility and completeness of data sheets, each biologist reviewed, and clarified if needed, all data sheets before data entry into a Filemaker Pro™ relational database for data storage and analysis. Prior to analysis, an independent reviewer conducted a 100-percent quality review of the data entries. Any questions that arose at this time were directed toward and answered by the field biologist.

2.2 Analysis

2.2.1 Species Groupings

Tetra Tech considered two primary groups of interest: raptors and non-raptors. Tetra Tech defined raptors as vultures, hawks, eagles, falcons, and owls. As turkey vulture flight behavior is similar to raptors and they are often included as raptors in other studies, Tetra Tech has included them with raptors for the purpose of our analyses. Non-raptors were defined as all other species groups.

2.2.2 Avian Use of the Project Area

Tetra Tech derived avian use (mean use) of the Project Area by calculating the average number of birds observed per 20-min (birds/20 min) survey at each point. Tetra Tech also calculated a measure of variability (90 percent confidence intervals) for all mean use values. To further evaluate the diversity and composition of avian species using the Project Area, Tetra Tech summarized the frequency of occurrence (percentage of surveys a species was observed) and percent composition (number of birds observed of a particular species divided by total number of birds observed). In addition, the number of observations is also presented, where an observation can be either an individual bird or a discrete flock of birds. This information helps evaluate whether high mean use is driven by a single event (e.g., a large flock of birds moving through the Project Area on migration). Because individual birds are not uniquely marked and identified, actual population size or abundance cannot be determined. One individual may be counted more than once during a survey period or across survey periods. Therefore, avian mean use does not equate to abundance.

2.2.3 Flight Behavior

Tetra Tech evaluated flight behavior by calculating the proportion of flying birds observed below, within, or above the height of the anticipated turbine rotor swept area (RSA). At the time of this study, CPV has not selected a specific turbine type for the Project. For the purposes of this report, the turbine type used to calculate the RSA at the Project was considered to have an 80-m hub height and up to a 101-m rotor diameter. With these specifications, the estimated RSA was between 29.5 and 130.5 m above ground. Tetra Tech considered a bird to have flown within the height of the anticipated RSA if any of its recorded heights fell within the upper or lower limits of the anticipated RSA.

2.2.4 Encounter Rate

To estimate the rate at which a species flew at the height of the anticipated RSA, Tetra Tech applied the following equation to every species observed in the Project Area:

$$Encounter\ Rate = A*P_f*P_t$$

A is the mean number of birds/20 min for a given species, P_f is the proportion of all activity observations for a given species that were flying; and P_t is the proportion flying observations that were at the height of a turbine RSA for a given species.

The encounter rate provides information on the rate at which a species may move at a height that is consistent with the RSA of the proposed turbines. This information is an important component in evaluating risk of collisions; however, this number alone does not indicate risk to a species. Species with a high encounter rate (e.g., > 2.0 birds at RSA height/20 min) are at a higher risk of collision than species with a low encounter rate (e.g., < 1.0 birds at RSA height/20 min), but it does not mean that mortality is certain. Other factors such as turbine location or a species ability to detect turbine blades, flight maneuverability, and habitat selection also influence mortality (Orloff and Flannery 1992). Values are sensitive to large flocks of birds flying within the RSA; that is, a species will have a high encounter rate even if only seen a few times in large flying flocks. Encounter rate also does not account for migrating behavior of nocturnal migrants.

2.2.5 Mortality Risk

The relationship between pre-construction avian use and post-construction mortality is not yet completely defined due to a lack of pre- and post-construction data from sites with moderate to high use. Based on the available data, raptor fatality rates generally are low at most wind energy developments with exceptions demonstrated at certain facilities in California with a predominance of older generation turbines (NWCC 2010). The highly regional nature of avian mean use across North America and the scarce data on avian mortality at wind farms in many parts of the continent contribute to uncertainty in predicting fatality rates (Arnett et al. 2007). To date, the most comprehensive source of regional information on avian fatality rates is the Avian and Bat Fact Sheet (NWCC 2010), which shows fatality rates range from 2.3 to 4.2 birds/MW/year in the Upper Midwest. As a result of uncertainty in predicting fatality rates, Tetra Tech did not attempt to derive mortality estimates from mean use data but will highlight those species or groups that may experience mortality or displacement that could significantly affect local or regional populations, based on the data provided in this report and other information sources.

3.0 RESULTS

3.1 Avian Use and Frequency of Occurrence

The biologist surveyed 3,476 acres of the Project Area during point count surveys, covering 20 percent of the Project Area. The 7 point count locations were each surveyed 13 times, resulting in 91 total 20-min surveys. A total 5,611 birds from 90 species were observed within the Project Area during the fixed-point count surveys (Table 2). Overall mean bird use within the Project Area was 61.66 birds/20 min and ranged from 0 to 311 birds/20 min.

Overall mean use by non-raptors was 60.92 birds/20 min and, among species groups, mean use was highest for songbirds (26.73 birds/20 min) and waterfowl (25.02 birds/20 min; Table 2). Both songbirds and waterfowl were observed in the majority of surveys and were widely distributed throughout the Project Area. The non-raptors with the highest mean use were the lesser scaup (6.45 birds/20 min, observed in 41.8 percent of all surveys), common grackle (5.90 birds/20 min; 59.3 percent of all surveys), red-winged blackbird (5.84 birds/20 min; 71.4 percent of all surveys), yellow-headed blackbird (5.47 birds/20 min; 29.7 percent of all surveys), and mallard (4.62 birds/20 min; 78.0 percent of all surveys). Other frequently observed species were western meadowlark (64.8 percent), American coot (53.8 percent), ring-necked pheasant (52.7 percent), and blue-winged teal (51.6 percent of all surveys) occurred the most often (Table 2).

Within the songbird species grouping; common grackle (22.1 percent), red-winged blackbird (21.8 percent), yellow-headed blackbird (20.5 percent), and European starling (10.5 percent) accounted for 74.9 percent of birds (Table 2). Among waterfowl, the second highest species group, lesser scaup (25.8 percent), mallard (18.4 percent), and blue winged teal (11.5 percent) accounted for 55.7 percent of the birds in the waterfowl species group. Among the remaining species groups, waterbirds and gulls/terns had the next highest mean use values of 5.21 birds/20 min and 2.29 birds/20 min, respectively (Table 2).

Non-raptor mean use was highest on June 13 (96.43 birds/20 min) and June 1 (94.71 birds/20 min; Figure 3). The species that contributed to high mean use on June 13 were the yellow-headed blackbird (146 birds), common grackle (66 birds), lesser scaup (68 birds), and red-winged blackbird (55 birds). The species that contributed to the high mean use on June 1 were yellow-headed blackbird (112 birds), ring-billed gull (105 birds), red-winged blackbird (95 birds), and common grackle (81 birds). Mean use for non-raptors was highest at point 6 (100.54 birds/20 min) and point 5 (91.23 birds/20 min; Table 3 and Figure 4). Although the habitat at point 6 and point 5 consists large open ponds with associated wetlands surrounded by agriculture fields, this habitat is not unique to these points. Most of the species observed at points 5 and 6 were seen at other point count locations with the exception of the greater white-fronted geese that were observed as a single flock in flight over survey point 5 (Table 3).

Raptors are a group of special interest because of their propensity to fly at heights similar to a turbine's RSA. Overall mean use for raptors was 0.74 birds/20 min (Table 2). Raptors were not among the most frequently observed species groups during the spring surveys. The raptor with the highest use was the Swainson's hawk (0.35 birds/20 min; 22.0 percent of all surveys). Mean use for each other raptor species was less than 0.17 birds/20 min. Other raptor species observed during the surveys included great-horned owl, red-tailed hawk, northern harrier, and rough-legged hawk (Table 2).

Mean use by raptors was highest on June 13 (1.29 birds/20 min) and included 4 Swainson's hawks, 3 red-tailed hawks, and 2 great-horned owls (Figure 5). Mean use was also relatively high on May 11, May 26, and June 8 (1.0 birds/20 min on each day) with mostly red-tailed hawks and Swainson's hawks being observed on the these days. Mean use by raptors was lower than 0.90 birds/20 min for all other survey dates. The highest mean use by raptors was at point count locations 9 and 7 and mostly included red-tailed hawk, Swainson's hawk, and great-horned owls (Table 3, Figure 6). The high counts of red-tailed hawks Swainson's hawks and great-horned owls were most-likely due to active nests found in the vicinity of the count circles. Swainson's hawk and great-horned owls were not observed at all point count locations.

3.2 Flight Height and Encounter Rate

During spring avian use surveys, the biologist collected behavioral data for all of all birds observed during point count surveys. The biologist observed 49.4 percent of birds flying and collected flight height data for 100 percent. Of the birds observed flying, 24.9 percent made directional flights and the biologist collected flight direction for all of these birds (Appendix 1). Of non-raptors observed flying, 81.4 percent flew below the height of the anticipated RSA, 18.5 percent flew at the height of the anticipated RSA, and 0.1 percent flew above the anticipated RSA (Table 4). Of raptors observed flying, 23.5 percent flew below the height of the anticipated RSA and 76.5 percent flew at the height of the anticipated RSA.

The common grackle, European starling and ring-billed gull had the highest encounter rates (1.82, 1.38 and 1.20 birds flying at RSA height/20 min, respectively; Table 5). All other species had encounter rates of less than 0.45 birds flying at RSA height/20 min.

3.3 Raptor Nest Surveys

Twelve raptor nests of three species were found during the raptor nest surveys (Figure 7). Four red-tailed hawks, two great-horned owls, and six Swainson's hawk nest were identified and monitored on subsequent visits (Appendix 2). Four raptor nests (two red-tailed hawks and two Swainson's hawks) were noted to be inactive. All nests were located in either Siberian elm or cottonwood trees along windbreaks or around riparian corridors and nest heights ranged from 10 m to 30 m (Figure 7).

3.4 Incidental Observations

The biologist documented 98 species as incidental observations (Table 6), 22 of which were not detected during the point counts: sandhill crane, bank swallow, horned grebe, western grebe, cattle egret, great-blue heron, Virginia rail, short-eared owl, Forster's tern, ferruginous hawk, Say's phoebe, chestnut-collared longspur, white crowned sparrow, tree swallow, cliff swallow, northern shrike, northern goshawk, LeConte's sparrow, gray partridge, Bonaparte's gull, American kestrel, and bald eagle.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Non-Raptor Use and Encounter Rate

Songbirds had the highest mean use out of all groups, a value which was driven by common grackle, red-winged blackbird, yellow-headed blackbird, European starling, and western meadowlark. Of these species, European starling and common grackle had the highest encounter rates. Common grackle (Jain et al. 2007) and European starling (Johnson et al. 2002; Kerns and Kerlinger 2004) mortality has been documented at other wind energy facilities. However, if fatalities occur at the Project, they are unlikely to have population-level impacts because regional populations (European starling: 120

million; common grackle: 97 million; Blancher et al. 2007) appear to be increasing (Sauer et al. 2008). Furthermore, European starlings are not protected by any state or federal laws although common grackles are protected by the MBTA. However, grackles are attracted to agricultural crops (corn, soybean, and sunflower) and are often targeted by agriculture industry as a nuisance species through take permits issued by the USFWS under the MBTA.

Waterfowl had the second highest mean use of all species groups at the Project. Eighteen species of waterfowl were observed at the Project Area, including most species that breed in the prairie pothole region of North America. There are designated WPAs around the Project Area, several large lakes to the west (Green and Pudwell Lakes) and the south (Salt Lake) of the Project Area that appear to attract waterfowl to the area. The majority of the waterfowl observed in the spring survey were lesser scaup, mallard, and blue-winged teal. However, each of these species had a low encounter rate (0.00, 0.42, and 0.02 birds flying at RSA height/20 min respectively). Lesser scaup (Young et al. 2003), mallard (Johnson et al. 2002; Erickson et al. 2004), and blue-winged teal (Johnson et al. 2002) mortality has been documented at other wind energy facilities but the overall numbers of fatalities are very low (i.e., fewer than 5 individuals per species). Furthermore, all three species have shown regional population increases in the eastern part of the Dakotas (Sauer 2008, USFWS 2009): greater and lesser scaup (266,000), mallard (463,000), and blue-winged teal (4 million). Any mortality at the Project, should it occur, is not expected to have regional population-level impacts.

Waterbirds ranked third in mean use among species groups (5.21 birds/20 min; Table 2). American coots had the highest mean use among waterbirds at 3.51 birds/20 min and accounted for 67.3 percent of all the waterbirds seen. However all waterbirds had an encounter rate of <0.05 birds flying at RSA height/20 min which is a very low. The results suggest a low probability for turbine-related fatalities.

Gulls/terns ranked fourth for mean use among species groups in the Project Area. The ring-billed gull had the highest encounter rate (1.20 birds flying at RSA height/20 min). There are no reported fatalities for ring-billed gulls at other wind energy facilities with publicly available data. However, given the encounter rate, it is possible that some mortality of ring-billed gulls may occur. Any mortality observed, should it occur at the Project, is not expect to impact the regional North Dakota population of ring-billed gulls as it is large and increasing (Sauer et al. 2008).

4.2 Raptor Use and Encounter Rate

High raptor use has been associated with high raptor mortality at new generation wind farms (Erickson 2007). Conversely, raptor mortality appears to be low when raptor use is low, as defined by Erickson (2007) as <1.0 birds/20 min, which is the case for raptor use in the Project Area.

Swainson's hawk was the most commonly observed raptor species during avian surveys. Swainson's hawks were seen at all point count locations except point count five and were one of the most commonly observed nesting raptors within the vicinity of the Project

Area. Although Swainson's hawk have been reported as fatalities at existing wind farms in the United States (Erickson et al. 2004), the very low encounter rates (0.19 birds flying at RSA height/20 min) observed in the Project Area suggest that the probability of turbine-related fatalities for Swainson's hawk at the Project Area is low. Given the number of raptor nests in the area the risk of turbine-related fatalities may increase for nesting raptors (Swainson's hawk, red-tailed hawk, and great-horned owl) in late spring to early fall as the young begin to fledge from the nests.

Construction and maintenance of the Project could lead to disturbance of nesting raptors within the Project Area. Human activities are known to impact raptors in at least 3 ways: by causing mortality to eggs, young, or adults; by altering habitats; and by disrupting birds' normal behavior (Postovit and Postovit 1987). Disturbance of nesting raptors can result in complete desertion of the nest, eggs, and/or young. Even a temporary departure by adults can lead to exposure of eggs or young to the weather, increased predation risk on eggs or young, or missed feedings (Suter and Jones 1981).

The biologist also observed great-horned owl, northern harrier, red-tailed hawk, and rough-legged hawk within the Project Area during the point count surveys. Additionally, 6 Swainson's hawks, 2 great-horned owl and 4 red-tailed hawk nests were found within the Project Area (Appendix 2, Figure 7). All raptor species observed have low encounter rates, thereby minimizing the potential for negative turbine-related impacts to these species. Additional raptor species: American kestrel, bald eagle, ferruginous hawk, bald eagle, northern goshawk and short-eared owls were seen as incidental observations within the Project Area.

4.3 Listed and Sensitive Species

The biologist did not detect any species listed on the Endangered Species Act or any federal candidate species. The biologist did detect a single bald eagle approximately 1 mile to the southwest of the Project Area in early spring. The Bald and Golden Eagle Protection Act (BGEPA) prohibits the take or disturbance of any bald eagle, alive or dead, including any part, nest, or egg. "Take" is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" a bald or golden eagle. "Disturb" means to agitate or bother an eagle to a degree that causes, or is likely to cause, 1) injury to an eagle, 2) a decrease in its productivity, or 3) nest abandonment. The USFWS has implemented a permitting process to allow take of bald and golden eagles on a limited basis under certain conditions (i.e., if the USFWS determines that the take is compatible with the preservation of the eagles and cannot be practicably avoided). Preservation is defined as consistent with the goal for a stable or increasing breeding population based off of regional populations. The limited number of eagle observations in the vicinity of the Project suggests a low probability of negative interactions between eagles and Project facilities.

Twenty-four species were detected during avian surveys or as incidental observations that are listed as North Dakota State Species of Conservation Priority:

> **Level I** – Horned grebe (incidental), American bittern, American white pelican, ferruginous hawk (incidental), Swainson's hawk, willet, upland sandpiper,

marbled godwit, Wilson's phalarope, Franklin's gull, black tern, grasshopper sparrow, Nelson's sharp-tailed sparrow, and chestnut-collared longspur (incidental).

Level II – bald eagle (incidental), northern pintail, canvasback, redhead, northern harrier, short-eared owl (incidental), sharp-tailed grouse, American avocet, LeConte's sparrow (incidental), and bobolink.

The designation of Species of Conservation Priority describes a species identified as in decline at the national, regional or state level, or a species whose population status in not well known, but thought to be in decline (Hagen et al. 2005). Species of Conservation Priority receive special attention from agencies, but do not require take permits or have other regulatory implications regardless of status (Level I or II); however, all but one of these species (sharp-tailed grouse) are protected under the MBTA. All species listed above had encounter rates of less than 0.25 birds/20 min flying within the RSA, primarily because of their low occurrence within the Project Area.

4.4 Species of Interest

The sharp-tailed grouse is managed as a gamebird in North Dakota, and is also listed as a Level II State Species of Conservation Priority. Much of North Dakota currently provides suitable habitat for sharp-tailed grouse (Hagen et al. 2005). Sharp-tailed grouse were observed during regular point counts and incidentally (Appendix 3). One active lek was found just outside of the Project Area during the survey approximately 300 m to the northeast of point count 5 (Figure 7). The highest number observed (18 birds) was during the survey on March 30. All but one observation of sharp-tailed grouse (both survey and incidental observations) were associated with the lek. The probability of sharp-tailed grouse fatalities is low as they typically fly low to the ground and, therefore, are at low risk of collision with turbines. Although the potential exists for wind energy development to have an impact on grouse behavior and habitat use, the extent and duration is unknown for sharp-tailed grouse.

4.5 Comparison of the Spring 2010 and the Fall 2009 Survey

Although the spring 2010 survey had one additional survey week, the fall 2009 survey had 14,950 birds of 91 species (with 209 unidentified birds) compared to the spring survey with 5,611 birds of 90 species (0 unidentified birds). The fall 2009 survey showed a higher overall mean use (177.98 birds/20 min) as compared to 61.66 birds/20 min observed in the spring 2010 survey. The five highest mean use species in the fall were (in order) red-winged blackbird, snow goose, sandhill crane, American coot and yellow-headed blackbird compared to the spring which had lesser scaup, common grackle, red-winged blackbird, yellow-headed blackbird and mallard. Birds were more frequently observed flying through the RSA during the fall surveys. Ring-billed gull had a high encounter rate during the fall surveys but not in the spring. Additionally, red-winged blackbird, snow geese, American white pelican, barn swallow, Franklin's gull, Lapland longspur, and Canada geese had high encounter rates in the fall and low encounter rates in the spring. One species that was not seen in the spring in the Project Area yet was seen in large numbers on a single day in the fall (with a high encounter rate) was the sandhill crane. A high encounter rate was considered ≥2.0 birds flying at RSA height/20 min.

4.6 Project Conclusions

The biologist did not detect any species listed as candidate, threatened or endangered under the ESA. The point count surveys suggest that the Project Area is utilized by a wide number and diversity of bird species during the spring migratory period. However, the behavioral data (e.g., flight patterns) suggest that the probability of negative interactions between birds and turbines in the Project Area is generally low for most species. Spring non-raptor use was dominated by lesser scaup, common grackle, red-winged blackbird, yellow-headed blackbird, and mallard. The three species with the highest encounter rates (common grackle, European starling, and ring-billed gull) have increasing regional populations (Sauer et al. 2008); therefore, if fatalities do occur they are unlikely to have population-level consequences. European starlings are not protected by any state or federal laws. Nocturnal migrants (e.g., some songbirds) may pass through the Project Area and would not be detected by the survey methods used in this study if the birds did not stop-over within the Project Area. However, mortality of nocturnal migrants at the Project is not expected to have population-level implications because less than 0.01 percent of nocturnal migrants that fly through wind farms are killed (Erickson 2007).

Spring raptor use in the Project Area was low. The level of raptor use in the Project Area suggests that raptor mortality is anticipated to be low, especially based on the results by Erickson 2007. Swainson's hawk was the most common raptor observed at the Project Area and fatalities of the species have occurred at wind farms (Kerns and Kerlinger 2004). However, the overall numbers and encounter rates of Swainson's hawk detected at the Project Area were low, thereby minimizing the probability of negative interactions with turbines.

Given the number of raptor nests in the Project Area the risk of turbine-related fatalities may increase for nesting raptors (Swainson's hawk, red-tailed hawk, and great-horned owl) in late spring to early fall as the young begin to fledge from the nests. Additionally, construction and maintenance of the Project could lead to disturbance of nesting raptors within the Project Area. Disturbance of nesting raptors can result in complete desertion of nest, eggs, or young.

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TABLES

Table 1. Spring 2010 point count survey dates at the Ashley Wind Energy Project.

Survey number	Date(s)
1	3/23-3/27
2	3/30
3	4/7
4	4/14
5	4/19
6	4/27
7	5/5
8	5/11
9	5/18
10	5/26
11	6/1
12	6/8
13	6/13

Table 2. Avian species, by species grouping, observed during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species Grouping	Overall Rank[1]	Number of Birds	Number of Observations	Mean Use # birds per 20 min.	(90% confidence interval)	Frequency % of surveys detected	Percent Composition	
							Group	Overall
Songbirds								
common grackle	2	537	63	5.90	(4.14-7.66)	59.3	22.1%	9.6%
red-winged blackbird	3	531	78	5.84	(4.40-7.28)	71.4	21.8%	9.5%
yellow-headed blackbird	4	498	35	5.47	(2.80-8.14)	29.7	20.5%	8.9%
European starling	8	256	16	2.81	(0.85-4.77)	16.5	10.5%	4.6%
western meadowlark	12	151	95	1.66	(1.37-1.95)	64.8	6.2%	2.7%
Lapland longspur	19	76	4	0.84	(0.00-1.94)	3.3	3.1%	1.4%
brown-headed cowbird	20	66	19	0.73	(0.43-1.03)	20.9	2.7%	1.2%
horned lark	22	51	36	0.56	(0.37-0.75)	28.6	2.1%	0.9%
barn swallow	28	25	16	0.27	(0.14-0.40)	15.4	1.0%	0.4%
common yellowthroat	31	22	20	0.24	(0.13-0.35)	15.4	0.9%	0.4%
marsh wren	32	20	4	0.22	(0.00-0.45)	3.3	0.8%	0.4%
eastern kingbird	34	16	13	0.18	(0.09-0.27)	13.2	0.7%	0.3%
American goldfinch	34	16	14	0.18	(0.09-0.27)	13.2	0.7%	0.3%
western kingbird	37	15	11	0.16	(0.06-0.26)	9.9	0.6%	0.3%
house sparrow	37	15	8	0.16	(0.07-0.25)	8.8	0.6%	0.3%
savannah sparrow	40	14	9	0.15	(0.05-0.25)	8.8	0.6%	0.2%
Brewer's blackbird	40	14	4	0.15	(0.00-0.30)	4.4	0.6%	0.2%
bobolink	40	14	8	0.15	(0.05-0.25)	8.8	0.6%	0.2%
tree swallow	48	10	6	0.11	(0.04-0.18)	6.6	0.4%	0.2%
house wren	48	10	8	0.11	(0.02-0.20)	5.5	0.4%	0.2%
orchard oriole	51	9	8	0.10	(0.03-0.17)	7.7	0.4%	0.2%
American robin	51	9	8	0.10	(0.04-0.16)	8.8	0.4%	0.2%
yellow warbler	54	7	7	0.08	(0.03-0.13)	6.6	0.3%	0.1%
song sparrow	54	7	7	0.08	(0.03-0.13)	7.7	0.3%	0.1%
least flycatcher	54	7	6	0.08	(0.02-0.14)	5.5	0.3%	0.1%
willow flycatcher	57	6	5	0.07	(0.01-0.13)	3.3	0.2%	0.1%
American crow	59	5	3	0.05	(0.00-0.11)	3.3	0.2%	0.1%
vesper sparrow	63	4	2	0.04	(0.00-0.09)	2.2	0.2%	0.1%

Table 2. Avian species, by species grouping, observed during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species Grouping	Overall Rank[1]	Number of Birds	Number of Observations	Mean Use # birds per 20 min. (90% confidence interval)		Frequency % of surveys detected	Percent Composition	
							Group	Overall
clay-colored sparrow	65	3	2	0.03	(0.00-0.07)	2.2	0.1%	0.1%
warbling vireo	68	2	2	0.02	(0.00-0.05)	2.2	0.1%	0.0%
Swainson's thrush	68	2	1	0.02	(0.00-0.06)	1.1	0.1%	0.0%
red-eyed vireo	68	2	1	0.02	(0.00-0.06)	1.1	0.1%	0.0%
grasshopper sparrow	68	2	1	0.02	(0.00-0.06)	1.1	0.1%	0.0%
chipping sparrow	68	2	2	0.02	(0.00-0.05)	2.2	0.1%	0.0%
brown thrasher	68	2	2	0.02	(0.00-0.05)	2.2	0.1%	0.0%
yellow-rumped warbler	79	1	1	0.01	(0.00-0.03)	1.1	0.0%	0.0%
Nelson's sharp-tailed sparrow	79	1	1	0.01	(0.00-0.03)	1.1	0.0%	0.0%
Harris's sparrow	79	1	1	0.01	(0.00-0.03)	1.1	0.0%	0.0%
gray catbird	79	1	1	0.01	(0.00-0.03)	1.1	0.0%	0.0%
Baltimore oriole	79	1	1	0.01	(0.00-0.03)	1.1	0.0%	0.0%
alder flycatcher	79	1	1	0.01	(0.00-0.03)	1.1	0.0%	0.0%
Group Total		**2432**	**530**	**26.73**	(21.21-32.25)	**97.8**		**43.3%**
Waterfowl								
lesser scaup	1	587	39	6.45	(4.44-8.46)	41.8	25.8%	10.5%
mallard	5	420	118	4.62	(3.63-5.61)	78.0	18.4%	7.5%
blue-winged teal	7	262	57	2.88	(2.11-3.65)	51.6	11.5%	4.7%
gadwall	10	155	48	1.70	(1.25-2.15)	42.9	6.8%	2.8%
northern pintail	11	154	62	1.69	(1.26-2.12)	46.2	6.8%	2.7%
snow goose	13	150	1	1.65	(0.00-4.36)	1.1	6.6%	2.7%
northern shoveler	14	142	40	1.56	(1.11-2.01)	37.4	6.2%	2.5%
Canada goose	15	101	43	1.11	(0.72-1.50)	39.6	4.4%	1.8%
redhead	16	98	24	1.08	(0.64-1.52)	19.8	4.3%	1.7%
greater white-fronted goose	18	80	1	0.88	(0.00-2.33)	1.1	3.5%	1.4%
ruddy duck	23	43	12	0.47	(0.23-0.71)	13.2	1.9%	0.8%
canvasback	28	25	6	0.27	(0.05-0.49)	6.6	1.1%	0.4%
bufflehead	33	19	6	0.21	(0.06-0.36)	6.6	0.8%	0.3%
common merganser	40	14	2	0.15	(0.00-0.34)	2.2	0.6%	0.2%

Table 2. Avian species, by species grouping, observed during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species Grouping	Overall Rank[1]	Number of Birds	Number of Observations	Mean Use # birds per 20 min. (90% confidence interval)		Frequency % of surveys detected	Percent Composition	
							Group	Overall
green-winged teal	45	12	5	0.13	(0.03-0.23)	5.5	0.5%	0.2%
American wigeon	45	12	8	0.13	(0.05-0.21)	8.8	0.5%	0.2%
ring-necked duck	68	2	1	0.02	(0.00-0.06)	1.1	0.1%	0.0%
red-breasted merganser	79	1	1	0.01	(0.00-0.03)	1.1	0.0%	0.0%
Group Total		**2277**	**474**	**25.02**	(20.55-29.49)	**96.7**		**40.6%**
Waterbirds								
American coot	6	319	70	3.51	(2.53-4.49)	53.8	67.3%	5.7%
killdeer	21	60	44	0.66	(0.50-0.82)	45.1	12.7%	1.1%
pied-billed grebe	26	28	19	0.31	(0.18-0.44)	18.7	5.9%	0.5%
marbled godwit	30	24	22	0.26	(0.16-0.36)	20.9	5.1%	0.4%
Wilson's snipe	45	12	12	0.13	(0.07-0.19)	13.2	2.5%	0.2%
willet	48	10	7	0.11	(0.04-0.18)	7.7	2.1%	0.2%
double-crested cormorant	59	5	5	0.05	(0.01-0.09)	5.5	1.1%	0.1%
black-crowned night-heron	59	5	4	0.05	(0.00-0.10)	4.4	1.1%	0.1%
upland sandpiper	65	3	3	0.03	(0.00-0.06)	3.3	0.6%	0.1%
American white pelican	65	3	1	0.03	(0.00-0.08)	1.1	0.6%	0.1%
Baird's sandpiper	68	2	1	0.02	(0.00-0.06)	1.1	0.4%	0.0%
Wilson's phalarope	79	1	1	0.01	(0.00-0.03)	1.1	0.2%	0.0%
American bittern	79	1	1	0.01	(0.00-0.03)	1.1	0.2%	0.0%
American avocet	79	1	1	0.01	(0.00-0.03)	1.1	0.2%	0.0%
Group Total		**474**	**191**	**5.21**	(4.08-6.34)	**78.0**		**8.4%**
Gulls/Terns								
ring-billed gull	9	168	23	1.85	(0.00-3.75)	23.1	80.8%	3.0%
Franklin's gull	24	32	2	0.35	(0.00-0.93)	1.1	15.4%	0.6%
black tern	57	6	4	0.07	(0.01-0.13)	4.4	2.9%	0.1%
California gull	68	2	1	0.02	(0.00-0.06)	1.1	1.0%	0.0%
Group Total		**208**	**30**	**2.29**	(0.31-4.27)	**25.3**		**3.7%**
Gamebirds								
ring-necked pheasant	17	93	53	1.02	(0.79-1.25)	52.7	76.9%	1.7%

Table 2. Avian species, by species grouping, observed during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species Grouping	Overall Rank[1]	Number of Birds	Number of Observations	Mean Use # birds per 20 min. (90% confidence interval)	Frequency % of surveys detected	Percent Composition	
						Group	Overall
sharp-tailed grouse	26	28	9	0.31 (0.00-0.64)	6.6	23.1%	0.5%
Group Total		**121**	**62**	**1.33** (0.92-1.74)	**53.8**		**2.2%**
Raptors							
Swainson's hawk	24	32	29	0.35 (0.22-0.48)	22.0	47.8%	0.6%
great horned owl	37	15	9	0.16 (0.05-0.27)	6.6	22.4%	0.3%
red-tailed hawk	40	14	14	0.15 (0.07-0.23)	12.1	20.9%	0.2%
northern harrier	63	4	4	0.04 (0.00-0.08)	4.4	6.0%	0.1%
rough-legged hawk	68	2	1	0.02 (0.00-0.06)	1.1	3.0%	0.0%
Group Total		**67**	**57**	**0.74** (0.54-0.94)	**40.7**		**1.2%**
Pigeons/Doves							
mourning dove	34	16	13	0.18 (0.10-0.26)	14.3	76.2%	0.3%
rock pigeon	59	5	2	0.05 (0.00-0.12)	2.2	23.8%	0.1%
Group Total		**21**	**15**	**0.23** (0.12-0.34)	**16.5**		**0.4%**
Cranes/Rails							
sora	53	8	8	0.09 (0.03-0.15)	7.7	100.0%	0.1%
Group Total		**8**	**8**	**0.09** (0.03-0.15)	**7.7**		**0.1%**
Woodpeckers							
northern flicker	68	2	2	0.02 (0.00-0.05)	2.2	66.7%	0.0%
hairy woodpecker	79	1	1	0.01 (0.00-0.03)	1.1	33.3%	0.0%
Group Total		**3**	**3**	**0.03** (0.00-0.06)	**3.3**		**0.1%**
Grand Total		**5611**	**1370**	**61.66** (52.65-70.67)			

[1] A ranking of 1 indicates highest mean use

Table 3. Avian species observed by point during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species	Number of Birds	Number of Obs.	Points 3	4	5	6	7	8	9
lesser scaup	587	39	0	0	148	100	164	24	151
common grackle	537	63	17	139	74	180	20	101	6
red-winged blackbird	531	78	59	2	104	196	12	129	29
yellow-headed blackbird	498	35	50	0	130	290	0	16	12
mallard	420	118	35	52	92	56	23	84	78
American coot	319	70	34	0	147	21	16	66	35
blue-winged teal	262	57	39	9	63	35	22	58	36
European starling	256	16	0	146	0	20	0	86	4
ring-billed gull	168	23	0	6	8	143	1	7	3
gadwall	155	48	22	17	31	30	6	29	20
northern pintail	154	62	22	22	38	9	11	27	25
western meadowlark	151	95	35	28	28	7	13	8	32
snow goose	150	1	150	0	0	0	0	0	0
northern shoveler	142	40	16	9	46	20	2	15	34
Canada goose	101	43	12	8	2	26	9	37	7
redhead	98	24	4	0	16	13	4	61	0
ring-necked pheasant	93	53	7	22	17	3	14	15	15
greater white-fronted goose	80	1	0	0	80	0	0	0	0
Lapland longspur	76	4	60	6	10	0	0	0	0
brown-headed cowbird	66	19	9	9	13	8	3	5	19
killdeer	60	44	12	7	12	15	0	7	7
horned lark	51	36	8	18	6	14	0	1	4
ruddy duck	43	12	3	0	33	5	0	2	0
Swainson's hawk	32	29	1	1	0	1	16	1	12
Franklin's gull	32	2	0	0	0	0	0	0	32
sharp-tailed grouse	28	9	1	0	27	0	0	0	0
pied-billed grebe	28	19	0	0	9	2	4	10	3
canvasback	25	6	0	2	4	19	0	0	0
barn swallow	25	16	1	6	2	4	0	2	10
marbled godwit	24	22	10	1	7	2	0	2	2
common yellowthroat	22	20	3	2	5	1	10	1	0
marsh wren	20	4	0	0	0	20	0	0	0
bufflehead	19	6	2	0	0	2	4	2	9
mourning dove	16	13	0	6	1	4	3	2	0
eastern kingbird	16	13	2	1	2	0	5	1	5
American goldfinch	16	14	0	4	0	2	8	2	0
western kingbird	15	11	0	5	0	1	8	1	0
house sparrow	15	8	0	7	0	6	0	0	2
great horned owl	15	9	0	2	0	0	0	0	13
savannah sparrow	14	9	5	0	5	0	0	0	4

Table 3. Avian species observed by point during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species	Number of Birds	Number of Obs.	Points						
			3	4	5	6	7	8	9
red-tailed hawk	14	14	4	4	1	1	3	0	1
common merganser	14	2	0	0	0	14	0	0	0
Brewer's blackbird	14	4	6	2	0	1	0	5	0
bobolink	14	8	1	0	5	0	0	4	4
Wilson's snipe	12	12	2	2	1	0	1	1	5
green-winged teal	12	5	4	2	0	2	0	2	2
American wigeon	12	8	2	2	2	2	0	1	3
willet	10	7	4	0	5	1	0	0	0
tree swallow	10	6	0	2	0	2	2	2	2
house wren	10	8	0	0	0	1	9	0	0
orchard oriole	9	8	0	1	0	3	4	0	1
American robin	9	8	0	5	0	1	2	1	0
sora	8	8	2	0	0	4	0	2	0
yellow warbler	7	7	0	0	0	0	6	1	0
song sparrow	7	7	0	0	0	1	5	0	1
least flycatcher	7	6	0	0	0	1	6	0	0
willow flycatcher	6	5	0	0	0	0	6	0	0
black tern	6	4	0	0	2	4	0	0	0
rock pigeon	5	2	0	5	0	0	0	0	0
double-crested cormorant	5	5	0	1	1	1	0	1	1
black-crowned night-heron	5	4	0	0	0	1	1	2	1
American crow	5	3	0	1	1	0	0	0	3
vesper sparrow	4	2	0	2	0	2	0	0	0
northern harrier	4	4	0	1	1	0	0	2	0
upland sandpiper	3	3	3	0	0	0	0	0	0
clay-colored sparrow	3	2	0	1	2	0	0	0	0
American white pelican	3	1	0	0	0	0	0	0	3
warbling vireo	2	2	0	0	0	1	1	0	0
Swainson's thrush	2	1	0	0	0	2	0	0	0
ring-necked duck	2	1	0	0	2	0	0	0	0
rough-legged hawk	2	1	0	0	0	0	0	0	2
red-eyed vireo	2	1	0	0	0	0	2	0	0
northern flicker	2	2	0	0	0	0	2	0	0
grasshopper sparrow	2	1	0	0	2	0	0	0	0
chipping sparrow	2	2	0	0	0	0	2	0	0
California gull	2	1	0	0	0	2	0	0	0
brown thrasher	2	2	0	1	0	1	0	0	0
Baird's sandpiper	2	1	0	0	2	0	0	0	0
yellow-rumped warbler	1	1	1	0	0	0	0	0	0
Wilson's phalarope	1	1	0	0	0	1	0	0	0

Table 3. Avian species observed by point during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species	Number of Birds	Number of Obs.	Points 3	4	5	6	7	8	9
red-breasted merganser	1	1	0	0	0	1	0	0	0
Nelson's sharp-tailed sparrow	1	1	0	0	0	1	0	0	0
hairy woodpecker	1	1	0	0	0	0	0	0	1
Harris's sparrow	1	1	0	0	0	1	0	0	0
gray catbird	1	1	0	0	0	0	1	0	0
Baltimore oriole	1	1	0	0	0	1	0	0	0
American bittern	1	1	0	0	1	0	0	0	0
American avocet	1	1	0	0	0	1	0	0	0
alder flycatcher	1	1	0	0	0	0	1	0	0
Grand Total	**5611**	**1370**	**648**	**569**	**1188**	**1309**	**432**	**826**	**639**

Table 4. Summary of avian flight heights[1] in relation to the turbine rotor swept area (RSA)[2] during Spring 2010 point count surveys at the Ashley Wind Energy Project.

		Birds	
		Number	Percentage
Non-raptors			
	Above RSA height (>130.5m)	3	0.1%
	At RSA height (29.5m–130.5m)	506	18.5%
	Below RSA height (<29.5m)	2231	81.4%
Raptors			
	At RSA height (29.5m–130.5m)	26	76.5%
	Below RSA height (<29.5m)	8	23.5%

[1] Includes only flying birds with flight height data

[2]These values assume a rotor diameter of 101 (m) and a hub height of 80 (m)

Table 5. Avian flight height characteristics in relation to the turbine rotor swept area (RSA)[1] during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species	Encounter Rate	Mean Use # birds/ 20 min. (90% confidence interval)	Percent Flying	Percent Above RSA Height	Percent At RSA Height	Percent Below RSA Height
common grackle	1.82	5.90 (4.14 - 7.66)	95.7	0.0	32.3	67.7
European starling	1.38	2.81 (0.85 - 4.77)	100.0	0.0	49.2	50.8
ring-billed gull	1.20	1.85 (0.00 - 3.75)	88.1	0.0	73.6	26.4
mallard	0.42	4.62 (3.63 - 5.61)	33.8	1.4	26.8	71.8
northern pintail	0.24	1.69 (1.26 - 2.12)	48.1	0.0	29.7	70.3
Swainson's hawk	0.19	0.35 (0.22 - 0.48)	59.4	0.0	89.5	10.5
gadwall	0.12	1.70 (1.25 - 2.15)	8.4	0.0	84.6	15.4
Canada goose	0.09	1.11 (0.72 - 1.50)	30.7	0.0	25.8	74.2
red-tailed hawk	0.09	0.15 (0.07 - 0.23)	64.3	0.0	88.9	11.1
tree swallow	0.06	0.11 (0.04 - 0.18)	100.0	0.0	50.0	50.0
redhead	0.04	1.08 (0.64 - 1.52)	10.2	0.0	40.0	60.0
marbled godwit	0.04	0.26 (0.16 - 0.36)	25.0	0.0	66.7	33.3
American white pelican	0.03	0.03 (0.00 - 0.08)	100.0	0.0	100.0	0.0
mourning dove	0.02	0.18 (0.10 - 0.26)	37.5	0.0	33.3	66.7
eastern kingbird	0.02	0.18 (0.09 - 0.27)	56.3	0.0	22.2	77.8
blue-winged teal	0.02	2.88 (2.11 - 3.65)	1.5	0.0	50.0	50.0
willet	0.01	0.11 (0.04 - 0.18)	80.0	0.0	12.5	87.5
red-winged blackbird	0.01	5.84 (4.40 - 7.28)	87.9	0.0	0.2	99.8
northern shoveler	0.01	1.56 (1.11 - 2.01)	0.7	0.0	100.0	0.0
northern harrier	0.01	0.04 (0.00 - 0.08)	100.0	0.0	25.0	75.0
double-crested cormorant	0.01	0.05 (0.01 - 0.09)	80.0	25.0	25.0	50.0
yellow warbler	0.00	0.08 (0.03 - 0.13)	0.0	0.0	0.0	0.0
yellow-rumped warbler	0.00	0.01 (0.00 - 0.03)	0.0	0.0	0.0	0.0
yellow-headed blackbird	0.00	5.47 (2.80 - 8.14)	97.4	0.0	0.0	100.0
Wilson's snipe	0.00	0.13 (0.07 - 0.19)	0.0	0.0	0.0	0.0
Wilson's phalarope	0.00	0.01 (0.00 - 0.03)	0.0	0.0	0.0	0.0

Table 5. Avian flight height characteristics in relation to the turbine rotor swept area (RSA)[1] during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species	Encounter Rate	Mean Use # birds/ 20 min. (90% confidence interval)	Percent Flying	Percent Above RSA Height	Percent At RSA Height	Percent Below RSA Height
willow flycatcher	0.00	0.07 (0.01 - 0.13)	0.0	0.0	0.0	0.0
western meadowlark	0.00	1.66 (1.37 - 1.95)	3.3	0.0	0.0	100.0
western kingbird	0.00	0.16 (0.06 - 0.26)	80.0	0.0	0.0	100.0
warbling vireo	0.00	0.02 (0.00 - 0.05)	0.0	0.0	0.0	0.0
vesper sparrow	0.00	0.04 (0.00 - 0.09)	0.0	0.0	0.0	0.0
upland sandpiper	0.00	0.03 (0.00 - 0.06)	0.0	0.0	0.0	0.0
Swainson's thrush	0.00	0.02 (0.00 - 0.06)	0.0	0.0	0.0	0.0
sharp-tailed grouse	0.00	0.31 (0.00 - 0.64)	82.1	0.0	0.0	100.0
song sparrow	0.00	0.08 (0.03 - 0.13)	0.0	0.0	0.0	0.0
sora	0.00	0.09 (0.03 - 0.15)	0.0	0.0	0.0	0.0
snow goose	0.00	1.65 (0.00 - 4.36)	100.0	0.0	0.0	100.0
savannah sparrow	0.00	0.15 (0.05 - 0.25)	7.1	0.0	0.0	100.0
ruddy duck	0.00	0.47 (0.23 - 0.71)	0.0	0.0	0.0	0.0
rock pigeon	0.00	0.05 (0.00 - 0.12)	100.0	0.0	0.0	100.0
ring-necked pheasant	0.00	1.02 (0.79 - 1.25)	0.0	0.0	0.0	0.0
ring-necked duck	0.00	0.02 (0.00 - 0.06)	0.0	0.0	0.0	0.0
rough-legged hawk	0.00	0.02 (0.00 - 0.06)	100.0	0.0	0.0	100.0
red-eyed vireo	0.00	0.02 (0.00 - 0.06)	0.0	0.0	0.0	0.0
red-breasted merganser	0.00	0.01 (0.00 - 0.03)	0.0	0.0	0.0	0.0
pied-billed grebe	0.00	0.31 (0.18 - 0.44)	0.0	0.0	0.0	0.0
orchard oriole	0.00	0.10 (0.03 - 0.17)	11.1	0.0	0.0	100.0
Nelson's sharp-tailed sparrow	0.00	0.01 (0.00 - 0.03)	0.0	0.0	0.0	0.0
northern flicker	0.00	0.02 (0.00 - 0.05)	0.0	0.0	0.0	0.0
marsh wren	0.00	0.22 (0.00 - 0.45)	0.0	0.0	0.0	0.0
lesser scaup	0.00	6.45 (4.44 - 8.46)	0.3	0.0	0.0	100.0
least flycatcher	0.00	0.08 (0.02 - 0.14)	28.6	0.0	0.0	100.0

Table 5. Avian flight height characteristics in relation to the turbine rotor swept area (RSA)[1] during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species	Encounter Rate	Mean Use # birds/ 20 min. (90% confidence interval)	Percent Flying	Percent Above RSA Height	Percent At RSA Height	Percent Below RSA Height
Lapland longspur	0.00	0.84 (0.00 - 1.94)	100.0	0.0	0.0	100.0
killdeer	0.00	0.66 (0.50 - 0.82)	48.3	0.0	0.0	100.0
house wren	0.00	0.11 (0.02 - 0.20)	0.0	0.0	0.0	0.0
house sparrow	0.00	0.16 (0.07 - 0.25)	13.3	0.0	0.0	100.0
horned lark	0.00	0.56 (0.37 - 0.75)	29.4	0.0	0.0	100.0
hairy woodpecker	0.00	0.01 (0.00 - 0.03)	100.0	0.0	0.0	100.0
Harris's sparrow	0.00	0.01 (0.00 - 0.03)	0.0	0.0	0.0	0.0
green-winged teal	0.00	0.13 (0.03 - 0.23)	0.0	0.0	0.0	0.0
greater white-fronted goose	0.00	0.88 (0.00 - 2.33)	100.0	0.0	0.0	100.0
grasshopper sparrow	0.00	0.02 (0.00 - 0.06)	0.0	0.0	0.0	0.0
gray catbird	0.00	0.01 (0.00 - 0.03)	0.0	0.0	0.0	0.0
great horned owl	0.00	0.16 (0.05 - 0.27)	0.0	0.0	0.0	0.0
Franklin's gull	0.00	0.35 (0.00 - 0.93)	100.0	0.0	0.0	100.0
common yellowthroat	0.00	0.24 (0.13 - 0.35)	0.0	0.0	0.0	0.0
common merganser	0.00	0.15 (0.00 - 0.34)	0.0	0.0	0.0	0.0
chipping sparrow	0.00	0.02 (0.00 - 0.05)	0.0	0.0	0.0	0.0
clay-colored sparrow	0.00	0.03 (0.00 - 0.07)	0.0	0.0	0.0	0.0
canvasback	0.00	0.27 (0.05 - 0.49)	0.0	0.0	0.0	0.0
California gull	0.00	0.02 (0.00 - 0.06)	100.0	0.0	0.0	100.0
bufflehead	0.00	0.21 (0.06 - 0.36)	0.0	0.0	0.0	0.0
brown thrasher	0.00	0.02 (0.00 - 0.05)	0.0	0.0	0.0	0.0
Brewer's blackbird	0.00	0.15 (0.00 - 0.30)	78.6	0.0	0.0	100.0
bobolink	0.00	0.15 (0.05 - 0.25)	57.1	0.0	0.0	100.0
black tern	0.00	0.07 (0.01 - 0.13)	100.0	0.0	0.0	100.0
brown-headed cowbird	0.00	0.73 (0.43 - 1.03)	74.2	0.0	0.0	100.0
black-crowned night-heron	0.00	0.05 (0.00 - 0.10)	0.0	0.0	0.0	0.0

Table 5. Avian flight height characteristics in relation to the turbine rotor swept area (RSA)[1] during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species	Encounter Rate	Mean Use # birds/ 20 min. (90% confidence interval)	Percent Flying	Percent Above RSA Height	Percent At RSA Height	Percent Below RSA Height
Baird's sandpiper	0.00	0.02 (0.00 - 0.06)	100.0	0.0	0.0	100.0
barn swallow	0.00	0.27 (0.14 - 0.40)	100.0	0.0	0.0	100.0
Baltimore oriole	0.00	0.01 (0.00 - 0.03)	0.0	0.0	0.0	0.0
American wigeon	0.00	0.13 (0.05 - 0.21)	8.3	0.0	0.0	100.0
American robin	0.00	0.10 (0.04 - 0.16)	22.2	0.0	0.0	100.0
American goldfinch	0.00	0.18 (0.09 - 0.27)	12.5	0.0	0.0	100.0
American crow	0.00	0.05 (0.00 - 0.11)	60.0	0.0	0.0	100.0
American coot	0.00	3.51 (2.53 - 4.49)	0.6	0.0	0.0	100.0
American bittern	0.00	0.01 (0.00 - 0.03)	0.0	0.0	0.0	0.0
American avocet	0.00	0.01 (0.00 - 0.03)	0.0	0.0	0.0	0.0
alder flycatcher	0.00	0.01 (0.00 - 0.03)	0.0	0.0	0.0	0.0

[1]These values assume a rotor diameter of 101 (m) and a hub height of 80 (m)

Table 6. Incidental observations of birds during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species
American avocet
American bittern
American coot
American crow
American goldfinch
American kestrel
American robin
American wigeon
American white pelican
bald eagle
bank swallow
barn swallow
black-crowned night-heron
brown-headed cowbird
black tern
bobolink
Bonaparte's gull
Brewer's blackbird
brown thrasher
bufflehead
blue-winged teal
cattle egret
California gull
Canada goose
canvasback
chestnut-collared longspur
clay-colored sparrow
cliff swallow
common grackle
common merganser
common yellowthroat
double-crested cormorant
eastern kingbird
European starling
ferruginous hawk
Forster's tern
Franklin's gull

Table 6. Incidental observations of birds during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species
gadwall
great blue heron
great horned owl
gray partridge
grasshopper sparrow
green-winged teal
hairy woodpecker
horned grebe
horned lark
house sparrow
house wren
killdeer
Le Conte's sparrow
least flycatcher
lesser scaup
marbled godwit
mallard
marsh wren
mourning dove
northern flicker
northern goshawk
northern harrier
northern pintail
northern shoveler
northern shrike
orchard oriole
pied-billed grebe
ring-billed gull
redhead
rough-legged hawk
ring-necked duck
ring-necked pheasant
rock pigeon
red-tailed hawk
ruddy duck
red-winged blackbird
sandhill crane

Table 6. Incidental observations of birds during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species
Say's phoebe
savannah sparrow
short-eared owl
snow goose
sora
song sparrow
sharp-tailed grouse
Swainson's hawk
tree swallow
upland sandpiper
vesper sparrow
Virginia rail
warbling vireo
white-crowned sparrow
western grebe
western kingbird
western meadowlark
willow flycatcher
willet
Wilson's phalarope
Wilson's snipe
yellow-headed blackbird
yellow-rumped warbler
yellow warbler

FIGURES

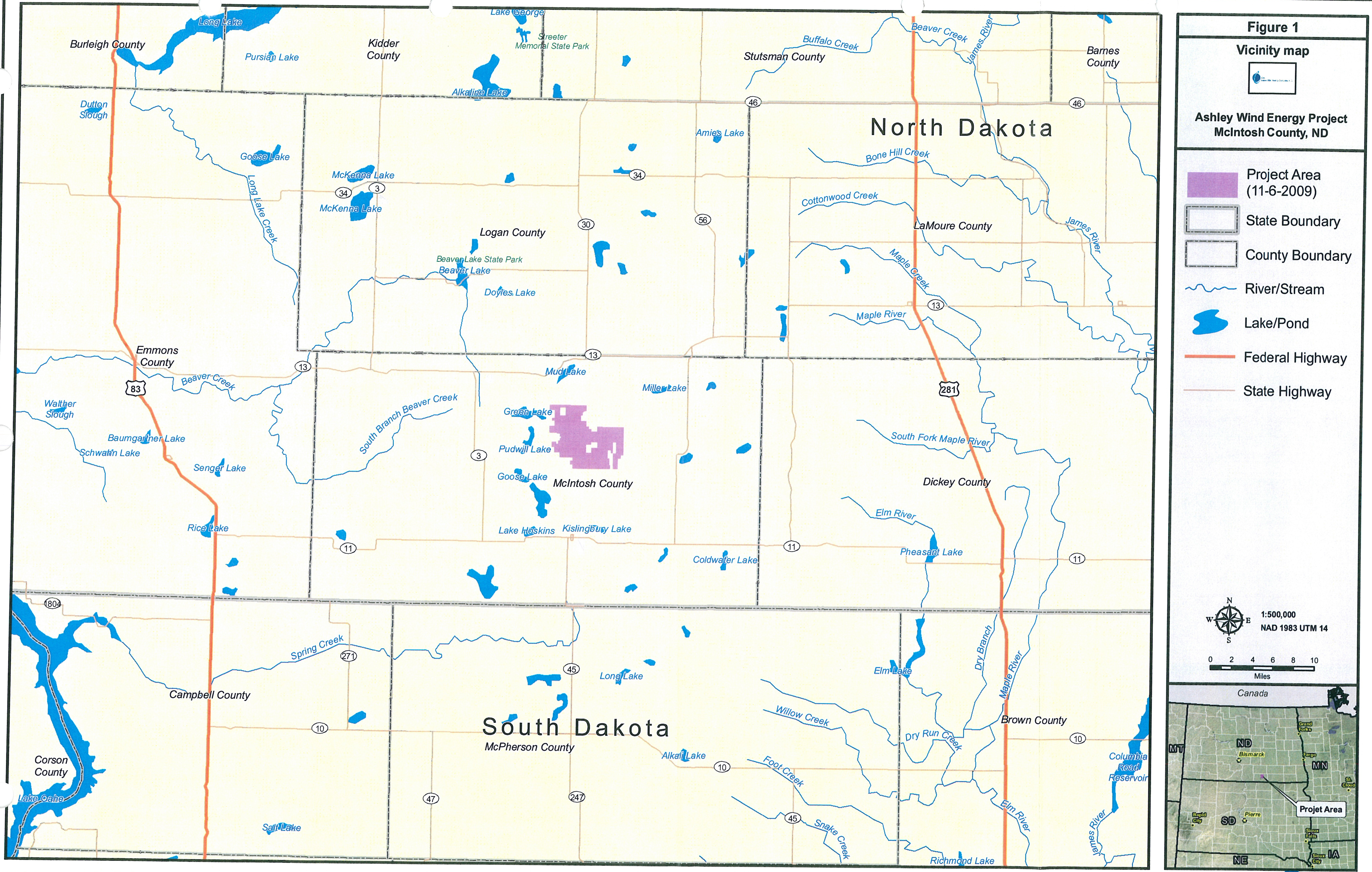


Figure 1
Vicinity map
Ashley Wind Energy Project
McIntosh County, ND
Project Area
(11-6-2009)
State Boundary
County Boundary
River/Stream
Lake/Pond
Federal Highway
State Highway
1:500,000
NAD 1983 UTM 14
0 2 4 6 8 10
Miles
N
S
E
W
Canada
ND
MT
MN
SD
NE
IA
Bismarck
Fargo
Grand Forks
St. Cloud
Pierre
Rapid City
Sioux Falls
Sioux City
Projet Area
TETRA TECH EC,INC
North Dakota
South Dakota
Burleigh County
Kidder County
Stutsman County
Barnes County
Logan County
LaMoure County
Emmons County
McIntosh County
Dickey County
Campbell County
McPherson County
Brown County
Corson County
Long Lake
Lake George
Streeter Memorial State Park
Pursian Lake
Alkaline Lake
Buffalo Creek
Beaver Creek
James River
Dutton Slough
Goose Lake
McKenna Lake
Long Lake Creek
Amies Lake
Bone Hill Creek
Cottonwood Creek
Beaver Lake State Park
Beaver Lake
Doyles Lake
Maple Creek
Maple River
Mud Lake
Miller Lake
Walther Slough
Beaver Creek
South Branch Beaver Creek
Green Lake
Pudwill Lake
Goose Lake
Baumgartner Lake
Schwahn Lake
Senger Lake
South Fork Maple River
Elm River
Rice Lake
Lake Hoskins
Kislingbury Lake
Pheasant Lake
Coldwater Lake
Spring Creek
Long Lake
Elm Lake
Dry Branch
Maple River
Willow Creek
Dry Run Creek
Alkali Lake
Foot Creek
Snake Creek
Elm River
James River
Columbia Road Reservoir
Lake Oahe
Salt Lake
Richmond Lake
83
281
1804
271
45
47
247
10
11
13
3
34
30
56
46

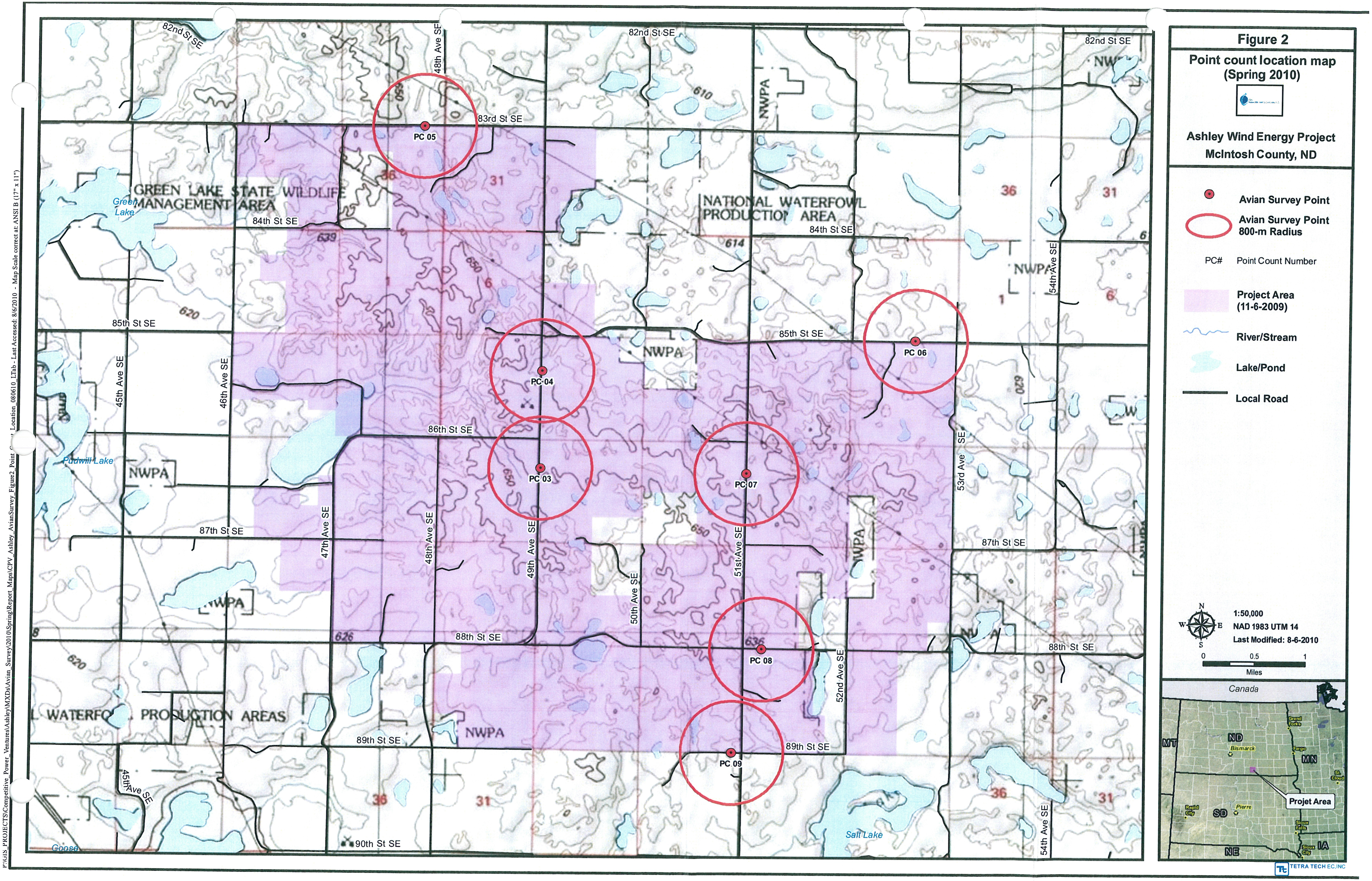
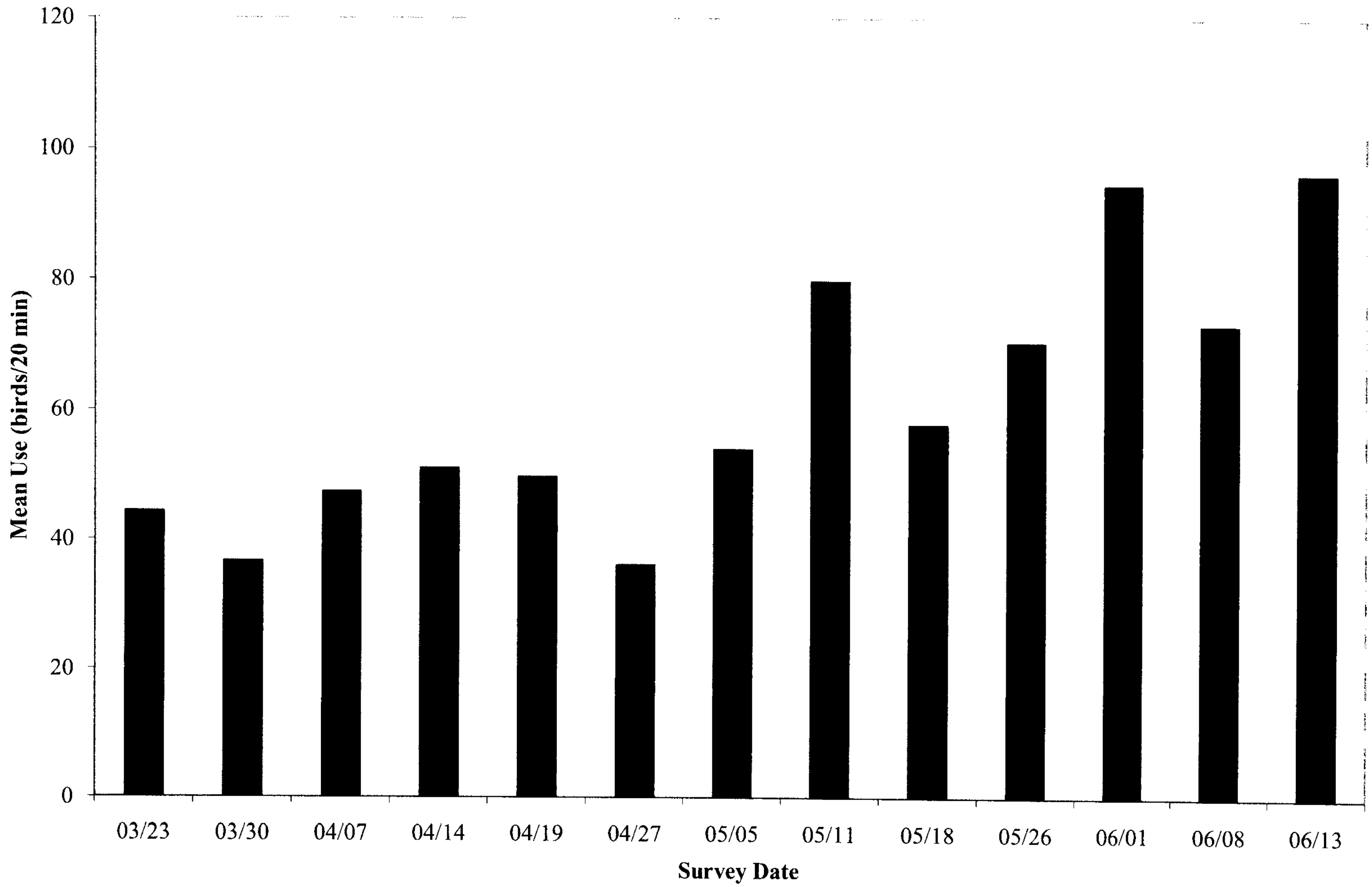


Figure 2
Point count location map (Spring 2010)
Ashley Wind Energy Project
McIntosh County, ND
Avian Survey Point
Avian Survey Point 800-m Radius
PC# Point Count Number
Project Area (11-6-2009)
River/Stream
Lake/Pond
Local Road
1:50,000
NAD 1983 UTM 14
Last Modified: 8-6-2010
0 0.5 1
Miles
Canada
ND
MN
SD
MT
NE
IA
Bismarck
Pierre
Fargo
Grand Forks
Rapid City
Sioux Falls
Sioux City
St. Cloud
Projet Area
TETRA TECH EC,INC
PC 05
PC 04
PC 03
PC 06
PC 07
PC 08
PC 09
82nd St SE
83rd St SE
84th St SE
85th St SE
86th St SE
87th St SE
88th St SE
89th St SE
90th St SE
45th Ave SE
46th Ave SE
47th Ave SE
48th Ave SE
49th Ave SE
50th Ave SE
51st Ave SE
52nd Ave SE
53rd Ave SE
54th Ave SE
GREEN LAKE STATE WILDLIFE MANAGEMENT AREA
NATIONAL WATERFOWL PRODUCTION AREA
WATERFOWL PRODUCTION AREAS
NWPA
Green Lake
Pudwill Lake
Salt Lake
Goose
P:\GIS_PROJECTS\Competitive_Power_Ventures\Ashley\MXDs\Avian_Survey\2010\Spring\Report_Maps\CPV_Ashley_AvianSurvey_Figure2_Point_Count_Location_080610_LTab - Last Accessed: 8/6/2010 - Map Scale correct at: ANSI B (17" x 11")

Figure 3. Non-raptor mean use by survey date in Spring 2010 at the Ashley Wind Energy Project.



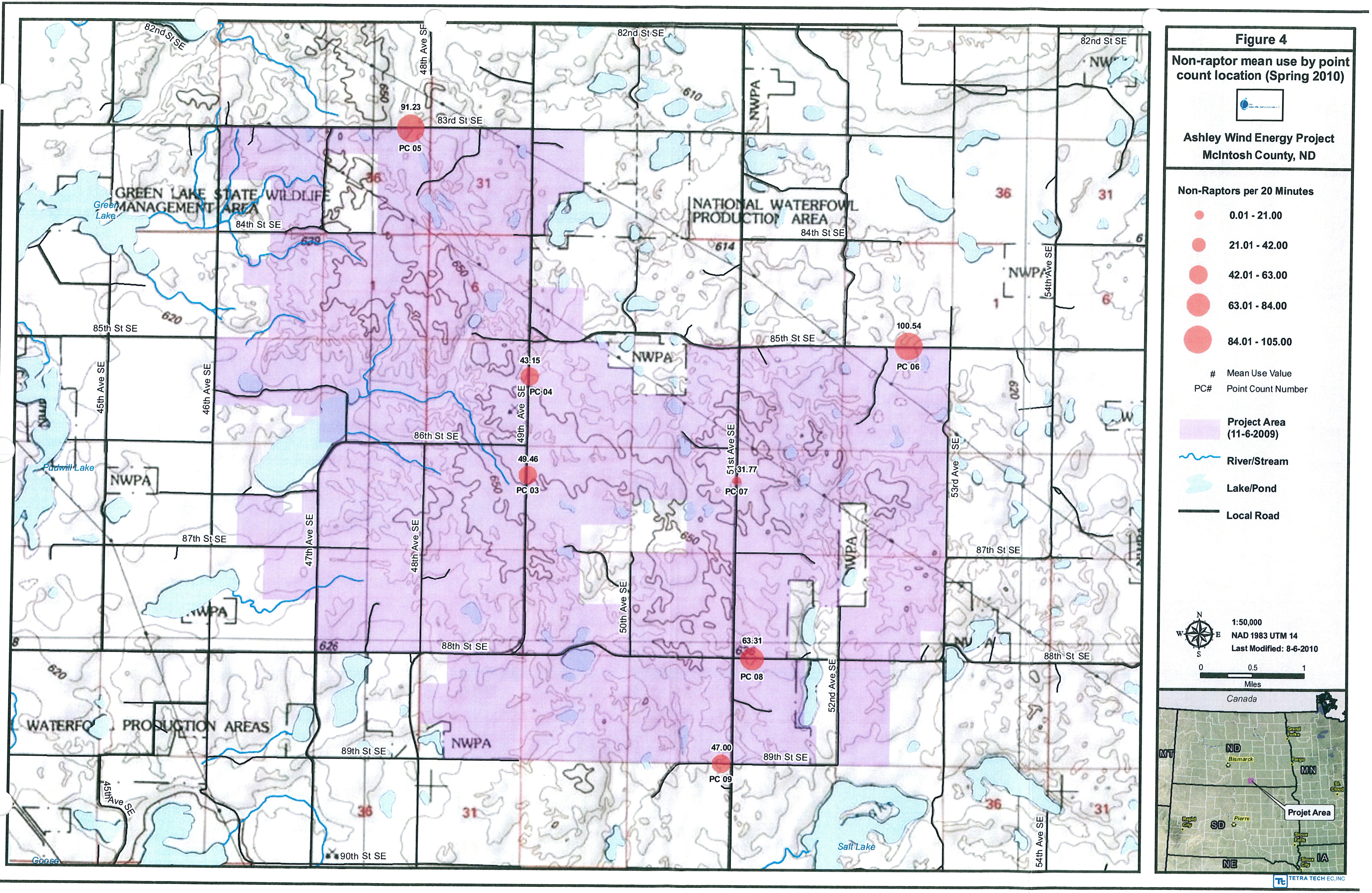


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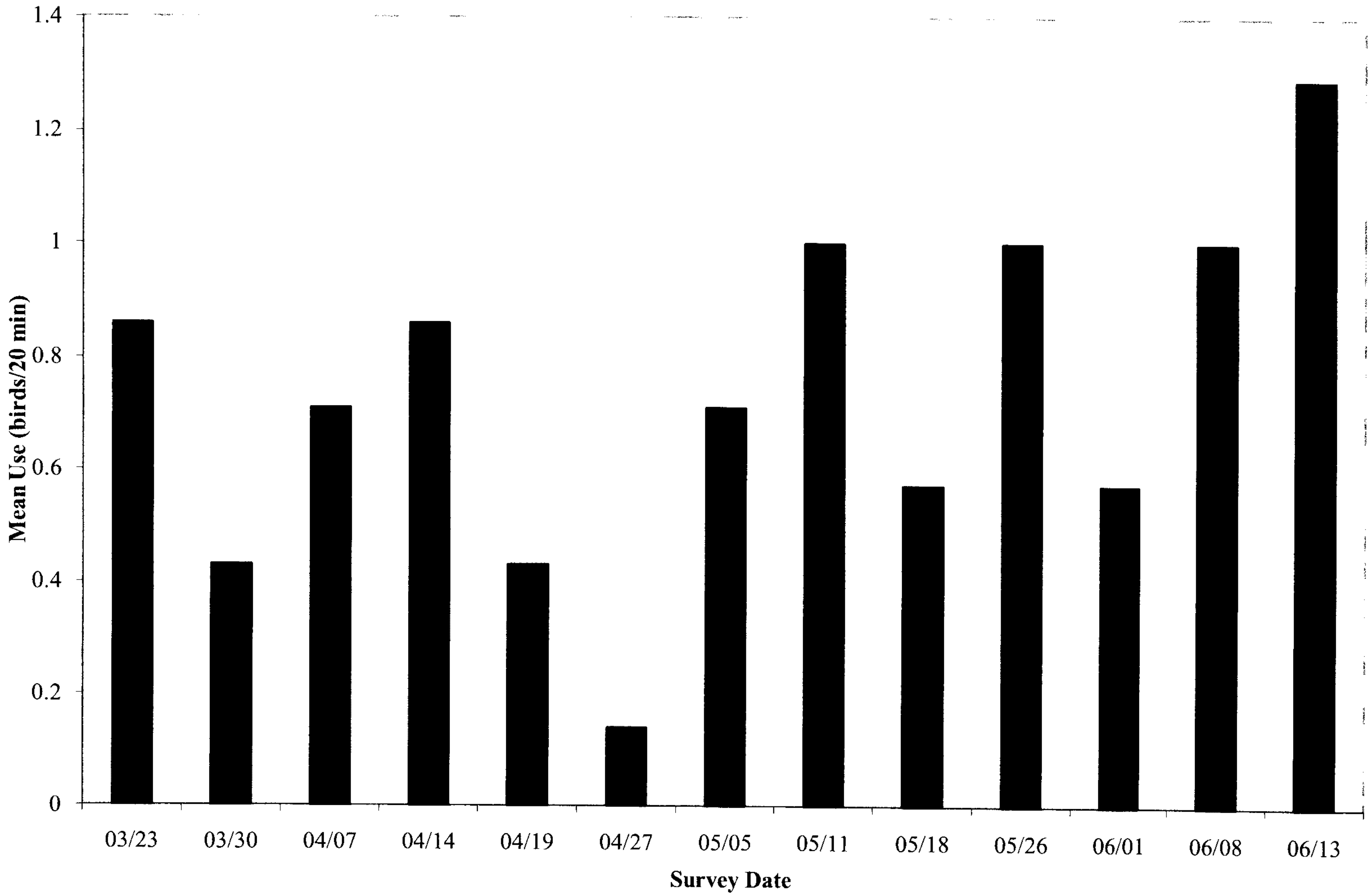
Figure 5. Raptor mean use by survey date in Spring 2010 at the Ashley Wind Energy Project.



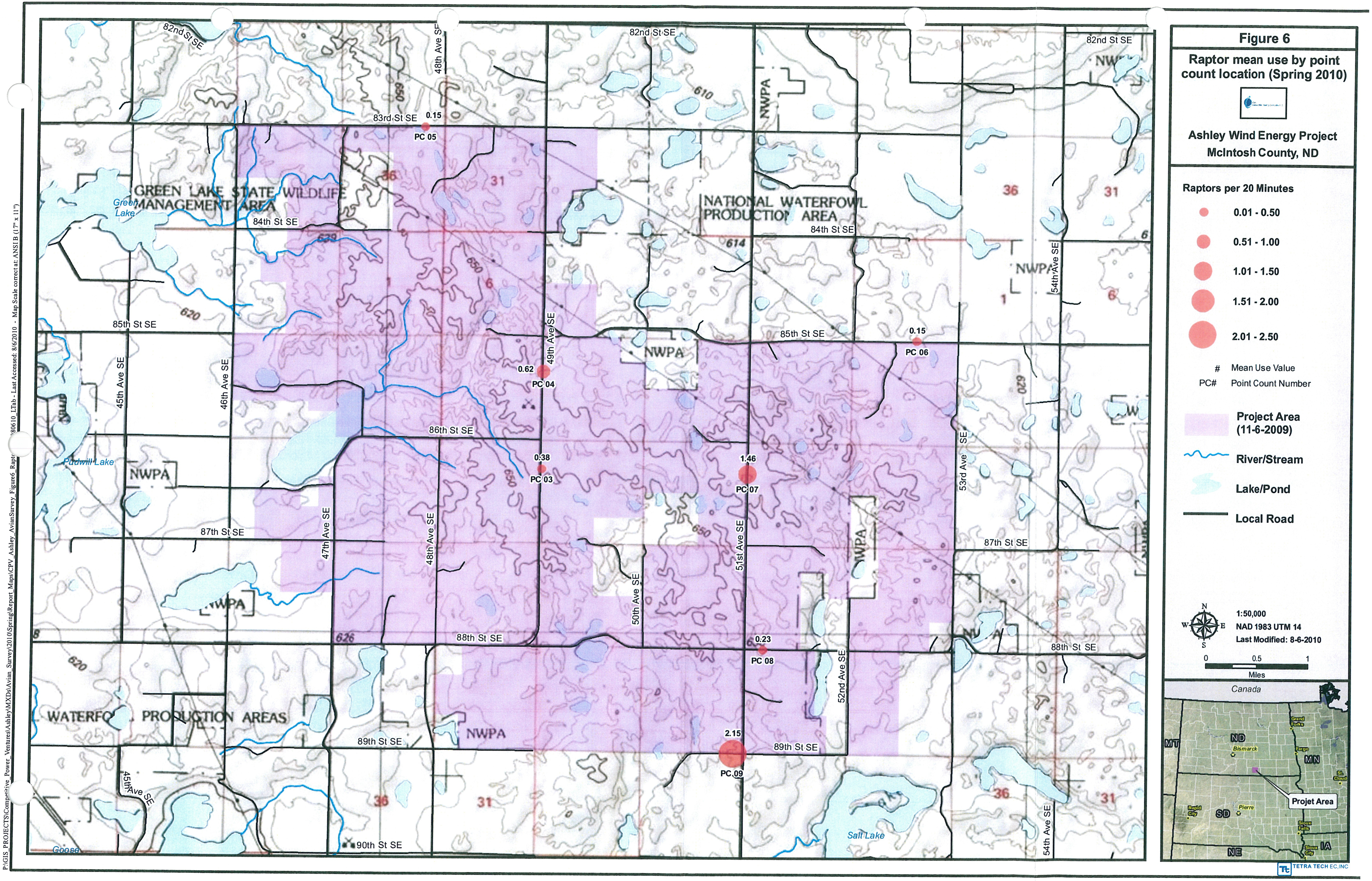


Figure 6
Raptor mean use by point count location (Spring 2010)
Ashley Wind Energy Project
McIntosh County, ND
Raptors per 20 Minutes
0.01 - 0.50
0.51 - 1.00
1.01 - 1.50
1.51 - 2.00
2.01 - 2.50
Mean Use Value
PC# Point Count Number
Project Area (11-6-2009)
River/Stream
Lake/Pond
Local Road
1:50,000
NAD 1983 UTM 14
Last Modified: 8-6-2010
0
0.5
1
Miles
Canada
ND
MN
SD
MT
NE
IA
Bismarck
Fargo
Grand Forks
Pierre
Rapid City
Sioux Falls
Sioux City
St. Cloud
Projet Area
TETRA TECH EC,INC
82nd St SE
83rd St SE
84th St SE
85th St SE
86th St SE
87th St SE
88th St SE
89th St SE
90th St SE
45th Ave SE
46th Ave SE
47th Ave SE
48th Ave SE
49th Ave SE
50th Ave SE
51st Ave SE
52nd Ave SE
53rd Ave SE
54th Ave SE
GREEN LAKE STATE WILDLIFE MANAGEMENT AREA
NATIONAL WATERFOWL PRODUCTION AREA
WATERFOWL PRODUCTION AREAS
NWPA
Green Lake
Pudwill Lake
Salt Lake
Goose
0.15
PC 05
0.62
PC 04
0.38
PC 03
1.46
PC 07
0.15
PC 06
0.23
PC 08
2.15
PC 09

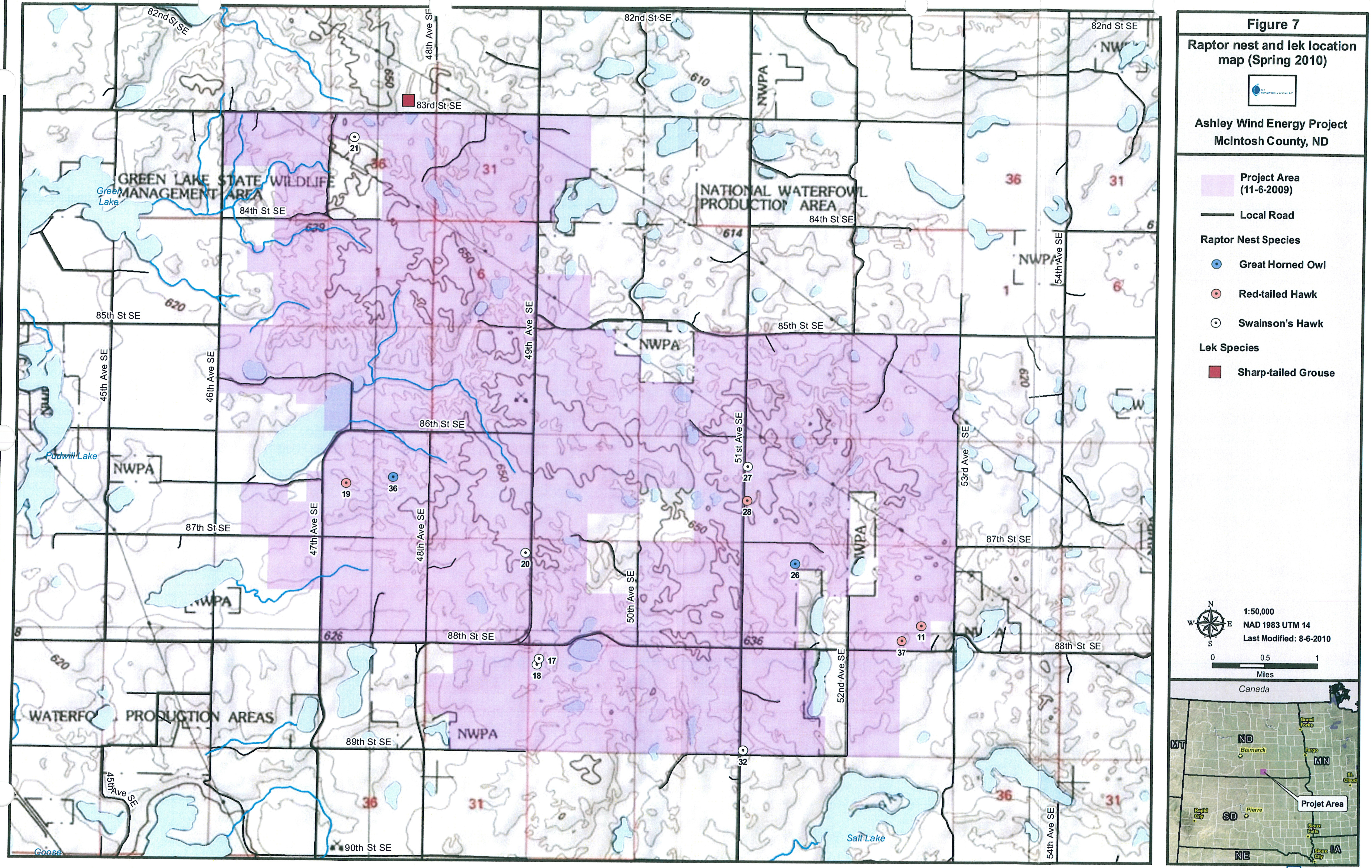


Figure 7

Raptor nest and lek location map (Spring 2010)

Ashley Wind Energy Project
McIntosh County, ND

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APPENDICES

Appendix 1. Flight directions of birds observed during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species	Number of Birds[1]	Number of Observations	Percentage of Flights								
			N	NE	E	SE	S	SW	W	NW	Variable
snow goose	150	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
mallard	102	39	12.7	8.8	17.6	2.9	15.7	20.6	15.7	5.9	0.0
greater white-fronted goose	80	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lapland longspur	76	4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
northern pintail	68	24	0.0	7.4	11.8	0.0	20.6	11.8	36.8	11.8	0.0
ring-billed gull	40	9	82.5	0.0	10.0	2.5	0.0	5.0	0.0	0.0	0.0
Franklin's gull	32	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Canada goose	29	12	13.8	31.0	3.4	6.9	37.9	0.0	0.0	6.9	0.0
sharp-tailed grouse	23	5	13.0	0.0	4.3	0.0	82.6	0.0	0.0	0.0	0.0
red-winged blackbird	13	2	92.3	0.0	0.0	0.0	7.7	0.0	0.0	0.0	0.0
gadwall	12	5	0.0	0.0	58.3	8.3	33.3	0.0	0.0	0.0	0.0
Swainson's hawk	10	10	10.0	20.0	30.0	0.0	0.0	0.0	40.0	0.0	0.0
redhead	10	2	0.0	0.0	0.0	0.0	60.0	0.0	0.0	40.0	0.0
red-tailed hawk	8	8	12.5	0.0	12.5	0.0	37.5	12.5	25.0	0.0	0.0
common grackle	6	2	0.0	0.0	0.0	0.0	50.0	0.0	50.0	0.0	0.0
northern harrier	4	4	50.0	25.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0
double-crested cormorant	4	4	0.0	25.0	50.0	0.0	0.0	25.0	0.0	0.0	0.0
blue-winged teal	4	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
willet	3	2	66.7	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0.0
American white pelican	3	1	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
American crow	3	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
rough-legged hawk	2	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
lesser scaup	2	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0

Appendix 1. Flight directions of birds observed during Spring 2010 point count surveys at the Ashley Wind Energy Project.

Species	Number of Birds[1]	Number of Observations	Percentage of Flights								
			N	NE	E	SE	S	SW	W	NW	Variable
European starling	2	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
black tern	2	2	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
northern shoveler	1	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American wigeon	1	1	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Grand Total	**690**	**147**	**33.5**	**4.8**	**7.1**	**1.6**	**11.4**	**4.9**	**29.1**	**7.5**	**0.0**

[1] Includes only flying birds with flight directions

Appendix 2. Raptor nests observed at the Ashley Wind Energy Project, 2010.

Nest Number	Dates Surveyed	Species	Status	Substrate	Nest Height (m)	Nest Condition
RTHA-2010-11	04/20/2010 05/05/2010 05/18/2010	NA NA red-tailed hawk	Inactive Inactive Active	Siberian Elm	25	Good
SWHA-2010-17	04/19/2010 04/27/2010	NA NA	Inactive Inactive	Siberian Elm	20	Fair
SWHA-2010-18	04/09/2010 05/05/2010 05/18/2010	NA NA Swainson's hawk	Inactive Inactive Active	Siberian Elm	20	Good
RTHA-2010-19	04/19/2010 05/05/2010	NA red-tailed hawk	Inactive Active	Siberian Elm	20	Excellent
SWHA-2010-20	04/20/2010 05/05/2010	NA NA	Inactive Inactive	Cottonwood	28	Good
SWHA-2010-21	5/11/2010 05/18/2010	NA Swainson's hawk	Inactive Active	Siberian Elm	30	Good
GHOW-2010-26	04/20/2010 04/27/2010 05/11/2010	great horned owl great horned owl great horned owl	Active Active Active	Siberian Elm	30	Good
SWHA-2010-27	04/20/2010 04/27/2010 05/05/2010	NA Swainson's hawk Swainson's hawk	Inactive Active Active	Siberian Elm	30	Good
RTHA-2010-28	04/20/2010 04/27/2010 05/05/2010	NA NA NA	Inactive Inactive Inactive		30	Good
SWHA-2010-32	04/20/2010 05/05/2010 05/11/2010	Swainson's hawk Swainson's hawk Swainson's hawk	Inactive Inactive Active	Siberian Elm	10	Excellent
GHOW-2010-36	05/11/2010 05/18/2010	great horned owl NA	Active Inactive	Siberian Elm	25	Fair
RTHA-2010-37	05/12/2010	NA	Inactive	Siberian Elm	20	Good

NA means not applicable

Appendix 3. Observations of sharp-tailed grouse at Ashley Wind Energy Project from 3/21/2010 thru 6/30/2010 .

Date	Obs. Pt.	Number of Indiv.	Activity Type(s)[1]		Habitat Type(s)[2]		Heights		Aud/Vis	RSA info[3]
							Low	High		
3/30/2010	3	1	FL		GR		2	5	Y/Y	Below
3/30/2010	5	18	FL	WA	GR	W	0	6	Y/Y	Below
4/14/2010	5	1	PE		GR				Y/N	na
4/14/2010	5	2	FL		GR		0	5	Y/Y	Below
4/19/2010	5	1	PE		GR				Y/N	na
4/19/2010	5	1	FL		GR		2	5	Y/Y	Below
6/8/2010	5	2	PE		AG	GR	1.5	20	Y/Y	na
6/8/2010	5	1	FL	PE	GR		0	20	Y/Y	Below
6/13/2010	5	1	WA		GR		0	0	Y/Y	na
Total		**28**								

[1]Activity Types: PE=Perched, FL=Flying, WA=Walking

[2]Habitat Types: AG=Agriculture, GR=Grassland, W=Wetland

[3]The RSA info assumes a rotor diameter of 101 (m) and a hub height of 80 (m), or rotor low of 29.5 m and a rotor high of 130.5 m. An "na" indicates that either the bird was not observed flying or no height data was collected.